WASHINGTON AQUEDUCT
Future Treatment Alternatives Study
Stakeholder Workshop #2

MEETING MINUTES
March 3, 2010

On Wednesday, March 3, 2010, an expert and stakeholder workshop was convened in the visitor center of the Washington Aqueduct Dalecarlia Water Treatment Plant.

Members Present: Dr. Dana Best, M.D., Children's National Medical Center
Joel Bluestein, ICF International
Erica Brown, American Metropolitan Water Agencies (AMWA)
Plato Chen, Washington Suburban Sanitary Commission (WSSC)
Andrew Fellows, Clean Water Action
Mike Hotaling, Newport News Water Works
Dr. Steve Hrudey, University of Alberta
Dr. Kimberly Jones, Howard University
Brian Kane, The Kane Group
Dr. Yanna Lambrinidou, Parents for Nontoxic Alternatives
Dr. Audrey Levine, USEPA
Ed Means, Malcolm Pirnie
Dr. Alexa Obolensky, Independent Consultant
Alan Roberson, American Water Works Association (AWWA) Regulatory Affairs and Fairfax Water Board
Dr. Phil Singer, University of North Carolina
Dr. Vern Snoeyink, University of Illinois
Dr. Vanessa Speight, Malcolm Pirnie
Dr. Scott Summers, University of Colorado
Mae Wu, Natural Resources Defense Council (NRDC)

Observers Present: Mark Aronhalt, Washington Aqueduct (WA)
Harish Arora, NCS Engineering
Miranda Brown, WA
Ryan Bucceri, CDM
Paul Castro, WA
Mike Chicoine, WA
Wayne Chmielewski, WA
Shabir Choudhary, WA
Nathan Cole, WA
Rodney Collins, City of Falls Church
Joe Cotruvo, DC WASA
Beth Craig, Arlington County
Matthew Dillard, WA
Robert Edelman, Virginia Department of Health (VDH)
Robert Etris, City of Falls Church

Marlee Franzen, Arlington County
Ashraf Gendy, WA
Rich Giani, DC WASA
Victoria Greenfield, Arlington County
Kerry Hamilton, Association of Schools of Public Health (ASPH) / EPA Environmental Health Fellowship Program
Dave Hundelt, Arlington County
Anjuli Jain Figueroa, MP
Thomas Jacobus, WA
Matthew Jacobi, City of Falls Church
Laura Khouvilay, Malcolm Pirnie
Charles Kiely, DC WASA
Eric Lindheimer, WA
David Lundin, WA
Dr. Michael MacPhee, Malcolm Pirnie
Jenna Manuszak, Malcolm Pirnie
John McLaughlin, WA
Tom McNulty, AECOM
Nicole Mikulich, WA
Nakieta Mitchell, WA
Lisa Neal, WA
Jay Nolan, WA
Dr. Kirk Nowack, Malcolm Pirnie
Doug Owen, Malcolm Pirnie
Goerin Pazmino, WA
Jennie Saxe, EPA Region III
Ralph Scott, Parents for Nontoxic Alternatives
Maureen Schmelling, DC WASA
Paul Schwartz, Clean Water Action
Kent Slowinski, Environmental Health Group
Ben Smith, WA
Anne Spiesman, WA
Lloyd Stowe, WA
Jagdish Tarpara, WA
Mel Tesema, WA

Call to Order: Mr. Means, Malcolm Pirnie called the meeting to order at 8:40 a.m.

8:40 a.m. Introductory remarks were made by Mr. Jacobus, General Manager of Washington Aqueduct.

8:45-9:00 a.m. **Welcome and Introductions**
Mr. Ed Means, Malcolm Pirnie - Session Moderator

Mr. Means welcomed the audience and introductions were made. He reviewed the meeting objectives, which were to:

- Review project background, goals and progress since last workshop;
- Present a sustainability framework for analysis of issues related to selection of treatment / non-treatment alternatives;
- Obtain feedback from stakeholders on prioritization of water quality issues and criteria for the alternative selection process.

Mr. Means also noted that the revised minutes of the October workshop were included in the attendee handouts.

8:55-9:15 a.m. **Presentation #1: Introduction and Progress to Date on the Future Treatment Alternatives Study**
Dr. Vanessa Speight, Malcolm Pirnie

Dr. Speight gave a short presentation reviewing the overall objectives of the Future Treatment Alternatives Study, project timeline and progress to date. She discussed the decision process that will be used to evaluate treatment and non-treatment alternatives to address WA's long-term water quality goals and the sustainability framework that will guide this decision. She reviewed next steps and objectives for the third stakeholder workshop, which is tentatively planned for fall 2010. (slides follow)

Presentation 1: Introduction and Progress to Date on the Future Treatment Alternatives Project

Dr. Vanessa Speight
Malcolm Pirnie

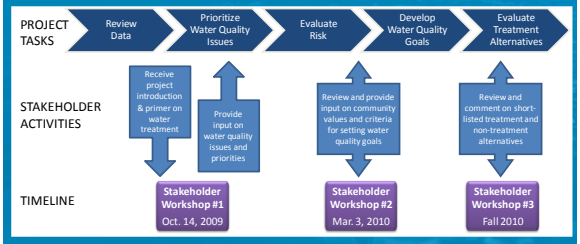
Future Treatment Alternatives Study

- Water utilities are dealing with the challenge of providing the best possible drinking water in the face of uncertainty regarding:
  - Contaminants
  - Health Effects
  - Treatment Effectiveness
  - Costs
  - Sustainability
- Washington Aqueduct is undertaking a process involving stakeholders and experts to address these challenges through the Future Treatment Alternatives Study

