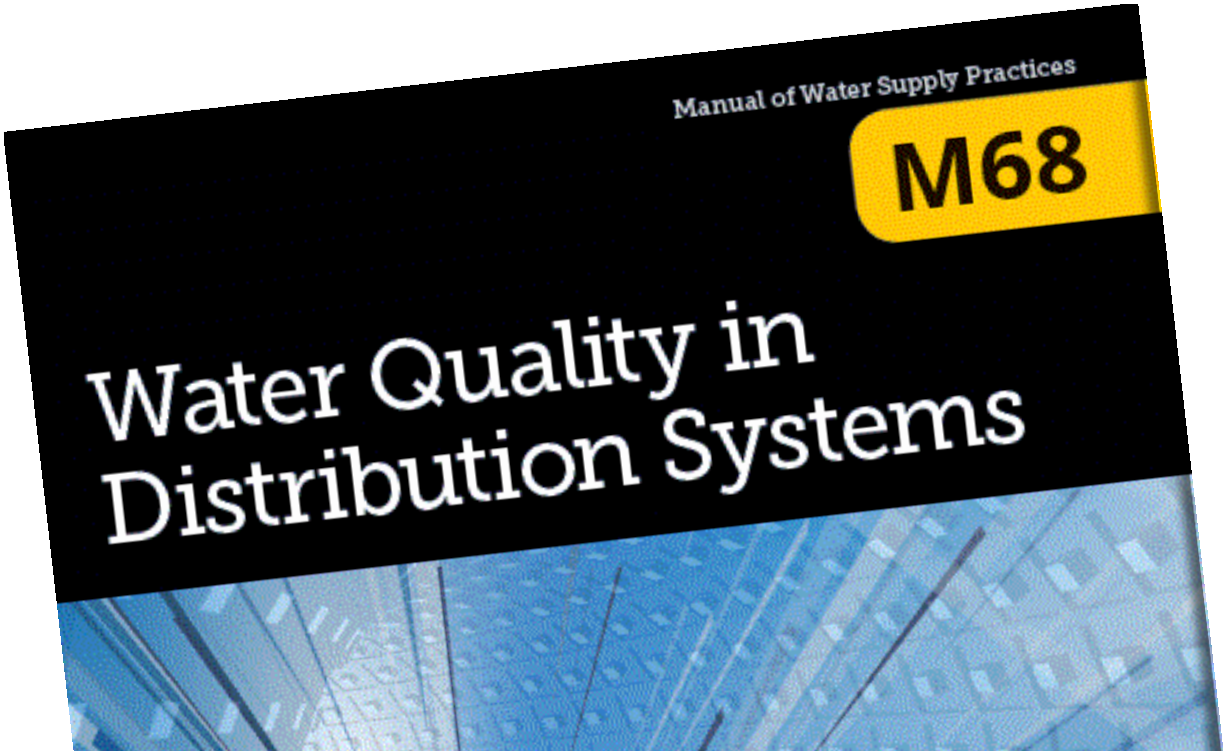
The New AWWA M68
and
How to Use It



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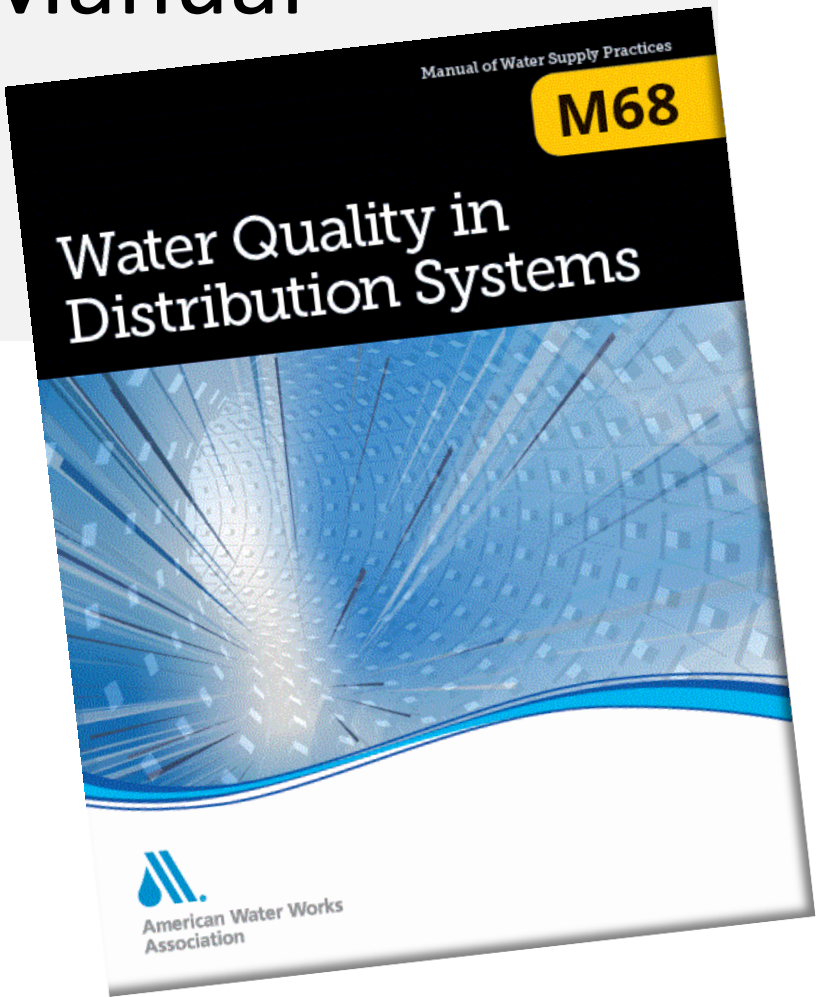
Outline

1. Introduction to Manual
2. Highlights
3. Case Studies



1. Introduction

Who wrote it?

Our colleagues

What is it for?

Best Practices, as a first step

