NDWAC MDBP Rule Revisions Working Group

National Drinking Water Advisory Council (NDWAC)

March 9, 2023 Meeting 7 Summary

Meeting Summary

Background on the MDBP Working Group

The United States Environmental Protection Agency (EPA) has sought public input and information to inform potential regulatory revisions of eight National Primary Drinking Water Regulations (NPDWRs) included in five Microbial and Disinfection Byproducts (MDBP) rules following the third Six-Year Review. EPA hosted an initial virtual public meeting in October 2020 to solicit input on further improving public health protection from MDBPs in drinking water. Throughout 2021, EPA sought input relevant to potential rule revisions through additional public meetings focusing on topics identified through public comments and information.

EPA has now charged the National Drinking Water Advisory Council (NDWAC or Council), a Federal Advisory Committee (FAC) established under the Safe Drinking Water Act (SDWA) of 1974 to provide the agency with advice and recommendations on potential revisions to the MDBP Rules. In addition, to support the work of the Council, EPA asked the NDWAC to form a working group to explore specific issues and identify potential MDBP rule revision options for the Council to consider in making recommendations to EPA. More information on the NDWAC MDBP Rule Revisions Working Group meeting schedules and other information are available at: https://www.epa.gov/ndwac/national-drinking-water-advisory-council-ndwac-microbial-and-disinfection-byproducts-mdbp. EPA is currently providing the public with an opportunity to send written input to EPA via the public docket at www.regulations.gov, Docket ID: EPA-HQ-OW-2020-0486.

Meeting summaries and background documents on each meeting topic are available in the MDBP Rule Revisions public docket at www.regulations.gov, Docket ID: EPA-HQ-OW-2020-0486. More information on the potential rule revisions is available at: https://www.epa.gov/dwsixyearreview/potential-revisions-microbial-and-disinfection-byproducts-rules.

Meeting Purpose

The seventh Working Group (WG) meeting was held to continue discussions about preliminary understandings for problem characterization and begin discussion of interventions. Materials provided to the WG members in advance of the meeting included reference articles, the Draft Meeting 6, Segment 4 Meeting Summary, and draft facilitator synthesis slides.

This document provides a summary of presentations and discussions from the meeting on March 9th, 2023. In addition to WG members, approximately 200 observers attended the meeting. Working Group member attendance is shown in Appendix 1.

Segment 1

Agenda Review and Meeting Procedures

Elizabeth Corr, MDBP Rule Revisions Working Group Designated Federal Officer, Office of Ground Water and Drinking Water (OGWDW), Office of Water, EPA

Ms. Corr welcomed all to the seventh meeting.

Eric Burneson, Director, Standards and Risk Management Division, OGWDW, Office of Water, EPA

Mr. Burneson noted the significance and importance of addressing public health concerns with regards to growth of opportunistic pathogens and formation of DBPs, all while addressing public health concerns caused by them, maintaining public health protection, assessing emerging contaminants, advancing risk balancing, managing implementation challenges, and ensuring efficient implementation of rules. The current discussions being undertaken also present an opportunity to advance environmental justice equity to protect consumer health, particularly for those in disadvantaged communities. Mr. Burneson encouraged further meaningful input as part of this opportunity to protect public health but also acknowledged the challenges, complications in balancing risk trade-offs, and hurdles of accomplishing all of this in a virtual meeting environment. In addition, he announced that EPA will hold an in-person meeting in June to support the WG, to aid in the development of consensus recommendations in a face-to-face setting and collaborative environment. Separately, as an item of relevance, Mr. Burneson shared notice of EPA's proposed Rulemaking for the Steam Electric Power Generating Effluent Limitations Guidelines, as part of a longstanding charge to reduce release of toxic metals and to further the protection of drinking and agriculturally used water. A comment period will follow for 60 days following the release of the Federal Register on March 29th.

Lisa Daniels, NDWAC MDBP Rules Revision Working Group Co-Chair, welcomed all to the meeting and observed that conversations for this meeting will be a continuation of those related to interim understanding for problem characterization, and noted that conversations were expected to shift towards interventions in the second-half of the meeting.

Andy Kricun, NDWAC MDBP Rules Revision Working Group Co-Chair, extended thanks to EPA and Ross Strategic for efforts put into bringing WG meetings together. He also thanked the Technical Analysts for providing support to the WG. Mr. Kricun acknowledged the WG members' commitment and how outcomes of this WG will allow EPA to be further protective of future generations, while signaling concern and emphasis that results will benefit all communities and households across the country.

Rob Greenwood, Ross Strategic, noted that three WG members had schedule conflicts and were not in attendance at the meeting, but arrangements would be made to include them in discussions, to ensure all WG members are continually kept up to date on discussions. Mr. Greenwood acknowledged scheduling conflicts for other WG members as well and thanked them for their time and attendance in Meeting #7. He reviewed controls for the Zoom platform along with the day's agenda. In addition, he noted that WG members are providing their unique points of view and are not representing their affiliated organizations.

Mr. Greenwood described how problem characterization discussions will continue, along with a look into discussions on interventions for Meeting #8. In this meeting, Segment 2 will encompass discussion related to opportunistic pathogens and disinfection byproducts, picking up on discussion themes from Segment 4 of Meeting #6. Segment 3 will allow further discussion on synthesis slides previously shared with Working Group members, touching on source water conditions, storage tanks, consecutive systems, environmental justice, and implementation challenges. Mr. Greenwood added that time will be allotted to discuss the approach for Meeting #8 scheduled for April 19th.

Segment 2

Continue Discussion of Working Group Understanding of OP and DBP Data and Analysis

For the purposes of this summary, in Segment 2 and Segment 3, the summary assembles the WG member comments thematically (rather than chronologically in the order they occurred) to enhance reader understanding of the areas of common understanding among WG members.

Opportunistic Pathogens (OPs)

Mr. Greenwood screen shared the Meeting 6, Segment 4 draft summary and reviewed the emerging themes from the WG's initial common understandings discussion on OPs, as well as some additional WG member observations from follow-up discussions. Mr. Greenwood explained that the goal of reviewing these highlights is to capture additional or alternative perspectives and support the emergence of areas where WG members share understanding amongst themselves.

