Discussion of Various Scenarios, For Stage 2 M/DBP and LTESWT Rules

Meeting Summary - June 2000

M/DBP Stage 2 Federal Advisory Committee (FACA2)
Discussion of Various Scenarios,

For Stage 2 M/DBP and LTESWT Rules

Meeting #12

June 27-28, 2000
Washington, DC

Final

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Introduction

On June 27-28, 2000, EPA held the thirteenth meeting of the Stage 2 Disinfection Byproducts and Long-Term 2 Enhanced Surface Water Treatment Rules (MDBP) Federal Advisory Committee (FACA). See Attachment I.a for a list of meeting participants and Attachment I.b for the draft meeting agenda. Facilitator Abby Arnold, RESOLVE, began the meeting by reviewing the proposed agenda and objectives of the meeting. The FACA approved the agenda with the addition of the presentation of the industry caucus's DBP proposal. Day one includes presentations from the TWG and an overview and articulation of current Stage 2 proposals on the table. On day two the FACA developed a specific proposal, or one-text, recommendation that they agreed to work on between July 2 and the last scheduled meeting on July 27-28. The final Stage 2 FACA meeting is scheduled for July 27-28, 2000. Abby Arnold presented a Topical Summary of M/DBP Stage 2 FACA Scenarios, which is a proposed outline for a Stage 2 agreement [Attachment I.c]. The Topical Summary includes DBP and microbial issues, existing areas of agreement, and other issues that could be included under the Stage 2 agreement. The FACA's goal during this meeting, and in the time remaining before the July 27-28 meeting, is to negotiate and come to agreement on the blanks in this outline.

DBP Proposal - Presented by the FACA Industry Caucus

Brian Ramaley, Association of Metropolitan Water Agencies representative, presented a proposal for Stage 2 Disinfection Byproducts (DBP) Rule recommendations [Attachment II]. The proposal includes:

- 80/60 Locational Running Annual Average for Total Trihalomethanes (TTHM) and Haleoaceteic Acid 5 (HAA5);
- Identification of high DBP sampling sites (through intensive monitoring during the first year);
- Revision of compliance monitoring sites; and
- Approach to address bromate concern.

The LRAA is proposed to address concerns of temporal and spatial variation in DBP levels that are not addressed using the Stage 1 running annual average approach. Using the LRAA standard will impact the magnitude and frequency of DBP peaks without changing the 80/60 standard. Plant treatment decisions will be based on the individual system characteristics and DBP peaks.

High DBP sampling sites will be identified during an intensive DBP monitoring program or Initial DBP System Evaluation (ISE). These peak sites will be used as the sampling sites in the calculation of the plant LRAA. The industry caucus proposed an intensive DBP monitoring program with sampling every other month for 12 months (6 total months of sampling). This approach will capture data from all four seasons and address variability in DBP peaks - which can occur at different times during the year.

Another approach proposed by a FACA member is to bracket intensive monitoring (ISE) around past demonstrated peaks, such as summer months, which would then ensure that highest peaks are captured in initial choice of plant sampling locations and level of DBP peaks.

Large and medium systems would include an additional 8 sample sites for each plant in the system during the period of intensive monitoring. Small systems, groundwater systems, and systems with demonstrated low TTHM and HAA5 levels (e.g., below 40/30) would include an additional 2 samples during the intensive monitoring period. Sampling sites would be chosen based on historical chlorine residual levels, maximum detention times (based on hydrological modeling and tracer tests), and sites that may have the highest DBP levels (e.g., booster disinfection and finished water reservoir and tank locations).

Compliance monitoring sites would be revised based on the results of the intensive monitoring program with four sites identified for future calculation of the LRAA:

- One at or near the entry point to the distribution site;
- One at the historical compliance monitoring point (average);
- One at the site with expected high TTHM value; and
- One at the site with expected high HAA5 value.

The industry caucus estimates that in the year of intensive monitoring this proposed approach would require 300,000 total samples for very small and small systems (not including non-community systems), and 225,000 total samples for medium and large systems. Per system cost would be $5,400 for small/very small systems, $48,000 for medium, and $135,000 for large systems. The total industry cost estimate of the program would be $477,846,000.