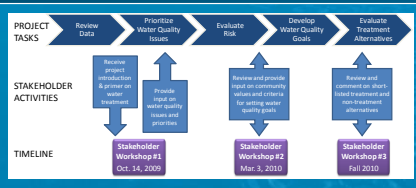
Project Goals

- Consider a wide range of water quality issues (e.g. *Cryptosporidium*, disinfection by-products, taste & odor, corrosion, emerging contaminants)
- Obtain Stakeholder input to understand community values
- Develop a framework that incorporates stakeholder concerns, expert input and potential health risks to synthesize and prioritize water quality issues
- Applying this framework, identify water quality objectives that can be used to develop:
  - Treatment strategies
  - Other options for water quality improvement

Summary of Project Activities



Progress to Date



- Completed historical data review and summary of water quality issues
  - Incorporated feedback from first workshop
- Developed draft health risk analysis

Project Outcomes

- Water quality priorities for future action
- Alternative treatments and strategies that will effectively address the priority areas
- Planning level costs
- Recommendations for monitoring or other long-term data collection on lower priority issues
- Ultimate goal: thoughtful selection of advanced treatment / non-treatment strategies to feed into systematic capital budgeting for the future

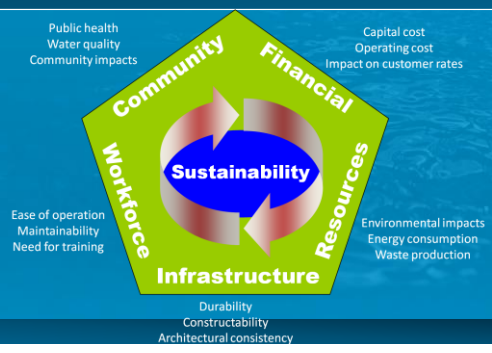
Water Quality Issues to be Considered

- Microbial water quality issues
  - Pathogens
  - Algae and algal by-products
- Water quality issues resulting from treatment and distribution
  - Disinfection by-products
  - Corrosion by-products
  - Trace contaminants in treatment chemicals
- Chemicals introduced into drinking water sources through human activities in the watershed
  - Sodium
  - Perchlorate
  - Pesticides
  - Pharmaceuticals and personal care products
  - Other persistent organic / inorganic chemicals
  - Endocrine-disrupting compounds
  - Nanomaterials

Decision Process

- ID criteria
- Weight the criteria
- Evaluate strategies against criteria (simple scoring)
- Generate an overall score
- Debate and discuss the outcome
- Use the scoring to guide policy decisions

Five Pillars of Sustainability: Framework to Discuss Criteria



Next Steps

- Develop water quality objectives
- Develop treatment / non-treatment strategies to meet water quality objectives
- Use decision process to select top three strategies
  - Incorporate feedback obtained at this workshop
- Discuss ranking of the strategies at the 3rd workshop (late summer/fall 2010)

Questions?

During the discussion period that followed, the following comments were made:

Mr. Scott from Parents for Nontoxic Alternatives inquired about the number of treatment alternatives to be tested and why only three would be considered. Speight replied that for the purposes of budgeting the project, three alternatives were specified. However, if the results of the analysis indicate that more than three alternatives should be considered, WA would work to make sure the appropriate analysis was conducted. Because the next steps include laboratory and pilot-testing of alternatives, it is quite expensive to test many options so the total number of alternatives needs to be narrowed to a reasonable number.

Mr. Schwartz from Clean Water Action inquired about long-term plans for future phases of work. Speight noted that the next phases of work may include pilot studies and possibly detailed design and implementation of new facilities and that those tasks might take several years. She also described how the current evaluation process is intended to develop a framework that could be updated by WA on a regular schedule as new water quality data become available and/or regulations change. Means noted that the ultimate decision regarding future phases and treatment changes will lie with policy makers and WA's customer board.

Mr. Roberson asked about the intended level of design and cost estimating that will be a part of this project. Speight responded that this phase of the work will include feasibility-level drawings and conceptual cost estimates (+/- 50% accuracy). Without the chemical dosing information obtained during pilot testing, it is difficult to develop more detailed cost estimates.

9:15-10:30 a.m. **Presentation #2: Public Health Risk Analysis**
Dr. Steve Hrudey, University of Alberta

Dr. Hrudey gave a 15-minute presentation on comparative health risk analyses performed by other countries and agencies for the purposes of guiding drinking water treatment selection and regulations. He then presented the screening approach that was developed for this study, which combines published health effects data with known occurrence information in the WA source water, treatment plants, and distribution system. (slides follow)

Presentation 2: Community Criteria Topic 1: Public Health Risk Analysis

Dr. Steve E. Hrudey
University of Alberta

Background on Health Risk Analysis in Drinking Water

- Several countries moving to a 'know your system better' (risk-based) approach for regulating & managing water treatment
  - Australia
  - World Health Organization
- Based on prevention is better than reaction

Hazard Identification & Risk Assessment for Drinking Water

1. Understand the water supply system
2. Identify hazards, hazardous events, and sources
3. Estimate the level of risk for each identified hazard / event
4. Identify and plan preventive measures for each hazard / event
5. Implement and monitor preventive measures

www.wqra.com.au/publications/report11_drinking_supplies.pdf

Example of Risk Approach (1 of 2)

1. Seasonal and storm-event extremes in raw water turbidity
2. Rapid turbidity increase can impair flocculation, filtration and disinfection
3. Identify and characterize impact of extreme conditions on filtered turbidity
4. Identify options for raw water storage and improved coagulant dosing
5. Evaluate and Implement storage options
   Initiate and Evaluate bench-scale trials on coagulant dosing adaptation

Example of Risk Approach (2 of 2)

1. Seasonal algal blooms
2. Identify conditions and warning signals
3. Compare with toxicity evidence for algal toxins
4. Identify treatment and reservoir management options
5. Evaluate reservoir management options, perform bench-scale treatment evaluation