The highlighted items shared were:

> …"drinking water is a contributor to *Legionella*-related public health impacts, and there is an opportunity to improve public health outcomes through improved drinking water quality management. Furthermore, consistency in the belief that both public water systems and building water systems have a role to play in improving these outcomes was indicated.
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> ….
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> *Legionella* is clearly a problem we need to look at.
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> …
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> reason to believe there are disparate, from an equity standpoint, public health impacts from *Legionella* that are important to consider.
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> …
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> WG members indicated that, while there are some actions that can be undertaken on the treatment and distribution system side of drinking water, improvements to building water quality management will be critical if public health improvements are to be realized. WG members added further cautions to the discussion including:
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> - utilities face many risks and challenges (e.g., other priorities such as investing and managing for climate impacts) that need to be considered in the context of framing pathogen control;
> - any additional controls put in place to address opportunistic pathogens will also have to be weighed with the other public health impact risks from DBPs;
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> …
>
> ***Mycobacterium avium* Complex (MAC) and *Pseudomonas***
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> - There are multiple opportunistic pathogens that have a role in drinking water quality. The WG has had less focus on MAC and *Pseudomonas* and there is less research, leaving the WG with less ability to draw conclusions related to problem characterization.
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> …
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> **Topic 2 – Premise plumbing pathogen-related public health impacts – evidence and root causes related to water quality conditions in premise plumbing and their relationship to pathogen-related outbreaks/illness.**
> A theme that emerged under this topic is that improvement to building water quality requires attention if opportunistic pathogen related public health impacts linked to drinking water are to improve. A second theme is the concept of **shared responsibility** between building owners/managers and public water systems for addressing opportunistic pathogen drinking water-related public health impacts. Additionally, WG members highlighted the importance of 1) distinguishing between different types of buildings and related premise plumbing systems being managed (e.g., those providing treatment and therefore regulated under the Safe Drinking Water Act (SDWA) and residential buildings including single family residences), and 2) establishing

reasonable assumptions about knowledge level and water quality management practices implemented by those controlling/managing the building plumbing.

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Topic 3 – Distribution system water quality conditions related to opportunistic pathogens – evidence and root causes of variable conditions and related vulnerabilities within the distribution system.

Regarding opportunistic pathogen growth root causes in distribution system water quality conditions, a primary theme from the WG discussions was that there are a variety of distribution system operating conditions that can support the growth of opportunistic pathogens in drinking water. A second theme that emerged was the uniqueness of every distribution system and the complexity of changing practices that can promote growth conditions throughout the system.

…

The initial perspective shared on this topic was that drinking water utilities need to do their part to deliver safe water through their distribution systems. Other members agreed with this perspective, with one member specifying that water conditions in distribution systems such as water age, nitrification, and sediment buildup are underlying conditions that exist within distribution systems that contribute to an environment that can contribute to outbreaks. This member stated that low or variable disinfectant residual could be a significant root cause for opportunistic pathogen growth in distribution systems. Other members agreed that there are variable distribution system management conditions that could be improved upon, and there will be value in raising attention and understanding of distribution system and treatment plant practices that can improve the consistency and safety of water quality delivered to buildings.

…

Additional root causes include biofilms and storage tank management practices.

…

distribution systems are not, and are not intended to be, sterile."

Mr. Greenwood then described relevant points that arose in the facilitation team's interim conservations with WG members:

- Every system is unique, but concepts of water quality management are consistent.
- OPs have a comparatively higher mortality rate than other microbials.
- Sensitive populations are an important consideration.
- MAC and *Pseudomonas*: DS occurrence data are weak, different exposure pathways (cuts, wounds), not reportable illnesses leading to lack of data. However, these pathogens have, as one WG member put it, "risen to the top of the heap for public health experts."
- Many management strategies for *Legionella* will likely be effective for MAC and *Pseudomonas*.

Mr. Greenwood then opened the floor for group discussion inviting the WG to share whether they feel there is shared understanding around these initial themes or if there are elements with which members do not feel comfortable. The discussion on opportunistic pathogens was set up for WG member discussion using the following questions:

- In your review of the draft summary Meeting 6, Segment 4, under OPs (topics 1-3), what do you see as important common themes among WG members?
- Do you believe there is any important information from the Meeting 6 discussion not captured in the summary or is there additional perspective you would like to add during our discussions today?

Discussion:

The initial summary statement put forward from a WG member was that there is emerging shared understanding amongst the WG, particularly with regards to: the connection between *Legionella* and water quality conditions and illness and the opportunity to improve outcomes; the uniqueness of the distribution systems that can have different

regional concerns dependent on various factors; and the importance of low disinfectant residuals as a root cause for the growth of *Legionella* in distribution systems and building water systems. The member added that it seems that *Mycobacterium avium* Complex (MAC) and *Pseudomonas* have public health impacts and are a problem, but there is limited availability of research associating drinking water to public health impacts, and to that end, maybe there are other areas the WG should focus on since there is limited understanding of their impacts.

The WG member also noted that discussions have used the concept of root cause in a few different ways: for example, disinfectant residual or lack of it is a root cause of public health impacts, but in some sense the disinfectant residual itself is a solution to other root causes related to opportunistic pathogens like water age. The member further shared that drinking water regulation may not be able to fully address all the issues that distribution systems across the country are facing, but that there are definitely basics that can be addressed while recognizing individual systems.

The WG member shared their perspective that while actions on both the premise plumbing and distribution system side have potential for limiting public health risk, the two systems do not have to be addressed in tandem and improving public water systems' water quality conditions alone will produce positive impacts on public health, but we also need to be aware of when we are hitting the limits of what can be done without addressing what is inside the buildings.

Overall, WG members indicated that this member's summary statement is within their comfort zone.

Shared responsibility
WG members noted that there are opportunities to improve distribution system water quality which can be the source of *Legionella* impacts, while recognizing the importance of and looking for ways to address the role of premise plumbing. In demonstrating the importance of the distribution system, one member] shared their experience working with a local school district that had positive tests for *Legionella* in its drinking water systems. In response, the school undertook flushing to draw water into the building system from the public water system but could not obtain water that had a detectable disinfectant residual. This member used the example to emphasize the important role of distribution water quality to seed opportunistic pathogen growth within building water systems, and to emphasize that addressing distribution system management will improve water quality.

In discussing the relationship between public water systems and building water systems, another member pointed to atypical mycobacterial outbreaks at healthcare facilities and noted one in which the source was traced to the hospital water system which is fed by the municipal system. In this instance a solution was additive treatment to the water coming in from the public water system, again demonstrating the importance of high-quality water coming from the public water system. Another member provided an example of a healthcare facility that filtered water within its building, or treated to the extent disinfectant was removed which can then create a problem with water quality in the building. In this case the public water system water quality was not related to the outbreak. This member added that water chemistry is complicated, and we need to be careful about balancing the shared responsibility.

