



WATER SYSTEM DISINFECTION OPTIONS

City Council Workshop – January 22, 2019

Agenda

- Brief recap of Fall 2018 Contamination Incident
- Alternatives Study performed by Stantec
 - Liquid Chlorine Solution (*Sodium Hypochlorite*)
 - Chlorine Gas
 - Ozone (Primary), with Chlorine residual
 - Ultraviolet (UV) Light, with Chlorine residual
 - Shock Chlorination
 - Filtration
 - Comprehensive Inspection & Enforcement
 - Do Nothing
- No decision requested at this time. Future discussion at additional CC workshop is planned.

Recap

- September 20, 2018 – three positive E. coli results on routine test sample group in low pressure zone of City
- September 22 – confirmatory testing by MDH yielded positive Total coliform tests in same area as analyzed by MDH, but no E. coli
- Regardless - Mandatory Boil Advisory for affected area issued September 22
- Emergency shock chlorination September 22-23, flushed clear by late on September 23, sample taken and negative test results delivered September 24.
- Precautionary low-level (liquid) chlorination (≈ 1 ppm) in effect since late September 2018.

Liquid Chlorine Solution (*Sodium Hypochlorite*)

- Very similar to existing method being used since fall 2018.
- Effective at providing residual amount of chlorine to protect from microbial contamination while water is transported from source to tap.
- Requires retrofitting equipment at all well houses and Water Treatment Plant.
- Degrades on its journey within the distribution system, and therefore requires frequent monitoring of dosage rates to maintain effective levels.
- Approximate Capital Cost = \$155,000
- Approximate Annual Operating Cost = \$99,000

**Capital cost does not include engineering and project management, typically 15-30%*

Chlorine Gas

- Very common practice in upper Midwest and other parts of the US.
- Highly effective at providing residual amount of chlorine necessary to protect from microbial contamination while water is transported from source to tap.
- Requires substantial retrofitting for equipment at all well houses and Water Treatment Plant than liquid Chlorine counterpart, due to need for providing containment of gas in the event of leakage.
- Does not degrade on its journey within the distribution system, and therefore dosage levels can be set and do not need frequent monitoring.
- Approximate Capital Cost* = \$351,000
- Approximate Annual Operating Cost = \$44,000

**Capital cost does not include engineering and project management, typically 15-30%*

Ozone with Chlorine Residual

- Can combat a broader set of microbial contaminants, such as viruses, cysts, and spores compared to chlorine.
- Can improve water aesthetics, and therefore are more commonly used for primary disinfection of surface water sources, such as rivers and lakes.
- Ozone on its own does NOT provide residual protection in distribution system, and would have to be paired with one of earlier chlorination methods.
- All new equipment needed at all wells and at water treatment plant.
- Approximate Capital Cost* = \$3,000,000 (Ozone only, chlorination equipment additional and dependent on method per earlier slides)
- Approximate Annual Operating Cost = \$104,000 (Ozone only, chlorination operations would be additional and dependent on method per earlier slides)

**Capital cost does not include engineering and project management, typically 15-30%*

Ultraviolet (UV) Light with Chlorine Residual

- Very effective at disinfection.
- Requires high-quality source water, including limited water hardness.
 - Aquifer source for Hastings has moderate hardness.
- UV also does NOT provide residual protection in distribution system, and would have to be paired with one of earlier chlorination methods.
- All new equipment needed at all wells and at water treatment plant.
- Approximate Capital Cost* = \$750,000 (UV only, chlorination equipment additional and dependent on method per earlier slides)
- Approximate Annual Operating Cost = \$22,000 (UV only, chlorination operations would be additional and dependent on method per earlier slides)

**Capital cost does not include engineering and project management, typically 15-30%*

Shock Chlorination

- Operate without chlorination most of the time, and periodically flush system with concentrated amount of chlorine.
- Very similar to emergency operations conducted in fall 2018.
- Requires coordination with public, and possibly requires temporary ban consumption (i.e. drinking/cooking).
 - ▣ Fall 2018 procedure took roughly 48 hours to complete.
- Does NOT provide continuous protection against microbial contamination.
- Cost is relatively low \approx \$10,000 each occurrence including outreach efforts.

Filtration

- Examples are Granular Activated Carbon (GAC) or membrane filtering equipment.
- Removes pathogens and microbial contaminants from water at the source.
 - ▣ More commonly used for surface water supplies, such as rivers and lakes, which have higher occurrences of these concerns.
- Hastings source water wells have great history of being free of harmful pathogens and microbial contaminants.
- Filtration equipment takes up substantial space, and is therefore very expensive to install, requiring building expansions at each site.
- Filtration does NOT provide residual protection in distribution system, and would have to be paired with one of the chlorination methods discussed earlier. Water treatment standards require chlorination if a filtration system were used.

Comprehensive Inspection & Enforcement

- This is a non-disinfection alternative.
- Focus is to prevent contamination on the distribution system before it has any opportunity to enter.
- Requires vigilant and aggressive inspection of all service connection points (7,800+), irrigation systems, construction interactions with water system, and fire hydrants (~1,500).
- Very heavy staff resources would be necessary
 - ▣ 3 to 4 FT staff on this task all year for at least the first year
- Public cooperation is absolutely necessary for maximum effectiveness.
 - ▣ Requires entry into properties to inspect for code compliant plumbing implements and cross connections.
- May reduce risks, but not guaranteed.
- Unlikely to trace back source of fall 2018 incident.

Do Nothing



- Discontinue the ongoing addition of liquid chlorine and return operations to that of pre-2018 event.
- If City experiences another event, continuous permanent disinfection will likely be required for City to continue to hold operations licensing.

Next Steps

- Councilmembers encouraged to digest information and think on it for a few weeks.
- Draft Study Report will be posted on City website, along with this presentation.
- Report to be amended to contain condensed summary of pros and cons
- Return for Second Workshop to discuss in late February/early March
 - More complete financial analysis, along with final staff recommendations
 - Additional Council Q & A
- City has option of requesting MDH host a community disinfection open house prior to final decision-making.
- Tentatively, staff would recommend Council make final considerations at regular Council meeting in late March/early April.
- Staff will prepare communications plan regardless of which choice is ultimately made, and will publish as soon as possible thereafter, with outreach to local media, social media, etc.

Questions?