Who is it for?

Owners, Operators, Engineers

What components are included?

Pumps, tanks, mains, fittings

2. Highlights

Chapters 1 - 11
Appendixes

Chapter 1

Introduction

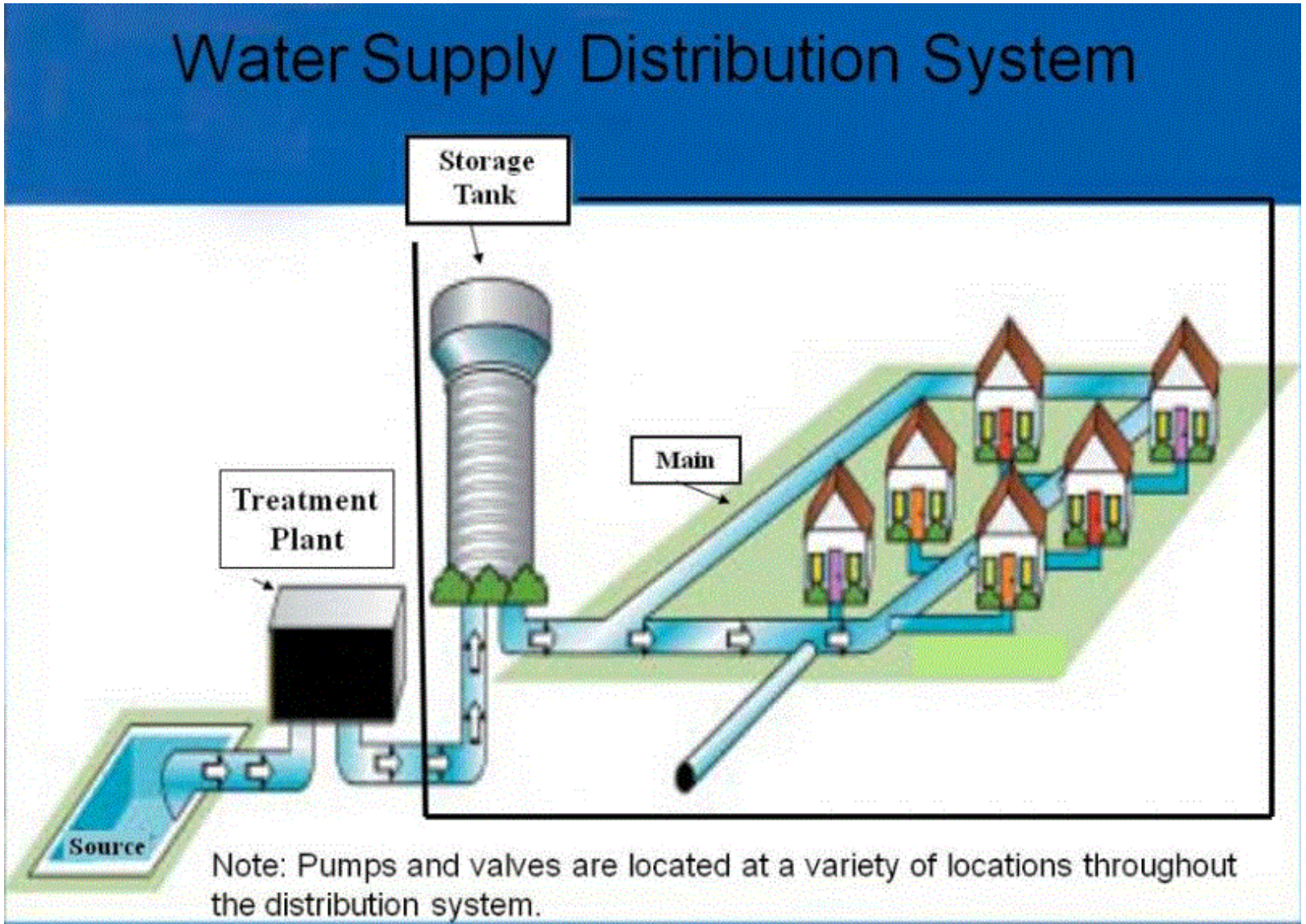
- How to Identify a Problem or Challenge
- Summary of Standards & Regulations
- References

