Main Break and Pressure Loss Guidance

Julie Sievers, DNR FO3

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1

Goals

- Protect public health and safety
  - Always #1 goal and priority
- Minimize disruption of water service
  - Repair main or fix problem
  - Restore normal service
- These goals should always be the focus

2

AWWA Standard C651

- Revised in 2014 (released 2/1/2015)
- Incorporates findings from Water Research Foundation (WRF)
  - Effective Microbial Control Strategies for Main Breaks and Depressurization, 4307
- Incorporates EPA's issue paper "New or Repaired Water Mains"

3

AWWA Standard C651 Changes

- Clarifies the methods of chlorination and adds a 4th method
- Clarifies the different requirements for new mains and repaired mains
- Separates main breaks into 4 categories – more on these in detail later

4

AWWA Standard C651 Changes

- Adds a section for large-diameter transmission lines
- Increases the scour rate for most situations
- Revises the bacteria sampling requirements
- Revises the flushing and pressure testing

5

AWWA Standard C651 Changes

- Adds a reference to the new AWWA C655 for dechlorination and disposal of highly chlorinated water
- A copy of the standard is available in each FO and in the WS office or for purchase from AWWA

6

Revised Guidance

- A committee was formed to update the main break guidance to incorporate the revised standard
- Representatives from AWWA, IAWA, IAMU, IRWA, DMWW, Atlantic MU, DNR WSES, DNR WSOS, DNR FOs

7

Main Breaks & Pressure Loss

- The remainder of the presentation focuses on main breaks, repairs, pressure loss actions, and public notice requirements

8

Depressurization

- The 10 States Standards requires systems:
  - maintain 20 psi during all flow conditions and
  - a minimum of 35 psi during normal conditions
- Depressurized means 0 psi
  - must have adequate pressure to move water, such as out of a faucet to be pressurized
  - water flowing out of a pipe by gravity is depressurized

9

Basic Procedures For Pipe Repairs

1. Prevent contaminants from entering pipe by
   - Maintaining positive pressure until the repair site is fully exposed
   - Maintaining a dewatered trench
   - Keeping all pipe, materials, and tools clean and in sanitary condition

10

Basic Procedures For Pipe Repairs

2. Inspection and cleaning of pipe followed by disinfection by swabbing or spraying with minimum of 1% chlorine solution
   - Includes exposed portion of pipe, pipe materials, handheld materials and tools
3. Advising affected customers to adequately flush their service lines upon return to service

11

Categories of Main Breaks

- Controlled pipe repair without depressurization
- Controlled pipe repair with depressurization after shutdown without opening the pipe
- Controlled pipe repair with depressurization after shutdown with opening the pipe

12

Categories of Main Breaks

- Uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair

13

Categories of Main Breaks

- Discussion of each in detail
- Refer to guidance document
- Appendix 3 is a simplified chart of each
- All the documents are available on the DNR website
  - WS Compliance, PN

14

Controlled Pipe Repair Without Depressurization

- Positive pressure maintained during the break
- Positive pressure maintained during the repair
- No signs of contamination or intrusion

15

Controlled Pipe Repair Without Depressurization

Procedure:

- Excavate to below the break
- Dewater trench so repair site can be cleaned and disinfected
  - Minimum 1% chlorine solution
- Repair made "live" or under pressure

16

Controlled Pipe Repair Without Depressurization

Procedure continued:

- Flush to obtain 3 volumes of water turnover
  - Visually clear water
  - No specific flushing rate
- Normal chlorine residuals at end of flushing, if not, flush more

17

Controlled Pipe Repair Without Depressurization

- No boil water advisory
- No bacteria sampling

18

Controlled Pipe Repair With Depressurization After Shutdown Without Opening the Pipe

- Positive pressure maintained during the break
- Positive pressure maintained until controlled shutdown (depressurization)
  - Until repair site is exposed and secure
- Pipe is not opened
- No signs of contamination or intrusion

19

Controlled Pipe Repair With Depressurization After Shutdown Without Opening the Pipe

Procedure:

- Excavate to below the break
- Dewater trench to below the repair site
- Depressurize system
- Clean and disinfect repair site
  - Minimum 1% chlorine solution

20

Controlled Pipe Repair With Depressurization After Shutdown Without Opening the Pipe

Procedure continued:

- Repair without opening (cutting into) the pipe
- Flush to scour pipe at 3.0 ft/sec
- Flush to obtain turnover of 3 volumes
  - Visually clear water