Water Safety Plan Approach

- Identify and document hazards and hazardous events for each component of the water supply system
- Assess risk for identified hazards in terms of likelihood of occurrence (e.g. certain, possible, rare) & severity of consequences (insignificant, major, catastrophic)
- Requires a pragmatic approach grounded in experience
- Determine important risks/document priorities for risk mgmt
- Periodically review and update the hazard identification and risk assessment to incorporate any changes

www.who.int/water_sanitation_health/publication_9789241562638/en/index.html

Objectives of Health Risk Analysis Approach for Washington Aqueduct

- Use a health-based metric for comparing different contaminants
  - Prioritize contaminants
  - Understand the costs/benefits of different strategies
- NOT to estimate the absolute risk associated with consuming the water
  - Current science is not able to support this type of calculation because of the low levels of contaminants, influence of other sources of contaminants, and short history associated with certain contaminants
  - Risks are not necessarily additive as health effects endpoints are different for various contaminants

Contaminants Considered in Analysis

- All currently regulated contaminants (~90)
- All contaminants monitored by WA, USGS, USDA, USEPA
- All contaminants on US EPA Candidate Contaminant List 3 (93)
- Other contaminants of concern from literature and experts
- Total of 767 contaminants included

Microbial Contaminants

- Discrete organisms (measured in # of cysts, oocysts or # of cells per volume of water)
- Health outcomes range from self-limiting gastro-intestinal illness to chronic illness or death
  - Depends on organism and immune status of individual
  - Healthy adult human dose-response data is available (a major advantage over most chemical contaminants)
- Known to cause adverse health impacts via drinking water exposure (such causation is not known for many chemicals)

Chemical Contaminants

- Many are classified as carcinogenic (human evidence via drinking water is uncertain for most)
- Endocrine disrupting compounds and pharmaceuticals may have different health outcomes
  - Interactions with other drugs (mixture effects)
  - Impairment of organ function
  - Reproductive effects
- Health effects are often long-term and difficult to distinguish between water sources and other environmental sources
- Relative source contribution is informative

Challenges for Risk Analysis

- Not all contaminants have health advisory level data
  - Different types of health advisory levels
- Acute vs. chronic exposure make it difficult to compare health impact of all contaminants:
  - Microbial (gastrointestinal)
  - Chemical (cancer)
  - Endocrine disruptors (reproductive)
  - Pharmaceuticals (organ function)
- Uncertainty is often not directly addressed

Risk Analysis for this Study

- A systematic process but not a detailed risk assessment
  - Builds upon the EPA CCL process
- Use only published values of health advisory levels for drinking water from reputable sources
- Easy to update as new data becomes available
- Incorporate occurrence data available for Potomac River
- Experts will review the approach and findings for consistency with other studies

Sources of Health Advisory Data

- EPA published Drinking Water Standards and Health Advisory Levels 2009
- 2009 EPA CCL3
- 2008 AWWARF study by Shane Snyder "Toxicological Relevance of EDCs and Pharmaceuticals in Drinking Water"
- 2008 Australian Guidelines for Water Recycling
- WHO Drinking Water Advisory Levels
- Others as suggested by experts

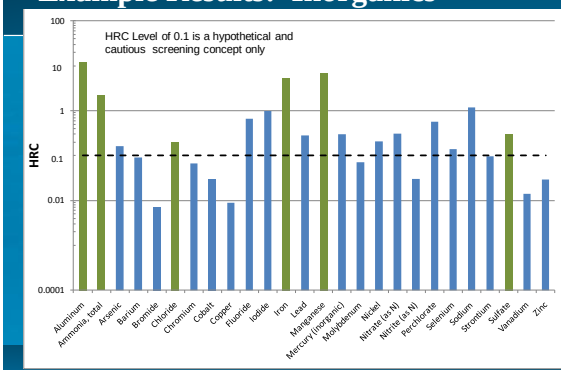
Health Risk Contribution Calculation

- Health Risk Contribution for each contaminant based on the health advisory level (percentage from 0 to 100+)
  - HRC = Occurrence / Health Criteria Level
- Cautious approach assumes maximum occurrence concentration and minimum health criteria level
- Adaptable to consider different levels for each contaminant, if necessary

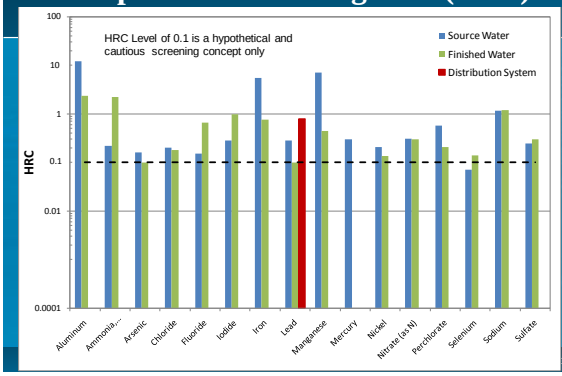
Example: Atrazine

- Maximum detected level (raw water) = 1.75 ug/L
- Health advisory level (WHO) = 2 ug/L
  - Current EPA MCL = 3 ug/L
- HRC = 1.75 / 2 = 0.9 = 90%
- All contaminants with HRC > 10% warrant further consideration as priorities for future treatment

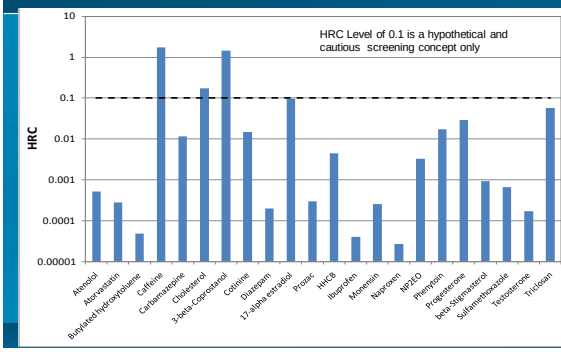
Example Results: Inorganics



Example Results: Inorganics (cont.)