Working Group members recognized the prominent role premise plumbing plays in Opportunistic Pathogen-related public health impacts and recognized that drinking water utilities do not have direct control over water quality past the master meter and into individual building contexts. One member suggested that there is a need for a mandatory partnership with building owners/managers to elevate water quality management as part of a shared responsibility framework for addressing opportunistic pathogen drinking water-related public health impacts. Another WG member noted that, under the current regulatory framework, premise plumbing may not be able to be addressed and suggested the WG look to building codes, green certifications, and insurance requirements as additional vehicles to make progress on the premise plumbing side. Mr. Greenwood reminded the group that the NDWAC charge clearly invites recommendations on non-regulatory approaches that may improve public health protection from OPs.

Understanding the types of premise plumbing
As part of this discussion, members highlighted that there is a need for greater understanding of the different types of buildings and existing authorities to mandate/incentivize water management plans on the premise plumbing side to ensure WG recommendations and roles are clear and can be followed through. One member noted that there are different types of building settings (e.g., hotel, hospital, college) and not all of them have a building manager (e.g., daycare centers, homeless shelters). Another member added that there are non-traditional community water systems (prisons, hospitals, universities) that are regulated and have to meet water quality standards and maintain their premise plumbing, and the WG can look to learn from their approaches to water management.

MAC *and Pseudomonas*
Generally, members agreed with the summary statement for MAC and *Pseudomonas* put forward by the WG member, adding that it would be helpful to understand how they may be addressed by actions taken to address *Legionella*.

Disparate public health impacts from Legionella
One member highlighted that the summary statement shared by Mr. Greenwood regarding disparate impacts and equity needs to be considered within the WG scope, while acknowledging that there are other larger equity aspects beyond the scope of this group. Another WG member indicated agreement, while stating that there are opportunities for the WG members to make recommendations related to such items as improved information sharing for utilities in low-income communities about financial resources available to adopt new technologies and other best practices.

A member shared their experience regarding the expense involved in addressing older infrastructure. For example, their water system has older sections with cast iron pipes associated with water quality challenges. Replacing that infrastructure, however, will require financial help. Another member agreed that older infrastructure harbors conditions contributing to opportunistic pathogen growth, such as biofilms. Another member supported the idea that the WG should look at the equity issue for addressing *Legionella* and reiterated the point from the previous meeting that, from an equity standpoint, there are disparate public health impacts from *Legionella*. The same member highlighted that improving public health will require investment from utilities, and any recommendations from the WG should be balanced, with consideration for offsetting costs with federal support, rather than costs being passed to consumers. Mr. Greenwood explained that the WG would have further opportunity to continue the discussion in the EJ session later in the meeting where there would be an opportunity to discuss underlying EJ conditions, including the more MDBP-specific aspects.

To wrap up this session, Rob Greenwood observed that Working Group members have signaled comfort with the opening problem characterization statement including that *Legionella* in drinking water requires the WGs attention, that there is a shared responsibility between public water systems and building owners/operators, that opportunities will likely exist to improve conditions related to MAC and *Pseudomonas* through actions taken related to *Legionella*, and that disparate impacts and outcomes are a needed part of the interventions conversation related to OPs.

Disinfection Byproducts (DBPs)

Rob Greenwood opened the discussion on DBPs by noting that at the previous WG meeting not all participants had a chance to speak due to timing issues. Consequently, the identification of areas with shared understanding between the group was not as clear as it was for OPs. Mr. Greenwood then shared highlighted selections from the Draft Meeting 6 Segment 4 Summary that the facilitation team considered as potential areas of shared understanding.

> "WG members discussed that research undertaken since the implementation of Stage 1 and 2 D/DBPRs signal that certain unregulated DBPs have the potential to pose both cancerous and non-cancerous health effects."

Mr. Greenwood explained that since Meeting 6, WG members and the facilitation team have further developed this concept to include an understanding that there is new research since adoption of Stage 1 and Stage 2 that adds to the body of knowledge that was used to regulate previously, and that new research does not alter the sense of public

health risk downward but instead it tends to be in the other direction. In particular, WG members have identified unregulated brominated haloacetic acids as a potential for further focus during WG discussions.
Mr. Greenwood shared further selected excerpts from the Meeting 6 Segment 4 Summary:

> Overall discussion pointed in the direction that the potential for public health impacts from regulated and unregulated DBPs merits further attention from the WG during the intervention phase of WG discussions.
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> One member noted that one of the key strategies utilized in implementation of the original D/DBP rules was a switch to chloramines, as an affordable treatment technique for utilities, though we now know that treatment can generate other types of unregulated DBPs.
> …
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> The original intent of the D/DBP rules was to address certain DBPs (THM4 and HAA5) with the expectation that their control would limit other DBPs as well. One suggestion to move forward is to look for "win-win" solutions focusing on temperature, precursors, and better source water protection for bromide sources.
> …
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> WG members indicated that there are some commonalities with root causes for microbial and DBP conditions.
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> …
>
> The focus areas that would be a win-win for everyone could be organic matter/nutrients, water age, storage tank management, temperatures, and other actions that help keep water flowing in the distribution system.

The Working Group was asked to reflect on the following discussion questions:

- In your review of the draft summary Meeting 6 Segment 4, under DBPs (Topics 4-5), what do you see as important common themes among WG members?
- Do you believe there is any important information from the Meeting 6 discussion not captured in the summary or is there additional perspective you would like to add during our discussions today?

Discussion:

A WG member offered their perspective as an initial problem characterization statement regarding DBPs. This member indicated that, given three aspects of regulatory review 1) understanding occurrence, 2) understanding toxicity, and 3) characterizing treatment options, their opinion is that the information the group has seen on toxicity is the weakest of the three aspects. The toxicity information presented thus far is focused on the DBPs we know most about and in this member's opinion has not produced a strong basis to understand and consider health effects. This inadequacy of information makes entering into discussions about interventions challenging, as the information to support risk-risk tradeoffs and cost benefit analysis does not seem as robust as it has been in past regulatory development processes for DBPs. There is a recognition that there are legitimate DBP issues that need to be dealt with, but also that this is an evolving topic regarding complicated water chemistry and cause and effect relationships, which is very challenging from a regulatory perspective.

Another member agreed with this statement and elaborated that, given the ongoing balancing act of varying precursor levels and the simultaneous compliance challenges that affect every system in unique ways due to varying characteristics, this raises some real issues with determining any new DBP interventions, and it all goes back to having stronger toxicity information. Along these lines, a member agreed and added that, until the toxicity data is further developed, the group's focus in the intervention phase should be on improving treatment through existing mechanisms and not new treatment regimens requiring major capital investment. Another member supported this statement. Additional WG members indicated that, as far as making intervention decisions, the toxicity information seems to be

a weak point, highlighting, in particular, the lack of information on health effects outside of bladder cancer, especially for some of the currently unregulated byproducts and looking at reproductive health effects.