A FACA member noted that the period of intensive monitoring would result in a large implementation task for state regulatory agencies. States will want flexibility for systems that have demonstrated low DBP levels. The burden on states for implementation and choosing LRAA compliance monitoring sites would be reduced for chloramine systems (which have low variation throughout distribution system) or by substituting one of the following:

- Historical TTHM and HAA data (many utilities collect more DBP data than in currently required and could use existing data);
- Chorine residual data from TCR sites;
- Distribution system tracer study;
- Calibrated network hydrolic model;
- Targeted monitoring (for TTHM, HAA5, Chlorine residual and/or demand);
- Combinations of the above; or
- Intensive monitoring study reports to be submitted within 12 months.

The industry caucus does not want to set the bromate MCL at a level that precludes plants from using ozone technology to inactivate *Crypto* or to reduce the use of chlorine gas. Many utilities have installed ozone as a proactive microbial inactivation measure and should not be punished if they cannot meet a lowered bromate MCL. A FACA member noted that ICR data collection occurred during a drought year in California and so ICR data may underestimate true bromide levels in California. EPA pointed out that "grandfathering" existing ozone systems is not an option because it is equivalent to having different MCLs for different systems. One possibility would be a graduated approach in which a system that exceeds the MCL by some percent (e.g., 25%) would be required to report to the state the nature of the problem and be required to increase monitoring. If MCL is exceeded by a trigger level (e.g., 50%) then state and plant take steps to reduce bromate. The discussion of bromate MCL options was continued following the TWG presentation of bromate MCL implications for ozone (see following section).

TWG Presentation to FACA Committee--Narrowing the Focus on Stage 2 Regulatory Scenarios

Michael McGuire, MEC, presented the TWG's analysis of impacts of the 80/60 LRAA Stage 2 DBP option, optimization monitoring cost estimate, and bromate MCL implications for ozone treatment [Attachment II.a]. McGuire reminded FACA members that he was presenting on behalf of the TWG. The TWG focused its modeling on the 80/60 Annual Average of Maximum (AAM) with bromate MCL at 5 and 10. The TWG uses the AAM to estimate the LRAA because ICR data cannot estimate LRAA directly.

McGuire presented a series of scatter plots showing TTHM and HAA5 system data points (called a "Schaeffer" plot) for systems under different compliance scenarios. These plots are useful for illustrating levels of peak DBP data points. Schaeffer plots were presented for ICR baseline data, 80/60 RAA (systems that meet Stage 1 MCLs through averaging even though some data points are above MCL), 80/60 RAA with safety factor (safety factor is estimated at 80% of the MCL and is used by the TWG to estimate utility response to a standard), 80/60 AAM (estimating LRAA), and 80/60 AAM with safety factor. Monthly maximum TTHM and HAA5 data was predicted using SWAT model (based on 273 surface water plants). There is a dramatic decrease in predicted high values (or peaks) when 80/60 LRAA is met (using both ICR data and SWAT predictions.)

McGuire reviewed the predicted impacts of optimizing sample locations. The TWG predicts that optimization of sampling locations, based on the intensive monitoring program, will result in higher potential individual sample point values as compared to Stage 1 compliance monitoring for some utilities. Some systems will be shifted from compliance to non-compliance and more systems will have to make treatment changes to comply with the LRAA than estimated by the SWAT. The TWG's best estimate for the total annual cost of switching to LRAA monitoring is $100 to $200 million. The cost of a one-time sampling to optimize the selection of sampling locations is estimated by the TWG at $114 million.

McGuire noted that the TWG has made dramatic improvements in the cost estimating models since June 1. Some of these changes have raised and some changes lowered predicted costs - though for two examples cost estimates have increased by 15-30% over previous efforts. McGuire presented revised cost estimates for the 80/60 LRAA option scenarios:

- Total annual cost estimates for 80/60 LRAA, 0 log inactivation, bromate = 5: UV on ($322 million) and UV off ($457 million).

  Costs are lowered with UV on even with 0 log Crypto inactivation because of use of UV for Giardia and virus inactivation.