Example Results: Pharmaceuticals and Personal Care Products

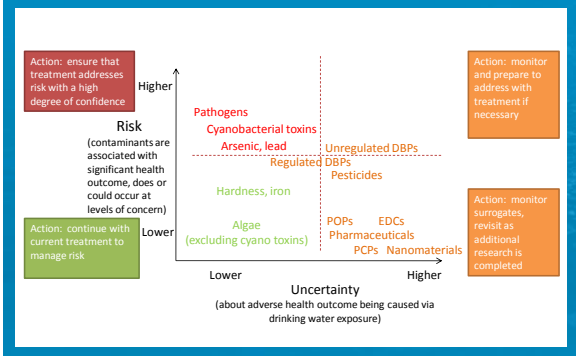


Many Contaminants are Lacking Occurrence and/or Health Data

- Will use expert judgment to create list of contaminants (or classes of contaminants) for further consideration
- Can also recommend monitoring for certain contaminants in the future

Framework for Evaluating Contaminants

- Health Risk Contribution calculation does not address the uncertainty
- Developed different categories to group each contaminant or class for future action
  - Incorporates uncertainty in a qualitative way
  - Will require expert input for contaminants that are lacking occurrence and health data



Developed with input from Ian Douglas, Canadian Water Network Risk Project

Next Steps

- Finalize categorization of contaminants
  - Use as input to decision process to select top rated future treatment alternatives
  - Develop recommendations on monitoring or other non-treatment options

Questions?

During the discussion period that followed, the following comments were made:

Dr. Best asked for clarification on how the team defines "reputable sources" of data. She noted that "reputable" is well-defined in the medical literature. Hrudey replied that all health risk data used in this study was obtained from published data from government agencies and peer-reviewed sources. Best stated that health data can be dubious and she recommended that the team should emphasize the fact that this project is using reputable sources.

Ms. Wu asked whether the occurrence data used to calculate the Health Risk Contribution (HRC) came from the same sources as the health risk data. Speight listed the occurrence data sources used in this study which include data from USGS and USDA studies, WA monitoring data for regulatory compliance and other efforts. Speight also said that many of the contaminants included in this analysis do not have associated occurrence data. Wu also inquired if the occurrence data was only limited to the Potomac River. Speight replied that so far Potomac River data is the only occurrence data used, but other sources could be used if applicable and recommended by the experts, such as using a national average.

Dr. Singer indicated the need to clarify the number of occurrence data points available for each contaminant, which in some cases might be a single value. He suggested including information about the uncertainty around the occurrence data in the final health risk memo.

Dr. Summers inquired about how health criteria levels that are not accepted by regulatory agencies or are under review are being incorporated in this study. Hrudey replied that that is the kind of input needed from the panel of experts and that it would be considered on a case by case basis.

Mr. Fellows inquired as to whether the cost of treatment versus the cost of implementing a prevention strategy at the source has been considered? Hrudey replied that cost has not yet being considered at this stage of the project. First, the contaminants of concern need to be identified and then there will be a detailed approach to determine how to handle these contaminants.

Dr. Best brought up the issue of sources of information. She explained that there are a lot of rising issues in toxicology (e.g., BPAs have risen to much higher level of interest over last several years) but that regulations take a long time to develop. An approach to identify and react to the "hot button" issues, while also ensuring the data used is sound, is needed.

Hrudey is hopeful that this project will highlight some of these important issues and added that the current project follows a flexible process that allows for adding contaminants and considering health criteria that are not fully developed as regulations.

Dr. Obolensky asked Hrudey whether he could clarify, for the audience, the issue of "knowing your system better", which is how the risk-based approach moves to be system-specific instead of nationally-based. Hrudey explained that the trend utilities are following is to move away from waiting for regulatory agencies and, instead, taking responsibility for the safety of their water. This is a proactive approach as opposed to reactive.

Mr. Chen mentioned that treatment is only one aspect of a utility's job. Generally, utilities have many things to balance with a limited budget and approaches like this help them prioritize their efforts and quantify the risk reduction by applying additional treatment where it would provide the greatest risk reduction.

Mr. Roberson asked what a utility can do to reduce uncertainty concerning health risk and how the source contribution of drinking water can be accounted for. Hrudey explained that the uncertainty concerning health risk is about causation, which is scientific health evidence that a utility cannot be expected to generate. However, utilities can be aware of what the literature says about risk and focus on those contaminant issues where the uncertainty surrounding the health risk is low. For example with nitrosamines, the occurrence levels in drinking water are much lower than in certain foods so that needs to be considered when developing health criteria.

Ms. Wu inquired about how the occurrence data captures short-term spikes if compounds are not continuously monitored (e.g., atrazine).
Dr. Hrudey admitted that there is some uncertainty around this issue. However, the intention of the risk analysis approach followed in this study is to be as cautious as possible and try to reduce uncertainty. The objective is to prioritize compounds with higher risk and lower uncertainty about the risk, which will be addressed first. Means added that a later step of this study will be to look at how the short-listed alternatives that come out of this study address the group of contaminants that have higher uncertainty.

Dr. Singer suggested including error bars in the HRC graphs instead of only using the maximum concentration and lowest health criteria level to help illustrate the uncertainty related to occurrence data.

Mr. Scott indicated that uncertainty can be interpreted differently by different people and can be used to confuse issues. Uncertainty is a

contested area and the same could be said for risk. He was also pleased to see that arsenic and lead are located in the high risk, low uncertainty quadrant.