One WG member asked if the technical analysts could discuss the likelihood of utilities achieving more than is required by the current 3x3 matrix for precursor removal required for conventional treatment plants. A technical analyst responded that some utilities could exceed the 3x3 matrix, with some utilities getting 5% more removal, but that there are site-specific concerns that should be considered. He discussed the use of "turbo coagulation" identified for Stage 1 and Stage 2 but that it has diminishing returns. He also spoke about related concerns such as extra sludge production. Another technical analyst responded that the question should be examined across the universe of PWSs including those who use the non 3x3 TOC reduction alternatives. One technical analyst discussed his experiences in the upper midwest where PWSs have done a good job of controlling TOC and meeting MCLs to address DBPs. He said that some PWSs have water sources that are not amenable to TOC reduction but achieve compliance by using chloramination. He said that softening systems have no problem meeting the 3x3 matrix. An additional technical analyst indicated that the premise behind the 3x3 matrix is that it would help to control unregulated DBPs but noted that it has room for improvement in situations where TOC is high, suggesting that for waters with TOC of 10 mg/L, a 50% reduction would only get you to 5 mg/L which is still relatively high. He said this concern would only be for some of the boxes in the 3x3 matrix.

Other working group members stated they believe there is a more well characterized understanding of toxicity than presented in the initial problem characterization statement. These members indicated that, as a result of regulation, there has been great improvement in DBP levels and health effects over the past 30 years and year to year. They further indicated that there is information about occurrence and some about toxicity. One member specifically cited published scientific research that has been presented to the group showing increased confidence that could be associated with the relationship between disinfection byproducts and bladder cancer with, of the approximately 79,000 annual bladder cancer cases in the U.S., potentially 8,000 attributable to DBPs, accounting for 10% of the cases (Weisman et al., 2022). This member stated the group should use caution in saying that the health effects of DBPs are unproven.

These same members did indicate comfort with the overall direction of the WG discussion and stated the belief that there is opportunity in anchoring the group's work in points where there is strong confidence, such as the role of precursors and the opportunities for multiple benefits from reducing water age. A member also suggested the group look at DBPs in terms of their similarities and look to see if there are reasonable interpretations that can be drawn regarding unregulated DBPs from what we know of regulated DBPs in terms of health effects.

Another member stated that, as the group moves to the next phase of discussions, there might be a need to at least refresh on what DBP health effects and toxicity information the group does have. This member also stated that the group should look to the current DBP compliance information and think about how much more can be done to bring more systems into compliance with current DBP regulations.

Additional perspectives shared on DBPs related to aspects other than the toxicity information included:

- There is a consistent theme around the Working Group discussions related to supporting consistent disinfectant residuals throughout a distribution system. However, this will have to be evaluated against potential increased DBP formation. This is something the Working Group should evaluate.

- A member noted that the group does have information about chloramination byproducts and suggested a close look at those byproducts. Another member agreed that using chloramination is a risk-risk tradeoff and the group needs to consider closely implications of any strategies that move more utilities towards that process, as the chloraminated byproducts are on the higher end of the toxicity spectrum based on information presented to the WG.

- A member referred to the current PFAS regulatory development process under the SDWA and noted that any overall changes to treatment processes undertaken to comply with future PFAS regulations may affect simultaneous compliance and DBP precursors. Other members reiterated that new regulatory requirements may provide benefits for DBPs and that the group should be closely monitoring these processes. A member specified that *Cryptosporidium* was what really previous treatment rule expansions, and that PFAS will likely be the biggest treatment driver for the next 15 or 20 years, making simultaneous compliance with any DBP interventions a critical factor in the group's work.

- Another member agreed with the problem characterization statements and suggested that characterizing precursors that cause problems with DBPs may be an important step as not all organic materials are contributors. Another member agreed and elaborated that looking to precursors within source water may be important in identifying the types of DBPs different utilities may have higher risk of creating based on their source water precursors.

- A member noted that there is a precedent within the SDWA for using indicators for overall compliance. An example is TCR where Total Coliform is used as an indicator for other types of bacteria. There is also precedent for treatment techniques. This member suggested that, as the WG members look at unregulated DBPs, they need to look at whether there is a sufficient benefit from the current focus on 4 THMS and 5 HAAs and is that sufficient to measure and control for other unregulated DBPs?

- A member also suggested the group look at DBP issues beyond conventional treatment plants, as there are other plants that do not have requirements for TOC removal and are having DBP issues.

- A member identified that, although there appeared to be less common understanding among WG members related to DBPs than OPs, there appear to be commonalities around underlying root causes such as precursors and operational conditions that are leading to DBPs. These commonalities can provide a basis for identifying low-hanging fruit opportunities in future discussions. Even with these items, capital investments that may cause simultaneous compliance challenges will have to be front of mind.

- A member noted that part of the difficulty is that the existing regulatory structure is contaminant by contaminant, which is not necessarily a good fit for DBPs.

As the DBP discussion segment drew to a close, Rob Greenwood summarized what he saw as the group's common understanding based on the discussion. His points included: 1) It would be useful to revisit what we know about health effects related to DBPs and in particular the unregulated DBPs; 2) there is hesitancy or caution on the part of certain Working Group members to say "yes let's go straight ahead we have prominent risk and need to move forward"; 3) It will be helpful to get an understanding of the potential treatment requirements under the PFAS rule and any implications those could have for DBP control; and 4) there is comfort with the concept of moving forward to explore multi-benefit intervention opportunities that can improve conditions related to DBP formation (including unregulated DBPs) and Opportunistic Pathogens.

Working group members indicated that Mr. Greenwood had sufficiently captured the key points of common understanding among WG members.

Segment 3

Synthesis of Source Water Conditions, Storage Tanks, Consecutive Systems, Environmental Justice, and Implementation Challenges – Discussion of Working Group Understanding of These Topics

Source Water Conditions

Mr. Greenwood began the discussion by presenting the synthesis slides on Source Water conditions and related treatment requirements – evidence and root causes of challenges posed by surface water quality. Mr. Greenwood summarized the initial feedback on the slide material and input that the facilitation team received from individual Working Group members prior to the meeting. Mr. Greenwood highlighted the following contributions from individual working group members:

- Precursors recognized as an area to receive attention – particularly organic matter and bromide (distinction between naturally occurring and discharged).
- Importance of understanding source water conditions (e.g., including changing conditions such as seasonal variation) to tailor treatment. Concept of source water assessment and the role that can play in effective decision-making.
- Disinfectant Concentration x Contact Times (CT) need to be updated – new tools are available.
- Total Organic Carbon (TOC) requirements are not protective.
- There is a large "cost wall" between conventional treatment and Granular Activated Carbon (GAC) for TOC control.
- There are limited options for removing bromide from a conventional treatment plant, such as Reverse Osmosis.
- Ground Water Under Direct Influence of Surface Water (GWUDI) definition and updated guidance – need for improved science on making the distinction between Ground Water (GW) and Surface Water (SW).
- For most reservoir sources, TOC and Dissolved Organic Carbon (DOC) are very similar – need very turbid source water for there to be a significant difference between the two.
- The point in the slides about CT tables not extending beyond pH9 was not seen as a critical issue.