Chapter 2

Capacity & Water Age

- Determining Capacity
- Determining Water Age
- Ways to Balance Capacity and Water Age
- Best Practices
- References

Water Quality in the System



Water Quality

Three Determinants

1. Source Water
2. Treatment
3. Distribution System

Water Age

What is it?

- General indicator
- Average time from treatment facility to any point in the distribution system
- Water quality tends to deteriorate with increasing water age

Water Age

What is ideal?

- Depends on…
  - Source, Treatment, Distribution System
  - System Goals
  - 5 days (120 hours)

Water Age

Can it be truly measured?

- No
- Can be approximated with varying degrees of accuracy
- Hydraulic Modeling, Tracer Studies, Measured Data

Data

- Accuracy – critical to modeling
- Baseline measurements

Data

- 5 Categories of Water Quality Indicators
  - Microbial activity
  - Disinfectant residuals
  - Disinfection By-products (DBPs)
  - Corrosion
  - Aesthetics

Improve Water Quality in Tanks

- Regular Inspections
- Cleaning
- Surfaces – welded steel (smooth) vs. concrete (rough)
- Booster Disinfection
  - Temporary
  - Permanent

Balance of Capacity and Age

Best Practices for Design

- Pipes
- Pumps
- Tanks

Balance of Capacity and Age

Pipes

- Size for fire flow – hurts water quality
- Eliminate/minimize dead-ends
- Planning for future demands
- Parallel piping

Balance of Capacity and Age

Pumps

- Size multiple pumps for continuous pumping from pump station
- Upsize pumps based on demand triggers vs. planning years

Balance of Capacity and Age

Tanks

- Avoid excessive storage
- Focus on effective rather than total storage
- Use hydraulic modeling to compare various scenarios
- Equalize storage
- Design for normal conditions, and find work-arounds for rare conditions (emergency interconnections, redundancy plans)

Balance of Capacity and Age

Best Practices for Operations

- Pipes
- Pumps
- Tanks

Balance of Capacity and Age

Pipes

- Allow flow thru zone boundary valves
- Reconfigure tank connections
- Close valves to change flow patterns
- Encourage water use at system extremities
- Consider effect of multiple supply sources

Balance of Capacity and Age

Pumps

- Change settings to improve tank turnover
- Pump across zone boundaries
- Control variable-speed pumps advantageously