Dr. Snoeyink reemphasized what Means said about the short listed treatment alternatives addressing some of the issues surrounded by higher uncertainty. For example, the atrazine spikes that Wu mentioned would be removed by ozone and granulated activated carbon (GAC). This approach deals with high risk, low uncertainty categories first, but treatment technologies are likely to remove multiple contaminants groups, even those with high uncertainty.

Mr. Arora considered a HRC threshold of 10% quite low. Treatment costs could be much higher for 10% rather than 20% or other higher percentages. Hrudey explained that at this stage of the study, a 10% level is used is to cast a wide net; it is a way to prioritize what contaminants need a closer look. After a closer look, 90% of contaminants that exceed the 10% threshold might be eliminated. He clarified that the plan is not to propose treatment for all the contaminants that exceed the 10% threshold before taking a closer look at them.

Mr. Schwartz inquired as to how families of chemicals will be addressed given that the approach presented is contaminant by contaminant. He added that this approach does not address the issues of additive effects and interactions. He was concerned that because some emerging contaminants are found in trace amounts they will not get close to a level of concern that will trigger the need for treatment, while the trigger might be surpassed if a combination of contaminants is considered. Hrudey replied that the approach of this study is a logic framework that incorporates uncertainty. However, it will not be the final answer; treatment processes are not contaminant specific and because of families of chemicals tend to have similar physical and chemical characteristics they will be removed by similar treatment processes. Hrudey also added that treatment is not the only solution. For example, in the case of atrazine another possible solution might be convincing regulators to ban its use.

Dr. Jones pointed out that one advantage of this approach is that it will enable us to be more preventative and less reactionary. For example, certain contaminants such as nanomaterials are being considered earlier in the process, even if the uncertainty associated with those contaminants is high.

Mr. Bucceri suggested that focusing on the list of regulated contaminants first might help to identify treatment processes that might also remove other contaminants on the list.

Mr. Fellows believes that treatment is not the only solution to the problem and that some of these issues could be solved more efficiently with policies elsewhere (e.g., watershed protection programs). For that reason, in his opinion, utilities need to reach to a broader audience, work with communities and policy makers to solve the problem. Hrudey agreed with Fellows and presented the example of atrazine in Australia, where high levels of atrazine in the source water reservoirs were reduced through cooperation with the forestry agency that was managing the watersheds.

10:30-10:45 a.m. **BREAK**

10:45-11:20 a.m. **Presentation #3: Restoring Safety and Public Trust**
Andrew Fellows, Clean Water Action
Ralph Scott, Parents for Non-Toxic Alternatives
Paul Schwartz, Clean Water Action
Dr. Yanna Lambrinidou, Parents for Non-Toxic Alternatives

Mr. Fellows provided an introduction to the presentation topic on community values. Mr. Scott spoke about the historical relationship between DC water utilities and the general public, especially pertaining to lead issues in the distribution system. Mr. Schwartz spoke about their vision of the future, which included a new water infrastructure paradigm consisting of an integrated water resource management. Finally, Dr. Lambrinidou presented the importance of inclusive public participation and dialogue and suggested next long and short term steps for this study. (slides follow)

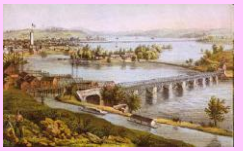
Restoring Water Safety & Public Trust

Securing a 21st Century Covenant
for a Resilient & Sustainable Water Future
in the Washington DC Region

A Community Stakeholder Perspective

Clean Water Action & Parents for Nontoxic Alternatives
March 3, 2010

Overview



- Appreciation for Dialogue
- Community Concerns
- Mission & Customers
- Drivers of Change
- Vision for Future
- Next Steps

Our thanks to WAD for…

- Initiating a top-to-bottom review of drinking water treatment
- Inviting and including community stakeholder input on agency's "Future Treatment Alternatives" study
- Giving us space on today's agenda
- Reaching out to us in the past about lead-in-water- and other water-related concerns

We hope this is the beginning of a deeper, ongoing collaboration.

Community Concerns about Water Safety & Public Trust

Select Highlights:

- **Example 1**: Lead-in-water problems - 1980s to the present
- **Example 2**: Spring Valley neighborhood groundwater and soil contamination from WWI chemical weapons
- **Example 3**: Other concerns

Community Concerns

Example 1: Lead in water <u>before</u> the public was told in 2004

- Since the late 1980s, lead levels and water chemistry have been an ongoing concern in DC
- Leading up to the 2001 lead spiking, WAD (in collaboration with EPA RIII and WASA) overlooked expert advice and made suboptimal treatment decisions
- When lead levels came back very high in 2001-2004, WAD joined WASA and EPA RIII in keeping the public largely uninformed and unprotected for two and a half years

Community Concerns

Example 1: Lead in water <u>after</u> the public was told in 2004

- Although it has made efforts to reach out to the public, WAD has supported a culture of secrecy that keeps critical information under wraps and obstructs independent investigations about lead in water with serious public health implications
- WAD has failed to take a public stand against unethical TEWG decisions and projects, including the group's exclusion of the public, and treatment of the 2009 Edwards *et al.* ES&T study, which confirmed harm to children, as PR "damage" to be controlled

Community Concerns

Example 1: Lead in water <u>after</u> the public was told in 2004

- WAD has categorically and repeatedly stated to DC City Council, Congress, and the press that DC water is safe despite numerous data sets showing otherwise
- At the request of WASA, WAD abruptly and without a reasonable explanation disinvited from its latest lead corrosion control study one of the nation's foremost lead corrosion experts whom the community trusts
- WAD is using orthophosphate for corrosion control, and there are questions about what dose achieves optimal public health protection