- Annual and capital costs for 80/60 LRAA with 0 log *Crypto* inactivation and a 20% safety factor: $740-2,700 million.
- Annual Household Cost Increases for 80/60 LRAA - a relatively small percentage of households is effected (3.7-5%), however, annual costs for those systems can be large (P90 of $275-304 per household).

  A FACA member noted that this estimate reflects approximately 3 million households with significantly higher costs - 10 % are above $275.

- Small System Annual Household Cost Increases for 80/60 LRAA

(Small Systems; SW and GW)	Br03=10 UV=Off	Br03=5 UV=Off
%HH	3.5%	6.5%
Median Affected	$2	$149
P90 Affected	$275	$304
Log inactivation = 0; with 20% Safety Factor		

Data does not include additional monitoring costs. EPA added that Stage 1 allows small systems (serving 500 - 10,000) to monitor quarterly and very small systems (serving <500) to monitor once per year. If a small or very small system is already in compliance with Stage 1 then it is unlikely that the 80/60 LRAA Stage 2 scenario will result in additional costs.

McGuire presented the 80/60 LRAA Stage 2 costs of optimized monitoring.

Stage 2 Costs - Optimized Monitoring (Intensive DBP System Evaluation)					
System Size	Very Small <500	Small 501-10,000	Medium 10,001-100,000	Large >100,000	TOTAL
No. Affected Plants	7,927	8,265	2,866	666	19,724
No. Sites/Plant	2	4	12	20	
No. Months Sampling	2	4	6	6	
Total Samples/Plant	4	16	72	120	
Sample Cost $/Sample	$320	$320	$235	$165	
Total Cost, Millions	10	42	48	13	114

In response to a question, EPA noted 10-20 percent of groundwater plants will begin chlorinating water to meet the Groundwater Rule.

All ozone plants in ICR are below 10 MCL for bromate, however, ozone levels used for *Crypto* inactivation would be higher than those used for *Giardia* and viruses and could push some plants into non-compliance. Several ICR plants would exceed a possible bromide MCL of 5 ug/L. McGuire presented the annual average bromate levels with ozone levels set to inactivate *Crypto* at the 0.5 log, 1.0 log, and 2.0 log level. Increases in bromide levels has a dramatic negative effect on the number of systems that can comply with a bromate MCL of 5 ug/L, especially if increased ozone doses are included for *Crypto* inactivation.

TWG Presentation to FACA Committee - Update on Microbial Framework and LT2ESWTR Implications

Stig Regli, EPA, presented the microbial framework developed by the TWG [Attachment IV]. Regli's presentation included:

- A review of FACA LT2ESWTR options;
- Implications of *Crypto* monitoring strategies in classifying mean source water concentrations;
- Regulatory impact implications assuming monthly sampling for 2 years; and
- Issues with *Crypto* and *E. coli* sampling.

Regli presented two LT2ESTWR options discussed by the FACA and estimates of the percent of plants within each of the bins for each option.

- Option A with 3 bins at <0.1, 0.1-1.0, and >1.0 oocysts per liter (with no action below the <0.1/L level.)
- Option B with 4 bins at <0.03, 0.03-0.1, 0.1-1.0, and >1.0 oocysts per liter (with no action below the <0.03/L level.)

Misclassification is an important issue. Classification error is largest if the true mean for a system is near a bin boundary. Overall performance may be improved by increasing the number of samples and/or volume of water sampled. Analysis of ICR and Supplemental Survey data shows that a simple mean based on 24 samples tends to misclassify plants into lower bins than the true mean, and a maximum RAA of 12 samples tends to misclassify high.

Regli presented estimates of the log credit and percent selected for microbial toolbox technologies for filtered systems (see page 12). LT2ESWTR impacts are estimated with the following assumptions: *Crypto* source concentrations are based on the highest 12 month running annual average, plants with less than 0.15 NTU combined filter effluent turbidity get 0.5 log inactivation credit, and the compliance forecast is based on industry estimates of how the toolbox would be used. Regli presented the TWG's estimates of log credit for microbial toolbox technologies.