An initial problem characterization statement was offered that, overall, the slides have reasonably captured the critical issues related to source water conditions, they provide the WG a good understanding of what the main issues are and, as a water provider, this is one of the most important areas to consider. The WG member stated the issues overlap somewhat with the earlier discussion about OPs and DBPs, and this is an important topic area for the WG to advance into future interventions discussions.

Other WG members agreed with this perspective, and elaborated on key points by adding that source water conditions are one of the greatest opportunities to reduce precursors and overall DBP problems because treatment conditions have gone as far as they can until more advanced treatment, in particular GAC, is adopted. However, there is a lack of data on what all of the organic components are that can cause DBP issues, and current TOC and DBP regulatory requirements are currently limited to conventional treatment plants. Ideally information and analysis could be put forward on all options for reducing precursors, for all water systems that draw on surface water and not limited to those using conventional treatment.

Regarding source water protection, several members expressed interest in looking to the sources of pollutants, including non-point sources and discharged pollutants, for a better understanding of opportunities to limit contaminants in source water that ultimately contribute to OP and DBP issues. At least one WG member expressed concern that the WG's consideration of source water was moving beyond treatment that could be offered within a drinking water treatment plant, and that beyond difficult to address DBP precursors such as bromide, the WG may be extending beyond its directive and ability to make recommendations. Mr. Greenwood offered that source water conditions are a topic that the charge from EPA and NDWAC lists as anticipated to be covered, and thus the group

should feel comfortable discussing source water conditions beyond the scope of direct drinking water treatment plant control.

Other WG members shared their perspective that this is an important area for WG consideration as there are actions this group and water utilities can take to improve source water conditions. Many drinking water utilities follow a multi-barrier strategy for provision of safe drinking water, which includes source water protection, treatment, and distribution system management. Drinking water utilities monitor their source water and should feel empowered to communicate with their state clean water regulators as water quality trends are observed from source water monitoring. Members suggested that the WG may want to consider looking to Clean Water Act NPDES permitting and wastewater treatment plants, as well as industrial pretreatment, for better removal of targeted compounds that can ultimately cause DBP issues in drinking water, with a specific mention made about a recently released draft Effluent Guideline covering bromide discharges from steam electric plants.

Other members emphasized the need to look at source water conditions and not feel that this process is limited to what can be done at a drinking water treatment plant, especially because many of the conditions being seen in source water are causing the use of alternative disinfectants that are associated with certain unregulated DBPs. An example is pre-oxidation can be used to reduce TOC levels in source waters, enabling the water system to have more flexibility in choosing disinfectants.

To close out this discussion segment, Mr. Greenwood asked if any WG members had discomfort with the observations made during the discussion of source water and, in particular, that source water conditions should receive attention during the next phase of Working Group discussions focused on interventions. No WG members indicated discomfort.

Storage Tanks

Mr. Greenwood reviewed the presentation "synthesis slides" related to storage tanks, and noted the feedback the facilitation team had received from WG members on the material presented in the slides:

- Storage tanks are key control points and one of the most vulnerable – important for overall DS optimization.
- Two dimensions: physical integrity (holes and corrosion); operations (turnover, sediment removal).
- Elevate management of tanks: not having a standard for O&M is a problem.
- Other storage objectives (e.g., fire protection) can't be compromised. Can't lose function of storage tanks – potential for this if there is too narrow of a focus.
- To what degree are storage tank issues associated with other factors (e.g., capacity constrained systems). Storage tanks challenges play out in a broader operating context for systems.
- Small systems may have only one tank – creating a reluctance to take it off-line for maintenance.
- Unclear how much variability across systems there actually is with storage tank conditions, and variability does not define what to do about the problem. How widespread is the problem of poorly designed, maintained, or operated storage tanks?

Discussion:

WG members were asked to reflect on the discussion question: based on the presentations, resource material, and discussions to date, what conclusions are emerging for you with respect to: impacts on drinking water quality and the primary root causes for those outcomes; and the degree of certainty we have for those conclusions?"
A theme that emerged from the discussion under this topic was the perspective that storage tanks can play a key role in water quality, with water age being one of the most common problems associated with them. A second theme was the need to look at tanks holistically, at both the physical/structural integrity and operational aspects, including potential requirements for operating and maintaining storage tanks, and sampling requirements at storage tanks.

The initial problem characterization perspective shared by a WG Member was that storage tanks are the other bookend, along with source water quality challenges. The member described the most common challenges associated with storage tanks, including: longer water age due to reduction in water use; insufficient disinfectant residual in water entering tanks and further decay of residual due to sedimentation or other tank conditions; water stratification in tanks; tank design with a single inlet/outlet; and DBP formation in certain parts of tanks. The member highlighted that, if a system is going to meet the maximum contaminant levels (MCL) for DBPs, then it needs to keep water moving to avoid problems associated with water age, and tanks play a significant role. With consecutive systems, it is common for the water system to only have the storage tank(s) it owns as the place where they can manage (through water age and flow) for water with high DBP concentrations received from a wholesale system.

Generally, members agreed with the initial problem characterization, adding that storage tanks can contribute to DBP formation and the growth of opportunistic pathogens that may have been present at low levels after primary treatment. *Legionella* and nontuberculous mycobacteria (for example MAC) can regrow where there is no persistent disinfectant.

WG members pointed out that tanks can cause a lot of problems, and there are not universal standards for maintaining and operating tanks throughout the states. Some states do have functional tank inspection and maintenance requirements but following through on these requirements and the resulting impacts on the water system take vigilance by the water utility. A member shared an example where chlorine levels in a storage tank remained very high following an inspection of the tank that took place in cold weather. The water could not be used until the disinfectant residual was at an acceptable level. This was an example of how unique circumstances need to be accounted for in tank inspection standards and that chlorine levels are better maintained in cold water conditions, - an important consideration for future WG discussions.