Community Concerns

Example 2: Spring Valley neighborhood groundwater contamination

- In light of increasing evidence that exposure to perchlorate occurs through multiple environmental sources, low perchlorate levels now found in WAD's treated drinking water pose a health concern, especially for developing fetuses, infants, and children
- In 1984, Civil War relic hunters recovered approximately 100 chemical munitions 100-200 yards east of the Dalecarlia Reservoir - questions remain about groundwater and drinking water contamination from such munitions and known impact areas

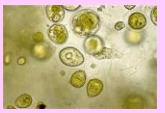
Community Concerns

Example 2: Spring Valley neighborhood groundwater contamination

- WAD has acquiesced to the US Army Corps of Engineers' (USACE) questionable groundwater testing for American University Experiment Station chemicals, including perchlorate, that obscures the true nature of the problem in Spring Valley, leads to premature conclusions of safety, and fails to address the community's public health concerns
- WAD has acquiesced to USACE's culture of secrecy by failing to stand up for full transparency of groundwater monitoring and true public participation in Partnering meetings between USACE, DC Department of the Environment, EPA, and the public
- WAD has not opened up their archives to community members interested in researching WWI activities on WAD property

Community Concerns

Example 3: Other concerns



Contaminants of Concern, Such As:

- Emerging contaminants such as *cryptosporidium parvum*, endocrine disruptors and pharmaceuticals
- History of boil-water or near-boil-water alerts
- Disinfectants and disinfectant byproducts, including those related to chlorine and chloramines
- Perchlorate and phthalates

Downstream Effects of Treatment Process:

- Unnecessarily treating to potable standards large volume of water from Potomac River
- Effects of WAD's treatment process on the ambient environment and neighborhood health and safety

WAD's Mission?

Selling water to wholesale customers & meeting government regulations and standards?

Or also…

Meeting the community's health and environmental needs with as light a "footprint" as possible and as many benefits as possible?

WAD's Customers?

Wholesale water customers (WASA, Arlington County, City of Falls Church)

VS.

Water consumers

Wholesale water customers (WASA, Arlington County, City of Falls Church)

AND

Water consumers

Drivers of Change

- "New WASA's" expressed commitment to public health, real community engagement and openness
- Increasing multiple emerging contaminants requiring fresh and holistic approaches
- Public distrust of WAD drinking water and consequent reliance on home-water-treatment methods and alternative drinking water sources

Drivers of Change

- Increasing need to address droughts and floods, climate effects on emerging contaminants, infrastructure resilience and security
- New science that indicates aquatic and human health issues related to trace amounts of pharmaceuticals and other endocrine disrupting and hormone-mimicking contaminants
- Other municipalities'/utilities' creation of smart, clean and green technologies and approaches that yield multiple benefits while meeting or exceeding the utility's core business

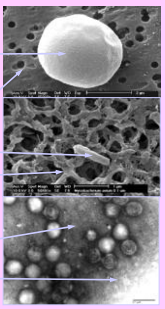
Our Vision for the Future

- New drinking water treatment
- New water infrastructure paradigm
- Integrated water resource management
- Regional leadership
- Integrated Governmental and Multi-Sectoral Collaborations
- Inclusive public participation and dialogue

Our Vision

Disinfection of Hard-to-Treat Pathogens Without Intensive Chemical Treatment

Use of nanostructured membranes and particles, catalysts, and photocatalysts and light to inactivate pathogens in water, without using chlorine or other powerful oxidants that can themselves form toxic compounds



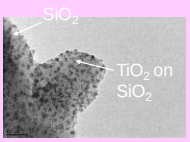
Benito Mariñas, UIUC

Our Vision

Cleansing Water of Toxins with Sunlight

Templated porous structures and fibers

Ndiege, Chandrasekharan, and Shannon, UIUC



TEM micrograph of 2 nm diameter TiO_2 on 20 nm diameter SiO_2 particles

Can use low-cost, treated silica (sand) to remove all organic compounds from water at high rates using free sunlight. Can remove carcinogens, toxic compounds, endocrine disrupters, and pathogens too, all without using chlorine.

Our Vision

A New Water Infrastructure Paradigm

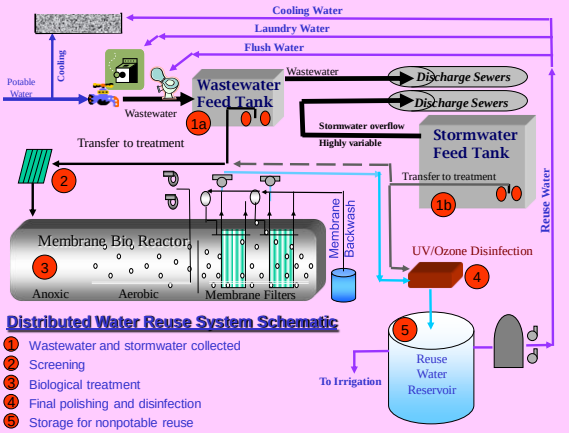
"Sustainable water systems in the future will use, treat, store, and reuse water efficiently at a small scale and will blend designs into restorative water hydrologies."

-- Baltimore Charter for Sustainable Water Infrastructure

Our Vision

Integrated Water Resource Management

- Look past narrow regulatory and engineering requirements and toward solving problems at all scales (building, community, region, etc.)
- Focus on pollution prevention, use reduction, "closed loop" strategies, synergies and maximizing community benefits



Our Vision

Taking Leadership on Regional Water Quality & Quantity and Land Use Issues

WAD should <u>actively</u> support or lead drinking water source protection (quality and quantity), including:

- Transportation and land use decision-making
- Prioritized total maximum daily load implementation strategies
- Water conservation and re-use measures

- Water withdrawal restrictions
- Adequate low flow protection for aquatic habitat
- A regional approach with multi-jurisdictional enforceability

Our Vision

Integrated Governmental & Multi-Sectoral Collaborations

Our Vision

Inclusive Public Participation & Dialogue

In 2008, a report by the National Research Council concluded that:

"When done well, public participation improves the quality and legitimacy of a decision and builds the capacity of all involved to engage in the policy process. It can lead to better results in terms of environmental quality and other social objectives. It can also enhance trust and understanding among parties."