Balance of Capacity and Age

Tanks

- Reduce storage volume
- Increase turnover
- Mixing strategies to improve flow patterns
- Take tank offline seasonally or permanently
- Direct bulk water haulers to draw from high water-age tanks
- Use ground storage with pumps and/or control valves to circulate water

Reduce Water Age in System

1. Increase demand (i.e. flushing)
2. Reduce volume in the system

Chapter 3

Understanding & Managing Biofilm, Coliform Occurrence, & the Microbial Community

Chapter 4

Infrastructure Integrity and Water Quality

Chapter 5

Taste, Odor, & Appearance

- Pure Water – clear & odorless
- Consumers judge based on good taste, odor & appearance, regardless if it meets all other drinking water standards
- Lowest health risk, yet highest impact on customer satisfaction

Taste, Odor & Appearance

Summary & Recommendations

- Basic: all water systems perform this action as part of standard practice
- Advanced: water systems with persistent taste, odor, and appearance issues may need to perform this action - beyond standard practice.

Taste, Odor & Appearance

Table 5-7 Recommended practices to address taste, odor, and appearance issues

Aesthetic Challenge		Best Management Practice	Level of Service
Sulfur-derived T&O: marshy, swampy, septic, rotten eggs	Monitoring	• Sensory analysis of affected T&O sites in distribution system	Basic
	Design, O&M considerations	• Provide and maintain free chlorine residual in distribution system	Advanced
		• Control biofilms	Basic
		• Minimize algal blooms and nutrients in source water(s)	Advanced
Disinfectant-derived T&O: chlorinous, ozonous, medicinal	Monitoring	• Laboratory analysis (e.g., gas chromatography/mass spectrometry) of T&O sites for aldehydes, N-chloroaldemines, iodinated trihalomethanes, or phenols	Basic
	Design, O&M considerations	• Minimize or eliminate potential for blending finished waters treated with different disinfectants	Basic/ Advanced
		• Add chlorine before ammonia and optimize chlorine-to-nitrogen ratio to form chloramines	Basic
		• Use biologically active filters after ozonation	Advanced
		• Use proper curing times on new or repaired pipelines and tanks	Basic

Chapters 6-10

6. Nitrification
7. Corrosion Control
8. Disinfection & Disinfection By-products
9. Management of Low Pressure
10. Cross-Connection Control & Backflow Prevention

Chapter 11

Security Issues

- Global concern for water suppliers
- Potential Threats & Pathways
  - Natural
  - Unintentional
  - Malevolent
- Risk Assessment & Planning

Security Issues

Table 11-1 Recommended best practices to address security challenges

Best Practice	Level of Service
Contaminant detection	
• Customer complaints	Basic
• Public health surveillance systems	Basic
• Routine monitoring: pressure, disinfectant residual	Basic
• Real-time monitoring	Advanced
• Develop/update vulnerability assessments	Basic/Advanced
• Develop/update emergency response plans	Basic/Advanced
• Harden facilities: upgrade padlocks and doors, install fences and exterior lighting	Basic
• Install detection systems: closed-circuit TV cameras and other security sensors	Advanced

Appendixes

- Techniques to Characterize Microbial Communities
- Summary of Flushing Techniques, Likely Water Quality Responses, Applications
- Methods for Identifying & Monitoring Water Quality Aesthetics in Distribution Systems
- Nitrification Monitoring Plan

3. Case Studies: #1

Plan

1. Obtain Data
2. Analyze Data
3. Hydraulic Modeling
4. Evaluate Water Quality Issues
5. Review Scenarios
6. Assess Costs
7. Formulate Long-term Plan