Overall, member discussions signaled a need to approach improved storage tank conditions holistically, taking into account physical/structural integrity (roof, walls, vents) and operational conditions (which can depend on location, pressure, fire flow, emergency storage, etc.). Discussion indicated that the former will be easier to tackle, while the latter will be more complex to regulate at a national level because solutions may vary with location, pressure gradients, fire flow requirements, emergency storage, and other parameters. One member added that, if storage tank deficiencies are a widespread issue, perhaps there could be a national initiative to rehabilitate them in a fashion similar to current lead service line replacement efforts.

Another member observed that, in some cases, water quality objectives and water volume objectives can represent competing priorities with the need for stored water to support fire flow or emergency situation demands which can place pressure on water quality conditions. This further highlighted the need to address storage tank improvements holistically. The member shared that a system once proudly indicated they maintain 30 days of operating flow in storage, while failing to recognize the potential impact on water age and related impacts on water quality.

Members discussed water stratification in tanks as a potential area to look at for improving water quality. One member shared their experience with tank stratification indicating the process is well understood but it may be complex to regulate since there is also a need to be mindful of fire flow requirements and emergency storage. In response, another member mentioned that it is up to individual water systems to make specific decisions on how to address tank stratification to ensure they do not interfere with fire flow and other water volume needs. One member added that electricity is also a cost factor as storage tank drain and fill cycles use a lot of power.

One member indicated that storage tank challenges fall under the more general challenge of technical, managerial, and financial (TMF) capacity constraints and overall water system configuration. In this context, the member stated that TMF constraints in the water industry should be looked at as underlying challenges that, if addressed, could solve multiple problems. For example, having the technical and operational capacity to use hydraulic models to analyze how a system is functioning is a technical element many utilities do not have capacity to manage. TMF is a

constraint creating real challenges that require the development of options by the WG. The member further cautioned about the cost to replace or retrofit existing oversized systems and noted that some water systems only have one storage tank limiting options such as taking it out of service for maintenance.

A member suggested that sampling at storage tanks is an area to look to for improvement. The member indicated that currently there are not storage tank sampling requirements and some industry guidance for sampling plans results in sampling not occurring at storage tanks. Not collecting information from tanks is removing an opportunity to flag issues when they arise. This member advised that sampling at storage tanks, especially when discharging, should be considered in future WG conversations.

To close out this discussion segment, Mr. Greenwood asked if any WG members had discomfort with the observations made during the discussion of storage tanks and, in particular, that storage tanks should receive attention during the next phase of Working Group discussions focused on interventions. No WG members indicated discomfort.

Consecutive Systems

Regarding "Consecutive Systems – evidence and root causes related to negative water quality impacts related to the unique circumstances of consecutive systems," WG members were asked to review the synthesis slides in advance of the meeting and consider the following discussion questions: based on the presentations, resource material, and discussions to date, what conclusions are emerging for you with respect to: impacts on drinking water quality and the primary root causes for those outcomes; and the degree of certainty we have for those conclusions?

Rob Greenwood summarized the feedback the facilitation team received from individual WG members in advance of the meeting:

- More consolidation will happen for reliability and affordability purposes – this makes addressing consecutive systems issues critical.
- Water age is very important in the context of consecutive systems.
- It is important to recognize that there are current differences in monitoring requirements for consecutive systems.
- The contract between wholesale and retail water providers is important, but there is no SDWA authority that covers this relationship.
- Turbidity is an important parameter for WG consideration – turbidity can increase with consecutive systems and as is not required to be monitored at entry points.
- Cost sharing arrangements between wholesale and retail providers are inadequate to fund water quality improvement investments.

Before the WG discussion began, **Ken Rotert, EPA OGWDW** introduced **Dr. Chad Seidel**, of the MDBP WG Technical Analysts to provide some additional characterization of the types of relationships, operational configurations, and compliance conditions that exist within the consecutive system context. Dr. Seidel stated that, while consecutive systems receive water from another provider, the simplistic view of a consecutive system connecting near to the end of a wholesale provider's system and that water quality degrades from the original treatment plant to the point of wholesale delivery and continues to degrade throughout the consecutive system is rarely the reality. There are in fact many examples where consecutive systems receive water from multiple systems and provide water to multiple systems. Dr. Seidel noted that, in some instances, consecutive systems receive water from a location close to or adjacent to the water treatment plant and in fact receive very high-quality water.

Dr. Seidel encouraged the WG to think about the range of DBP compliance for "parent" water systems and "child" water systems as being in one of four quadrants: In Quadrant 1, the parent is in compliance and child is out of compliance. In Quadrant 2, the parent is out of compliance and the child is in compliance. In Quadrant 3, both the

parent and child are in compliance. In Quadrant 4, both parent and child are out of compliance. One may think that if both parent and child are out of compliance then addressing the parent problem would address the child problem, however, that is not always the case. Consecutive systems need to address all the parameters affecting the challenge they are facing. Dr. Seidel encouraged the WG to delve into details and recognize complexities, then apply a framework that achieves desired outcomes for all systems, not just consecutive systems. Dr. Seidel stated the data he was drawing on to make his remarks are contained in a presentation previously delivered at a conference. Mr. Greenwood indicated that the presentation will be made available to WG members. Mr. Rotert added that according to the analysis presented in the slide deck, there were almost as many situations where the child was in compliance and the parent was not in compliance as when the parent was in compliance and the child was not in compliance.

Discussion:

An initial problem characterization statement was offered by a WG member that expressed support for the problem characterization outlined in the synthesis slides and elaborated that, when considering consecutive systems from a physical perspective, it is important to start with a water source, then treatment, and then distribution. When certain parts of these drinking water cycle components are owned, operated, and maintained by different entities, they are viewed from a regulatory perspective as separate water systems and classify them as either a wholesale or purchasing water system, (i.e., a consecutive system). This division of a physically combined system into different parts according to ownership and regulatory implementation is a major factor that complicates the implementation of and compliance with regulation, in particular regarding sampling. Measures that lead to viewing a combined water system as a physical whole and that improve coordination and cooperation among its parts might be expected to enhance rule implementation and compliance.

This WG member continued stating that, in consecutive systems, water typically does travel longer distances. While that is not always the case, as some water systems sell/transfer water right at the plant, typically consecutive systems are farther out on the wholesale system, and water is traveling for longer distances. As a result, there is increased water age, potential loss of disinfectant residual, and DBP formation. The effort to encourage water systems to consolidate, while offering benefits to certain aspects of drinking water provision, has added to MDBP water quality problems. Additionally, wholesalers currently are sometimes not accountable for the DBP concentrations or for DBP formation potentials in water they deliver at a master meter. There are exceptions only where purchase contracts include this as a requirement or local regulations require sampling on both sides of the master meter, but this is not federally required.