In response to a question on the length of time it would take for utilities to comply with LT2ESWTR EPA had previously estimated that approximately 500 UV systems per year could be built. Systems have 5 years to meet a new standard if capital investment is required. Stage 2 rules will be final in 2002.

Regli presented the LT2ESWTR Compliance Forecast (percent of systems affected) for both options. For Option A, 11.9-23.5 percent of systems would fall into the 0.5 log removal bin and 1.4-6.8 percent of systems would fall into the 1.0 Log removal bin. For Option B 14.5-18.8 percent of systems would fall into the 0.5 log removal bin, 11.9-23.5 percent into the 1.5 Log removal bin, and 1.4-6.8 percent would fall into the 2.5 log removal bin. The use of 4 bins versus 3 bins doubles the percent of affected systems and costs.

Microbial toolbox cost estimate for treatment changes (not including monitoring) would be:

- Option A: Small systems $26-61 million
Large systems $56-140 million
Total $82-202 million
- Option B: Small systems $61-114 million
Large systems $162-309 million
Total $222-423 million

Small system monitoring for *E. coli* (12 month bi-weekly sampling for systems serving under 10,000) would affect approximately 4,000 non-purchased systems. Some utilities may analyze their samples in-house, however, many would ship samples to outside labs for analysis. Regli presented estimated LT2ESWTR microbial monitoring costs. Remaining issues surrounding *E. coli* monitoring include reliability as indicator of *Crypto* for reservoirs/lakes - correlation is likely to be good for streams but not for lakes and reservoirs. Anther problem is exceedance of sample holding times for *E. coli* samples. *E. coli* analysis may present major challenges for small systems to implement.

Regli included as an Appendix to his presentation additional analysis of *Crypto* occurrence results and cost data for enhanced filtration.

Draft Summary of Possible M/DBP Scenarios - Alternative LT2ESWTR Scenarios & Stage 2 DBP Scenarios

Ephraim King, EPA, presented a personal One-Text, not an EPA endorsed position, on possible LT2ESWTR, Stage 2 DBPR and other remaining issues [Attachment V.a]. The FACA discussed the LT2 ESWTR and Stage 2 DBPR scenarios presented during their discussion of Stage 2 regulatory options (see below). The FACA discussed King's proposals for the remaining issues listed below:

Uncovered Finished Water Reservoirs

EPA estimates that there are 141 uncovered finished water reservoirs in the US - approximately half are less than 5 million gallons. The largest number are in California (40), New York (40), and Puerto Rico (20). King presented three scenarios:

> *a. Risk Mitigation Plans:* Systems develop and implement plans to mitigate risk (addressing security, surface water run-on, bird control, water quality assessment, and other components). Plans must be available to the public and failure to implement plan would be subject to enforcement.
>
> *b. Default Strategy:* Systems must cover uncovered finished water reservoirs, treat reservoir discharge to achieve 4-log inactivation, <u>or</u> state must determine that existing risk mitigation is adequate.
>
> *c. Water Quality Trigger:* Default strategy scenario is triggered by water quality deficiency, water quality monitoring program is implemented, and appropriate water quality trigger is identified.

In response to a request by the FACA, Dan Schmelling, EPA, circulated cost information on uncovered finished water reservoirs [Attachment V.b]. Costs to cover reservoirs range from $2 - $30 per square foot depending on the type of cover, size, and other factors. Costs to replace uncovered reservoirs with tanks typically range from $0.20 - $1.00 per square gallon. Systems maintaining a free chlorine residual would meet the 4-log virus inactivation requirement, however, chloramine systems would not. Three cost tables included data on: (Table 1.0) costs to cover unfinished water reservoirs by reservoir size category; (Table 1.1) costs to treat effluent of uncovered finished water reservoirs by UV; and (Table 1.2) costs to cover or treat uncovered reservoirs by state/territory. A FACA member noted that in her experience the costs presented underestimated the true costs of covering existing unfinished water reservoirs.

Cross Connection Controls

There is no current federal regulations covering cross connection controls. Some states have indicated to EPA that they could not address cross connection controls until there are federal rules - especially in states with laws requiring that state law no be more stringent than federal requirements. EPA received the largest number of comments during Stage 1 public comment period asking for federal action to create a baseline for cross connection controls.