Case Studies: #2

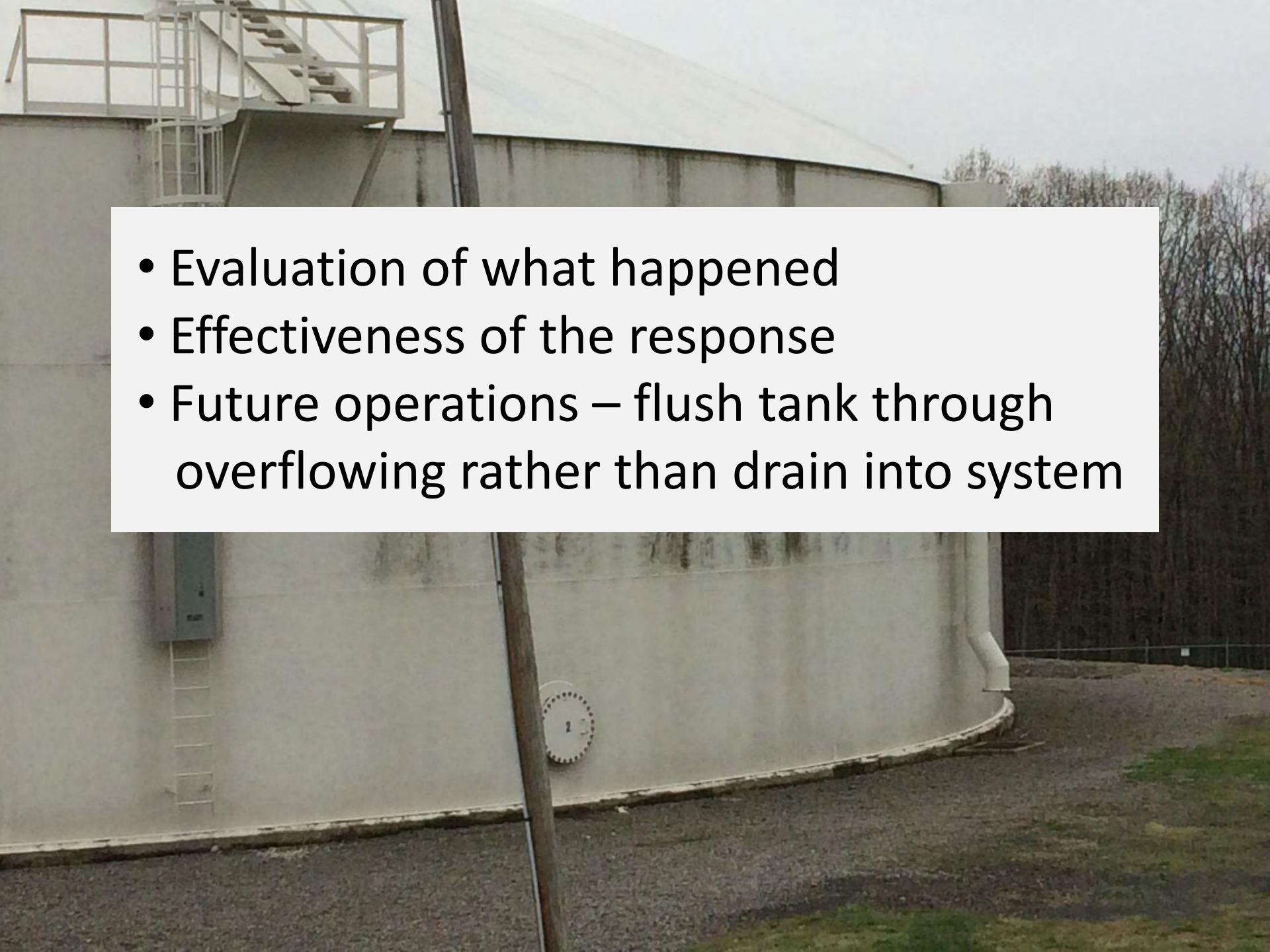
TTHM Issues

1. Obtain Data
2. Analyze Data
3. Hydraulic Modeling
4. Evaluate Water Quality Issues
5. Review Scenarios
6. Assess Costs
7. Formulate Long-term Plan

Case Studies: #3 (from Chapter 2)

Western System

- 950,000 retail and wholesale customers
- Supply – unfiltered surface water
- Free chlorine for primary disinfection
- Event:
  - Nonacute TCR violation
  - More positive coliform samples



- Evaluation of what happened
- Effectiveness of the response
- Future operations – flush tank through overflowing rather than drain into system

Conclusions – M68

- Water distribution systems are complex; M68 makes them easier to understand
- Best Practices as a first step to solving water quality problems
- Valuable for seasoned veterans or newbies

Questions?

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