This member continued indicating that wholesalers and consecutive systems each have a role to play in achieving compliance. Consecutive systems have a role to play in water quality and can have limited control options, such as: passive aeration in water towers and standpipes; flushing; booster chlorination; maintaining higher levels of disinfectants, and these might explain why a consecutive system is in compliance while a wholesaler is not. Wholesalers have these same, as well as additional, water quality management options. There are also factors such as communication and personality that can affect relationships between wholesaler and consecutives with implications for operational effectiveness of combined systems. The key to developing water quality control strategies for combined systems is having information about factors like disinfectant residual, water age, hydraulic analyses, and profiles throughout the system from source water through the tap. Profiles of this type of data, however, are generally not available. If a consecutive system receives water from more than one system, developing that information is useful but very difficult. When a wholesale system uses chloramination, it can make it difficult for the consecutive system to monitor and boost residual and avoid nitrification issues and depletion of disinfectant residual. It also can be hard to meet the cost requirements for needed operational expertise and measuring water quality parameters.

Other members agreed with the initial perspective shared and added that keeping water quality high in consecutive systems requires managing storage, and when appropriate, may include using disinfectant boosters to maintain

adequate disinfectant residual, and keeping the water moving to best manage for variables such as temperature extremes and water age. Another member stated that WG members should consider if sampling for turbidity at a delivery point would be helpful as an indicator for water quality conditions affecting microbials and DBPs that may be created in the distribution system and delivered to downstream consecutive systems.

To close out this discussion segment, Mr. Greenwood asked if any WG members had discomfort with the observations made during the discussion of consecutive systems and, in particular, that consecutive systems should receive attention during the next phase of Working Group discussions focused on interventions. No WG members indicated discomfort.

Environmental Justice (EJ)

Mr. Greenwood began by reviewing the synthesis slides on EJ that had previously been provided to the Working Group, and provided the following discussion questions for the Working Group to reflect upon:

- Are you aware of any additional examples or research that can add to our understanding of Environmental Justice (EJ) conditions related to MDBP rules?
- Are there additional EJ considerations within the specific context of the MDBP rules that are important to acknowledge?

Discussion:
The initial problem characterization perspective shared by a WG Member was to first acknowledge that the WG has not heard from experts with lived experience, and they themselves are not a low-income, black, indigenous, or person of color, hence their characterization of the EJ universe of issues may be incomplete. With this WG member's perspective acknowledged, they did indicate the synthesis slides provide good coverage of problem characterization for this topic area. This WG member further noted that the greater context of history should be recognized, particularly housing, education, healthcare, and economic systems and policies that systematically place barriers on minority and low-income communities and residents. Redlining and housing policies created entire water systems that serve minority and low-income populations, and areas within larger water systems that serve concentrated groups of minority and low-income residents. The data demonstrating that water quality varies over time and space in both source water and distribution systems indicate that minority and low-income populations are disproportionately exposed to microbial and DBP contaminants in drinking water, for example, they stated that data show that Legionnaires Disease (LD) is twice as high for black populations as compared to white populations. Although it is not known exactly how much of the LD in black populations is attributable to drinking water, the disproportionately higher incidence of LD among Black or African American persons and people with lower socioeconomic status suggests a need for public health action. The WG member added that gaps in requirements and implementation of the MDBP rules can further contribute to disproportionate impacts on low-income and minority populations, e.g., locations where disinfectant residual is monitored, how compliance is measured (system wide vs. in individual neighborhoods), and how it is reported to the affected community.

The member put forward a framework to help the WG look at EJ issues: some of the root causes are centered within the WG's charge (e.g., conditions for OP growth; disinfectant residual requirements; public notification; distribution system sampling plans; consecutive systems), some are not as directly centered in the WG's scope , and some root causes are adjacent to the scope (e.g., water affordability and requirement to fund through water rates; access to state and federal funding for infrastructure upgrades and for staff; number and size of systems; TMF capacity; transparency and trust; workforce and certified operators).

The member elaborated on a topic that has not been discussed in the MDBP EJ context which is water emergencies. Many water emergencies have a microbial component. The WG member suggested that looking at short term interventions during water emergencies could be a component of MDBP rules, in particular public notice and provision of safe drinking water in a microbial water emergency. While any community can have a water emergency,

water emergencies can have disproportionate impacts in low income and disadvantaged communities. Other members agreed with this statement noting that water emergencies can impact low-income communities harder.

One member stated that an important idea in the characterization statement was that the same water users are not subjected to allowances within drinking water rules that don't provide 100% protection for people within the entire distribution system. For example, if the disinfectant residual rule only requires it be met for 95% of samples, and the LCR rule is for 90% of the distribution system, we need to make sure it is not always the same parts of the water system that are bearing these deficiencies. Monitoring and sampling to not allow the same parts of the system to be above various action levels could be a consideration of the WG on equitably protecting consumer's health.

One member highlighted that there is often tension between two sides (protection and cost) of EJ and cautioned that there can be a sense of false choice between the need to make sure everyone has access to safe drinking water; and the cost of providing that safe water. This WG member recommended that the WG needs to frame the EJ discussion as "both/and" for EJ communities, in that high quality water is provided in every community without any notion that not all communities can afford the highest quality water.

One member emphasized that there is a need for more site-specific or regional information as to where problematic systems are and what the issues are. They indicated that, if the WG is assuming water age and pipe materials among the contributing factors to disparate impacts, it would be helpful to look at systems serving over 100,000 people to understand what percentage of the community falls within the definition of EJ and identify where there may be opportunities for pipe replacement since not every pipe can be replaced in the immediate years. At the same time, this WG member also pointed out the importance of not making assumptions about water quality based on community characteristics. As an example, in regard to water age, the low-income populations in this member's water system may have lower water age while the high-income communities that sit more distant on the system have higher water age. Another member noted that EJ cannot be looked at as just one issue and that causes of disparate impact are all intertwined (e.g., comorbidities, food deserts, lack of good jobs).

One main area of discussion focused on opportunities to identify disparate impact through improved and more intentional water quality sampling. Building off the first member's statement that utilities might be inadvertently sampling in a way that does not catch disproportionate impact, another member indicated that sampling plans and checklists that water utilities already develop could for example, consider demographics when they are developing sampling plans. Several members noted that this approach of identifying the most vulnerable demographics would be similar to future remediation efforts on lead pipe replacement, where older infrastructure can be found in communities with minorities. One member noted that overall, EJ issues revolve around chronic underfunding and added that the WG could elevate the importance of having EJ communities prioritized in funding decisions.