21

Controlled Pipe Repair With Depressurization After Shutdown Without Opening the Pipe

Procedure continued:

- Normal chlorine residuals at end of flushing, if not, flush more
- Advise customers to flush interior piping
- No boil water advisory or bacteria sampling
  - unless potential contamination

22

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

- Positive pressure maintained during the break
- Positive pressure maintained until controlled shutdown (depressurization)
  - Until repair site is exposed and secure
- Pipe is opened
- No signs of contamination or intrusion

23

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

Procedure:

- Excavate to below the break
- Dewater trench to below the repair site
- Depressurize system
- Flush from the pipe into the trench until clear

24

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

Procedure continued:

- Clean and disinfect repair site and into pipe and all repair parts/pipe
  - Minimum 1% chlorine solution
- Repair with opening (cutting into) the pipe

25

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

Procedure continued:

- Flush to scour pipe, 3.0 ft/sec minimum
- Flush to obtain turnover of 3 volumes
- Visually clear water
- Normal chlorine residuals at end of flushing, if not, flush more

26

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

Procedure continued:

- Advise customers to flush interior piping
- A boil water advisory is recommended

27

Controlled Pipe Repair With Depressurization After Shutdown With Opening the Pipe

Procedure continued:

- One set of bacteria samples is recommended
  - Number of samples is based on number of service connections or miles of pipe
- Lift the boil water advisory when bacteria samples are clean (absent)

28

Uncontrolled Pipe Break

- Likelihood of water contamination or loss of sanitary conditions during repair
- Need to isolate break to maintain tower, leaking sewer line in trench, muddy water flowing into pipe, etc.
- Could be controlled situation "gone bad"

29

Uncontrolled Pipe Break

- Could be catastrophic event or failure
- Depressurization before excavation
- Possible or actual contamination or intrusion

30

Uncontrolled Pipe Break

Procedure:

- Excavate to below the break
- Dewater trench to below the repair site
- Flush from the pipe into the trench until clear

31

Uncontrolled Pipe Break

Procedure continued:

- Clean and disinfect repair site and into pipe and all repair parts/pipe
  - Minimum 1% chlorine solution
- Repair with opening (cutting into) the pipe

32

Uncontrolled Pipe Break

Procedure continued:

- **IF** practical, disinfect line
- Use disinfection procedures for new line
  - Isolate (close) all service connections
  - Disinfect
  - Flush
- Balance public health and risks

33

Uncontrolled Pipe Break

Procedure continued:

- Flush to scour pipe, 3.0 ft/sec minimum
- Flush to obtain turnover of 3 volumes
- Visually clear water
- Normal chlorine residuals at end of flushing, if not, flush more

34

Uncontrolled Pipe Break

Procedure continued:

- A boil water advisory is required
- Two sets of bacteria samples required
  - # of samples based on number of service connections or miles of pipe
  - Sample same locations >16 hours apart
  - Lift the boil water advisory when bacteria samples are clean (absent)

35

Number of Bacteria Samples

Number of Service Connections Impacted by the Depressurization	Controlled Repair with Depressurization Minimum Number of Samples Recommended*	Uncontrolled Pipe Break Minimum Number of Samples Required**
1 – 25	1	1 + 1 or 1 + 2***
26 – 50	2	2 + 2
51 – 100	3	3 + 3
101 – 500	4	4 + 4
501 – 2000	5	5 + 5
>2000	As directed by DNR	As directed by DNR

*Samples should be collected from each side of the repaired break if flow direction is uncertain/unknown or if it is a looped line.
***If the water flow is in one direction, take 1 sample downstream of the break, then another sample at the same location at least 16 hours later.

36

Number of Bacteria Samples

- For Rural Water Systems: 1 bacteria sample for every 5 miles of pipe that is depressurized
- Consult with DNR Field Office in any situation where guidance is not practical

37

Main Break Log

- The guidance includes a template for a main break log
  - Appendix 1
- Systems are encouraged to have some method of documenting main breaks and actions taken for each one

38

Public Notice Rules

- Public notice requirements by tiers
  - Related to type and severity of situation
- Requires 24 hr notice in tier 1 situations
  - The clock starts when the system learns of the violation or situation
- Requires notification to all customers, not just billed customers