It is time for true openness and public participation in all WAD processes, including collaboration with the "new WASA" and community stakeholders to make environmental and public health a real priority.

<u>A trustworthy process makes for trustworthy results</u>

WAD's "Future Treatment Alternatives" Study

- Must be transparent
- Must ensure that the public (and their trusted experts) have a meaningful role in the study
- Must look at 21st Century: Smart, Clean & Green technologies and approaches
- Must look beyond water treatment methods and include upstream (pollution prevention) and downstream (waste) issues
- Must include affordability, low income and racial disparities, and public health considerations
- Must call for ongoing stakeholder involvement in implementation

Next Steps

- Create ongoing interagency task force that includes community and social science capacity (along with current technical capacity) to implement the big picture recommendations that come out of WAD's "Future Treatment Alternatives" study
- Bring in Suburban MD, NoVA and DC agencies such as DDOT, DDOE, DCOP, DCRA, DCPR, DDOH – plus federal partners from USEPA R3 and HQ, Forest and Park Services, DOD, etc.
- Include internationally recognized and trusted experts in all areas of concern

Next Steps: Short Term

- Open existing work groups (e.g., Lead TEWG, Spring Valley Partnership) to true public participation
- Make existing data available to the public
- Continue and expand public involvement in developing "Future Treatment Alternatives" study
- Join us in co-sponsoring a one-day symposium on 21st century smart, green, and clean models for drinking water quality and environmental protection

Thank you!

Clean Water Action
Paul Schwartz (pschwartz@cleanwater.org)
Andrew Fellows (afellows@cleanwater.org)
202.895.0420

Parents for Nontoxic Alternatives
Ralph Scott (ralphmscott@gmail.com)
Yanna Lambrinidou (pnalternatives@yahoo.com)
202.997.1834

11:20-11:45 a.m. **Utility Perspectives**

A series of brief water utility vignettes were presented to illustrate other treatment decision processes similar to those being used in this study.

Mr. Owen spoke about how the treatment selection of GAC in Cincinnati, OH, covered all five pillars of sustainability: community, financial, resources, infrastructure, and workforce. The Cincinnati decision process was mainly driven by public health, with concerns for chemical spills in the source water (Ohio River) and a new regulation on the horizon at that time (the Stage 1 Disinfectants / Disinfection By-Products Rule). In terms of the financial criteria, GAC produced higher quality water that could be distributed over longer distances, allowing them to extend their service area and improve affordability by distributing the cost among more customers. On the resources side, they decided to perform carbon reactivation onsite and therefore air emissions became an important issue that required installation of heat recovery systems. Regarding infrastructure, they were concerned about interrupting operations while construction took place. GAC scored high for constructability because it is added at the end of the treatment train. Operations continued during construction and the piping was connected overnight (time of lowest water demand). Finally, training about the equipment and health and safety procedures was also required.

Mr. Chen explained that the decision made by WSSC to add ultraviolet (UV) treatment was driven by community concerns on health effects. He explained that even if the historically measured *Cryptosporidium* levels in the source water were low, uncertainty about the measurement methodology and about future levels warranted a proactive approach. Compared to other technologies available, UV was relatively cheap, uses less energy and produces no residuals or waste products. With regards to infrastructure, UV was able to fit into the current plant site easily, which is a concern especially for WSSC's Potomac Plant. Chen emphasized the importance of the workforce aspects during the decision process because of the extensive training requirements and complex operations for the UV reactors.

Dr. MacPhee shared his experience with the treatment process selection for a new plant in Baltimore, MD. In this case, there were relatively few spatial constraints because there are no other existing buildings on the site. The decision process began with more than a hundred treatment train alternatives (i.e., combinations of different treatment technologies), and that list was narrowed to four alternatives. The final selection of a process that combined low-pressure membranes and GAC was driven by the operations group. They wanted a robust treatment train that would ensure excellent finished water quality, even in the event of a loss of other

upstream treatment processes like coagulation. This treatment train had additional benefits such as removal of several emerging contaminants.

Mr. Hotaling explained that the decision in the late 1990s to install ozone at the Newport News Water Works was motivated by the anticipated Stage 2 DBPR. In addition to lowering their DBP levels, ozone provided other benefits such as microbial disinfection, algae removal, and taste and odor control. In the financial aspect, the total capital cost of $15 million worked out to approximately $40 per person per year, with an additional operational cost per household of $2.50 per year, which he considers to be affordable. He realizes that ozone is an energy intensive technology but they considered that the water quality improvements and lack of a waste stream was worth the additional energy usage. Other benefits of ozone were its small footprint and ease of operation and maintenance. Worker safety was also a consideration for the design.

Lastly, Dr. Obolensky described an example that did not involve treatment. About 10 years ago, the Philadelphia Water Department (PWD) established the Office of Watersheds to address the issue of combined sewer overflows (CSOs) during storm events. The Office of Watersheds established an integrated program to divert stormwater from the combined sewer system by using green options (e.g., planting trees and rain gardens). To implement this program it was necessary to restructure the stormwater rates. Rates were no longer linked to water consumption and were charged based on the impervious area for each property owner, which motivates entities with large impervious area to install low impact development (LID) stormwater control (e.g., use new pervious materials in parking lots). However, this type of program takes time to implement due to the review of plans and permits necessary. This program also raises questions about administration, such as the determination of ownership and responsibility for maintaining the green infrastructure (City or private property owner?). Obolensky emphasized the need to consider implementation along with this type of green initiative.