The One-Text proposes that community water systems establish, at a minimum, three element program consisting of (1) hazard assessment surveys (to identify potentially high-risk facilities requiring backflow preventers, (2) backflow preventer testing, and (3) record keeping (including survey results and follow-up, testing schedule and status, and cross connection events.) Cross Connection Control program implementation could be reviewed as part of sanitary surveys.

Significant Deficiency Independent Enforceability

The One-Text proposes that a system's failure to correct a significant deficiency within 90 days or in accordance with a state-approved schedule constitutes a treatment technique violation. Significant deficiency is defined under the sanitary survey provision of the Interim Enhanced Surface Water Treatment Rule. There is currently no authority for enforcement of corrective actions in states without primacy or in tribal lands.

Microbial Water Quality Criteria

The One-Text proposes that the FACA recommends development of national water quality criteria for microbial pathogens for stream reaches designated by states for drinking water use (there are existing chemical criteria). States have the authority to limit non-point sources and would implement the standards. Criteria would put drinking water utilities on a level playing field in decisions regarding permitting of upstream polluters. The Clean Water Act includes drinking water as a designated use of a stream. A FACA member commented that a systematic approach is needed to ensure that a city with both drinking water and sewage systems can balance the needs of both.

Distribution Systems

Distribution systems have a significant impact on water quality. The One-Text proposes that EPA evaluate existing data and develop a distribution system rule and technical guidance to address risks. The following language in included in the One-Text:

> a. FACA recognizes that finished water storage and distribution systems impact water quality and can pose potentially significant risks to public health;
>
> b. FACA recognizes that water quality problems can be related to infrastructure problems and that aging of distribution systems increases risks of infrastructure problems;
>
> c. FACA recognizes that distribution systems are highly complex and that there is a significant need for additional information and analysis on the nature and magnitude of risk associated with them;
>
> d. Therefore, FACA recommends that beginning January 2001, EPA evaluate available data and research on aspects of distribution systems that may create risks to public health and, working with stakeholders, initiate a process for developing a distribution system rule as well as technical guidance and related policy to address significant public health risks.

Discussion of Regulatory Options

Day 2 of the FACA meeting consisted of a discussion among FACA members of regulatory options. The day included plenary and caucus discussions among FACA members. The results of the FACA deliberations on microbial disinfection (LT2ESWTR) and disinfection byproducts (Stage 2 DBPR) are noted in the charts below:

Alternative LT2ESWTR Scenarios - Revised June 29, 2000			
Elements	- Bins - (< 0.075/L) (0.075/L - 1.0/L) (> 1.0-3.0/L) (>3.0 /L)	Criteria for unfiltered are still being debated	
Monitoring	<u>a. Large & Medium</u>	a. <u>Unfiltered</u>:	a. <u>Small Filtered </u>(<10,000):

& Monitoring Triggers	<u>Filtered</u> (>10,000): • Crypto & E. Coli monitoring for 24 months based on 12 mos max RAA • Allowance for 48 samples/2yrs mean <u>Bin Actions</u> (for systems using conventional treatment) <0.075/L: No Action 0.075/L - 1.0/L: 1 additional log treatment or control (0.5 log/0.5 log or 1.0 log - toolbox options) 1.0/L - 3.0/L: 2 additional log treatment or control [including at least 1 log inactivation or membranes, bag filters, river bank filtration] >3.0/L: 2.5 additional log treatment or control [including at least 1 log inactivation or membranes]	• At least 2 log inactivation of Crypto unless monitoring demonstrates mean SW concentration <1/1000L; then need at least 1 log inactivation • Filtration avoidance criteria as in SWTR/ IESWTR) Note: EPA to provide table on monitoring requirements for demonstration of <1/1000 L	• Comply with LT1 • Begin bi-weekly *E.coli* 3 years after start date of large system Crypto monitoring. Delay allows use of large system data & possible development of better indicator criteria to distinguish Crypto concentrations • *E. coli* monitoring triggers Crypto monitoring (unless system elects to install 2.5 log inactivation) • Trigger level: mean > 50/100 *ml E. coli* for flowing streams and mean > 10/100 ml *E. coli* for lakes/reservoirs • Crypto monitoring & bin classification to defines level of additional control same as for large systems Note: EPA to develop possible alternative (lower frequency) Crypto monitoring criteria for providing conservative mean estimate Additional research to be conducted on evaluating *E.coli* measurement as function of holding time and temperature conditions.
Tools	• Watershed Control Program 0.5 log credit • Pretreatment 0.5 to 2 log credit • River bank filtration 2 log credit • Treatment • < 0.15 NTU (95% of time -optimized filter performance) 0.5 log credit • Partnership level 4 1 log credit • *UV Inactivation 2.5 log inactivation • Ozone 0.5 - 2.0 log inactivation • Chlorine dioxide 0.5 - 1.0 log inactivation * Issues associated with maturity and availability of UV. UV would be additional barrier against *Crypto*; it is not intended to replace chemical pre-disinfection or pre-oxidation. Note: other tools still being developed		