39

Tiered Public Notice Requirements

- Tier I: acute MCL, TT, situations
  - Consult with IDNR as soon as practical; no later than 24 hours
  - Provide PN as soon as practical; no later than 24 hours
- Tier 2: chronic MCL & some TT violations
  - 30 days to conduct notice
- Tier 3: Monitoring and reporting violations
  - 3 month to conduct for acute contaminants
  - 12 months to conduct notice for nonacutes

40

Tier I PN Violations & Situations

- Subparagraphs 1 – 8 very prescriptive
  - Nitrate, nitrite, and coliform with fecal indicator MCL violations
  - Surface water/IGW treatment technique violations
  - Chlorine dioxide MRDL violations

41

Tier I PN Violations & Situations

- Subparagraph 9: Treatment or distribution system failure that "significantly increases the potential for drinking water contamination"
- Subparagraph 10: Other situations "with significant potential to have serious adverse effects on human health as a result of short-term exposure, as determined by the department either in its rules or on a case-by-case basis"

42

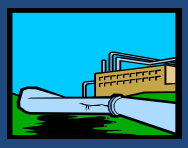
What Does A Tier I Main Break Look Like?

- Uncontrolled pipe break
  - Potential for bacterial contamination
  - Located near a contaminant source
    - River crossing
    - Co-located with broken sewer line
    - Feedlot, other contamination source
    - Elevation differences

43

Tier I Main Break (cont.)

- Potential to create a high hazard backflow incident
  - High hazard business located in affected area
- Minimum disinfectant residuals cannot be maintained
  - Downstream of the break
  - Throughout the distribution system
  - After the main is put back into service



44

Other Tier 1 Situations

- Interruption of source or treatment such as power loss, equipment failure, etc.
- Depressurization of distribution system
  - Tower or storage facility has been emptied
- Confirmed backflow or backsiphonage
  - No Use Advisory

45

Consult with DNR

- If any of these situations occur, the system should consult with DNR
- Determine if Tier I situation & requires PN
- Extent and method of distribution
- Content
  - No federally mandated language
  - Boil/Bottled Water Advisory
  - "No Use" Water Advisory

46

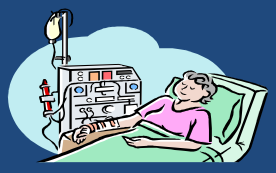
Public Notice Templates

- Boil advisory templates in Appendix 2
  - Two versions
    - One specific for systems with nitrate >7 or nitrite >0.7 mg/L as N with language for infants
- Use "No Use" if backflow/backsiphonage event
- May need conservation advisory
- Notify DNR FO when issue and lift an advisory

47

Public Notice

- Sometimes press release issued by DNR
  - Assistance
  - Compliance
- System still needs to meet all PN requirements
  - PWS still needs to contact critical users
    - Hospitals, Care Facilities, Dialysis Centers, Schools, Wet Industry



48

Public Notice/Public Relations

- Use public notice as a public relations opportunity
- Your customers prefer to hear information from you
  - Allows you to manage the situation
  - What happened
  - What should they do
  - Where to get additional information

Communication Plan

- Include the public notice templates tailored for your system
- Identify critical users and their contacts
- Anticipate questions
- Identify a primary contact
- Partner with trusted experts
- Know their media contact info
  - including after hours
- May include use of Code Red or reverse dialer system
- May use door to door delivery or other methods

50

Disposal of Chlorinated Water

- **61.3(2)** *General water quality criteria.* The following criteria are applicable to all surface waters including general use and designated use waters…
- *d.* Such waters shall be free from substances attributable to wastewater discharges or agricultural practices in concentrations or combinations which are acutely toxic to human, animal, or plant life.
- Chlorine is highly toxic to aquatic life

51

Proper Disposal or Dechlorination

- Prevent water from reaching a water of the US
  - Pool in areas where have exposure to sunlight and time to reduce chlorine levels
  - Force to run along ground's surface for long distances
  - Block storm water intakes
  - Measure chlorine residual at intake, want no measurable chlorine residual

52

Dechlorination

- Addition of dechlorinating agent
  - Sodium thiosulfate, ascorbic acid, sodium bisulfite, others
    - Must take care not to overfeed or can be toxic
  - Some type of mechanical means to mix and disperse
  - Often times a diffuser is used on a fire hydrant with dechlorinating chemical mixed through several different methods

53

Dechlorination Units

- Several systems now have equipment
- Some units available for loan or rent
- Encourage operators to check with neighboring systems about availability
- Encourage operators to check with contractors as many also have units

Questions??

55