Disinfectant Residual Monitoring & Maintaining Residuals

Data Summit
Region 5, U.S. EPA

January 10, 2017
Historic Monitoring

- ~100,000 population
- 100 monthly TCR samples required
- 10 locations, 3× week

- 01/16 – asked to assess chlorination in the DS to ensure the disinfection residual barrier and public health protection
EPA
Recurring Chlorine Monitoring

- Additional Cl$_2$ monitoring locations justified:
  - Areas embedded with residences
  - Smaller diameter DS network/ representing ageing water
- 1 week implementation
- Mapped all public locations (i.e. schools, churches, etc.)
- Developed sectors
- Investigated areas closest to primary residential water usage
- Measured service lines and flow rates / calculated flush times
Combined EPA/Flint Recurring Chlorine Monitoring

- Added 24 Cl\(_2\) monitoring sites
- Mostly churches, schools, childcares
- Combined with the 10 Utility sites, total = 34 Cl\(_2\) monitoring locations weekly
- Concentrations mapped on EPA website, updated biweekly
Flint Chlorine Monitoring

- Cl₂ residuals
- Week: June 13
- 10 Utility TCR monitoring locations
- Working with Utility to implement best practices
- Including flushing program for localized low residual areas
Combined EPA/Flint Recurring Chlorine Monitoring

- Cl₂ residuals
- Week: June 13
- 10 Utility TCR monitoring locations + 24 EPA Cl₂ monitoring locations

- 0.5 mg/L and greater
- 0.2 mg/L to less than 0.5 mg/L
- Less than 0.2 mg/L
Recurring Chlorine Monitoring

Source: epa.gov/flint

September 2, 2016 to September 9, 2016

- 0.5 mg/L and greater
- 0.2 mg/L to less than 0.5 mg/L
- Less than 0.2 mg/L
- No data
Recurring Chlorine Results

Recurring Chlorine Over Time (mg/L)

Left-side (y-axis) = Chlorine (mg/L). Bottom (x-axis) = time in 1 week intervals. Hover over point in chart for more info.
Recurring Chlorine Results

Recurring Chlorine Over Time (mg/L)

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Regulated Disinfection Byproducts

Total Trihalomethanes (n=24/month)

THM Concentration (µg/L)

Max
Min
Ave

Total Haloacetic Acids 5 (n=24/month)

HAA5 Concentration (µg/L)

Max
Min
Ave

MCL = 80 µg/L

MCL = 60 µg/L
Flint Draft
RTCR
Monitoring

- **RTCR-**
  - 30/week from 20 sites *(green)*
- **Chlorine Only**
  - 5/week *(blue)*
- **Total**
  - 35/week from 25 unique locations taken Mon-Fri
Investigative Chlorine Sampling

- Hydrant Sampler – www.epa.gov/hydrant-sampler
- Targeted “critical” areas of the system
- Free & Total Cl\(_2\), pH, and temperature
- April 2016 – Collected 130 samples system-wide
- August 2016 – Targeted additional low Cl\(_2\) areas
- Ongoing sampling conducted by City of Flint throughout summer
- Low chlorine addressed by City of Flint through flushing and valve repair/replacement
Investigative Sampling Results – April 2016

Free Chlorine Residual

- ≤ 0.20 mg/L
- > 0.20 to 0.50 mg/L
- > 0.50 mg/L
Distribution System Flushing Program

- Currently consists of:
  - 13 Automated Flushers
  - 13 Manual Flushers
  - 4 Permanent Auto-Flushers (ordered)
- Modified to flush at low, controlled flow rate
- Cl₂ monitored and settings adjusted routinely
Flushing Program Data

![Graph showing chlorine and flush duration over time]
Final Thoughts

- Fresh iron surfaces consume more chlorine
- Reaction demand must be managed
- Increased chlorine mass
  - Higher conc.
  - Decreased residence time
- Reaction demand should decrease over time