Some members indicated that it may be helpful to understand the different water treatment techniques used in EJ communities (i.e., whether there is free chlorine or chloramine used for disinfection). One member explained that chloramine can reduce certain DBP formation in the distribution system as compared to chlorine and may "even out" the DBPs level in the entire distribution system which would produce a seemingly equitable outcome. In response to a question from a WG member, some members explained that converting from chlorine to chloramine is a very involved process and requires more active management.

To close out this session, Mr. Greenwood observed that discussion following on the initial WG member problem characterization signaled comfort with that characterization. He explicitly asked WG members if there was any specific discomfort with the initial problem characterization and any of the additional observations made by WG members. No WG members indicated discomfort with the discussion.

Implementation Challenges

Rob Greenwood introduced the implementation challenges synthesis slides, and presented the group with the discussion question "Have we captured a well-rounded characterization of MDBP related implementation challenges faced by drinking water systems? If not, what needs to be added?"

Discussion:

An initial problem characterization statement was offered by a WG member that water utilities and water professionals want to provide the safest drinking water possible to customers and are willing to address the challenges to doing so, keeping in mind that smaller and consecutive systems face unique challenges and that location, regional standards, and water source characteristics all affect a water systems approach to safe drinking water provision. Technical, Managerial, and Financial (TMF) capacity also affect smaller utilities' ability to manage drinking water requirements, and regionalization as a solution brings its own challenges through consecutive systems. Regarding any holistic recommendations from the WG, the decisions need to take into account regional challenges, different climates, and different water use issues. Some solutions that are available may have more limited applicability, such as flushing, which can be limited due to water scarcity. This Working Group should especially take into consideration the upcoming requirements under the Lead and Copper Rule (LCR) and potential PFAS regulations, as well as the regular infrastructure replacement guidance utilities attempt to follow. It will be important to recognize how these will impact water utilities and whether co-benefits for OPs and DBPs will be possible. This approach can help optimize impact from changes that utilities will be making while not adding extra requirements without knowing the full impact and benefit. It would also be beneficial if water systems can get better access to funding.

Dr. Del DeBoer, TA, added to the WG member's problem characterization statement that each water utility is site specific. While efforts are made to create a regulatory environment that utilities can work with effectively, the implementation of those regulations has to be cost effective for a community and make the water safe to drink. A utility's experience in the Midwest is very different than a water utility in Florida – the water is different. A standard for chlorine residual is going to be a real challenge for some systems to meet, given how differently it can play out in individual systems. The varied perspectives of this group will bring all the perspectives together and make sure the direction this group's work takes adds value to water. If utilities see the value and improvement to water and public health, they will be eager to implement the changes that are recommended.

Other WG members agreed with the initial problem characterization statement, and they elaborated that aligning sampling schedules for residuals and DBPs to the most critical seasons and implementing consistent sampling can provide benefit to OP and DBP implementation challenges because consistent monitoring at the appropriate time will protect public health and identify problems. This member also shared that systems that qualify for reduced monitoring can miss problems in their systems. Another member suggested that the WG should look into free chlorine burnout for chloramine utilities and how that impacts DBP sampling.

WG members also emphasized the need to invest financially both for capital improvements and a utility's technical and managerial capacity to address the variety of challenges utilities encounter: regulatory, climate, and equity considerations all have financial cost. Utilities are facing increased costs from many factors simultaneously. This is compounded when utility leaders are concerned about increasing rates and delay needed maintenance and improvement which results in exacerbated problems which could have been addressed sooner with prudent investment. Along the lines of capacity development, another WG member suggested that addressing implementation challenges can look across the range of utility requirements, and that skill development, training, and improved testing can assist utilities in addressing new requirements. Another member shared that, developing knowledge about states and regions that are doing well with compliance and providing assistance to utilities that need it, can provide examples of practices that could be considered.

To close this discussion segment, Mr. Greenwood asked if any WG members had different perspectives to share and if any members were uncomfortable with the perspectives that had been shared, in particular that the Working Group, with the information provided in the synthesis slides and additional contributions made during the discussion, had developed a reasonable common understanding of the MDBP implementation-related challenges currently faced by utilities. No Working Group members indicated discomfort with the discussion or provided additional perspectives.

Segment 4

Introducing and Planning for MDBP Working Group Interventions Discussion

Rob Greenwood reviewed a draft facilitator's presentation titled Introducing and Planning for MDBP Working Group Interventions Discussion, which contained information about the WG meetings for the remainder of the year and oriented members to the draft Reference Table 3 on interventions that will be used in the future WG meeting.

Mr. Greenwood explained that, besides the already scheduled WG meetings in April and June, the facilitation team will look to gather the WG's availability for potential meetings in early September, early October, early November, and mid-November. He further added that leading up to Meeting 8 in April, the facilitation team will look to have individual discussions with WG members and gather initial ideas to help inform the WG's discussion on interventions at this meeting. As part of preparations for this meeting, the facilitation team will send the WG the draft Table 3: Interventions for review. Mr. Greenwood explained that, to develop the table, the Facilitation Team and EPA reviewed previous input from the 2020 and 2021 stakeholder engagements, observations made by WG members during discussions, and resources that were shared with the WG up to this point.

Meeting 9 will take place on June 27-29 and will be an in-person meeting, with discussion focusing on interventions and related implementation mechanisms that the group can further refine and vet. There is the possibility of an "as needed" contingent meeting in July, then subsequent meetings in early September, early October, and early November. The approach calls for providing a briefing to the full NDWAC in November (this would be a joint meeting between the Working Group and the NDWAC) providing an opportunity to discuss and answer questions about the Working Group's emergent recommendations, followed by a WG meeting to finalize recommendations and deliver them to the NDWAC. The full NDWAC will then deliberate on the Working Group recommendations with a target overall process completion date of mid-December.

The Co-Chairs thanked the facilitation team and the EPA for an excellent meeting, and especially the volunteer Working Group members that have contributed their time.

Elizabeth Corr, MDBP Rule Revision Working Group Designated Federal Officer closed the meeting.

Appendix 1: MDBP Working Group Meeting Attendance – March 9, 2023

Name	Attendance
Andy Kricun, WG Co-Chair	x
Lisa Daniels, WG Co-Chair	x
Alex Rodriguez	x
Benjamin Pauli	
Bill Moody	x
Elin Betanzo	x
Erik Olson	x
Gary Williams	
Jeffrey Griffiths	x
John Choate	
Jolyn Leslie	x
Kay Coffey	x
Lynn Thorp	x
Lisa Ragain	x
Michael Hotaling	x
Nancy Quirk	x
Rosemary Menard	x
Scott Borman	x