Stage 2 DBP Scenarios -Revised June 29, 2000			
MCL	Large & Medium Systems	Small Systems (<10,000)	QUESTIONS

	(>10,000)		
TTHM/ HAA5	← 80/60 LRAA →		
Compliance Monitoring	1. Frequency: Quarterly sampling (at least 1 sample set must reflect peak historical month; remaining samples taken every 90 days +/- 7 (to 14?) days) b. Location: 4 locations in distribution system as determined by ISE (definition of locations?)	*a. Frequency:* *500-10,000: Quarterly sampling* *< 500: Annual sampling* *b. Location:* *500-10,000: 1 location* *<500: 1 location* *(locations determined by ISE).*	1.a How will full implementation of LRAA mitigate the magnitude and frequency of peaks? 1.b What is the likelihood that peaks will be missed with this monitoring frequency? AND if highest month were bracketed, would additional peaks be captured? 1.c What to do about occurrence excursions identified during compliance monitoring? (not a compliance issue) 1.d Look at plants that meet LRAA but have high peaks. 3. What to do about short term distribution/operational issues? 4. Subgroup to discuss compliance monitoring for GW systems. 5. DBP variability for GW?
Initial DBP System Evaluation (ISE)	a. Frequency: 1 year of monitoring, every other month at 60 day intervals +/- 3 days b. Location: 8 sites/plant (other than 4 Stg 1 qrtr sites) Chlorine Chloramine EP to DS 2 1	*a. Frequency:* *500-10,000: Quarterly sampling* *<500: Semi-Annual sampling (when?)* *b. Location (other than Stage 1 sites):* *500-10,000: 2 sites/plant* *<500: 2 sites/plant*	1. Look at ICR data to ensure that this sampling regime will capture highest points. Is water temperature a good indicator? 2. Subgroup will discuss ISE timeframe and revisit proposed monitoring frequency plan. 3. What are outs for ISE? 4. Subgroup to discuss compliance monitoring for GW systems.

	DS Avg 2 2 High DBP 4 5		
Bromate	← 10 or 5 ug/L? →		1. What to do about plants currently using ozone?

Public Comment

There were no requests for public comment.

Next Steps

1) Continue to develop the One-Text document.

2) Schedule for FACA Activities:

- July 6, 2-4 PM ET Small Systems Conference Call
- July 6 One-Text: circulated to FACA members and interested parties
- July 7, 12-2 PM ET Unfiltered Systems Conference Call
- July 11, 9:30-5 PM ET FACA Subgroup meeting/conference call on bromate, non-degradation, groundwater system compliance, early state implementation for DBP and Microbial, and TWG characterization of DBP peaks.
- July 14 One-Text: comments from FACA members to RESOLVE by COB
  Along with the one-text will be a fax or email reply form, if you do not have comments please return the cover noting your approval.
- July 19 One-Text: Revised one-text circulated FACA
- July 27-28 FACA meeting

The FACA expressed their thanks to McGuire, Regli, and all of the members of the TWG for their hard work distilling large amounts of information into useful data for the FACA.

Adjourn