11:45-12:10 p.m. **Community Criteria Discussion Period**

Mr. Means opened the discussion period of community criteria and the following summarizes the key comments and questions that were posed:

Following up on the unintended consequences, Obolensky asked Summers if the conversion to GAC in Cincinnati shifted the DBPs towards brominated compounds, even if the total DBP level remained low. Summers replied that a shift to brominated compounds did in fact occur, although the bromide levels in the Ohio River are not that high so the change did not pose an overall adverse impact. It took the water utility several years to learn about the impacts of changing the treatment process.

Obolensky also asked Hotaling if they had ozone byproducts at the Newport News treatment plants. Hotaling replied that the only regulated byproduct of ozone is bromate and that a low pH of 6.0 is maintained so bromate is not formed. They do not measure non-regulated ozone byproducts.

Dr. Obolensky indicated that the PWD Office of Watersheds has extensive staff and contract resources. Approximately 75% of these resources are related to public engagement. She added that public engagement has become part of the PWD core mission.

Mr. Schwartz indicated that the PWD Office of Watersheds program (that Obolensky described) focuses on the sewer side under a consent decree and that the situation many not be the same for WA. Issues of governance, management, and workforce need to be considered. New approaches might not include utilities as the main entity performing the work (e.g., telemetry to monitor land-use in distant areas). He also believes that federal involvement is needed to move research and technology implementation forward in partnership with water utilities. He is also concerned about how climate change is going to affect water and public health. Greenhouse gases are widely discussed but other impacts are not, such as the nitrogen/phosphorus cycle. Institutional silos need to be broken down and "game-changing" advances need to be made, similar to the advances made in computer technology in the past 20 years.

Mr. Means said that he has worked on an integration project with utilities in the Los Angeles area that involved multiple stakeholders in an attempt to break down some barriers. The idea was to be imaginative and think outside the narrowly controlled issues that each group could address. The discussion was motivating but is only a first step to move towards the utility of the future and the process moves slowly.

Fellows was concerned that, by using the five pillars of sustainability framework, the final driving force of this process would be a combination of the cost and the internal forces (i.e., infrastructure, workforce, and resources) and the input from the community would have less weight (1 out of 5, or 20%). Furthermore, the community may have a different definition of cost. A city thinks differently than a utility. Means clarified that each of the five criteria of the sustainability framework may not have equal weights. He explained that the different criteria would need to be weighted as part of the decision-making process.

Dr. Jones noted that the technical experts focus more on water quality aspects whereas the community focuses on the WA's mission related to broader water quality issues and integrated solutions, and she wonders how these two points of view are going to be incorporated successfully

into the decision-making process. She pointed out that the implementation of innovative ideas takes a long time yet other problems need to be addressed in the short term. A timeline is needed to converge on what is feasible now, yet still think about the future. Many of the emerging technologies presented are not ready for full-scale implementation. Means replied that the integration of short and long-term strategies is the practical challenge of this project.

Dr. Levine indicated that this process is very forward-thinking. She added that the new EPA administration is emphasizing a community focus and that some of the new programs are in line with what is being discussed in this workshop. In the past, changes were driven by problems that needed to be solved. Many water treatment innovations have resulted as a response to specific incidents. However, the new approach is to be proactive and to include social science aspects into technical research.

Mr. Roberson said that it looks like the final outcome of this project could include treatment alternatives or other concrete steps as Lambrinidou outlined in her presentation. He indicated that there are other regional agencies (e.g., MWCOG and Interstate Commission of the Potomac River Basin (ICPRB)) that are already working on watershed protection initiatives and he wondered how these initiatives could benefit from this study. Roberson also inquired as to how unregulated DBPs are being addressed and added that some of the technologies used to control these would also help with emerging contaminants.

Dr. Snoeyink said that first a vision of integrated water management is needed, and then we can look for opportunities in our existing cities such as wastewater treatment plant (WWTP) energy recovery and water use minimization. He liked the concept of the onsite reuse project that Schwartz previously presented. However, a failure analysis needs to be conducted for individual systems because the smaller the system is, the more likely there would be problems with operation. There could be serious public health impacts if the system is not run properly (e.g., the wrong water runs through the pipe). He added that the major problems with drinking water violations occur at small water systems; therefore a cautious approach is needed towards smaller water and wastewater systems.

Mr. Chen indicated that one other consideration that is important is the integration between the WA and its wholesale customers systems to preserve the benefits of advanced treatment. Even if the water leaving WA plants is treated to the highest standards, water quality can be impacted if the distribution system management practices are not good.

Dr. Best encouraged WA to focus on short-term needs to get to the “low-

hanging fruit". One positive move is for WA to gain a better understanding of their collaborators and to continue the openness beyond these workshops. Open flow of information could help end some adversarial relationships. She added that conservation (e.g., installing low flow toilets) may be one area that would be helpful to establish collaboration, since it might give early success.

Ms. Brown agreed with Best's idea of low-hanging fruit. She said that having a Plan-Act-Check-Revise procedure would help ideas to converge and also allows for continually adding info along the way. Brown also said that conversation about the integrated water management idea presented by Schwartz is already happening, such as the Climate Ready Water Utilities Working Group [of the National Drinking Water Advisory Council]. She added that WA is in a unique position as being part of the Army Corps of Engineers (USACE) to "push the envelope" towards more aggressive and visionary ideas.

Mr. Hotaling indicated that recent studies have shown per capita water usage is decreasing across the US. The traditional utility business model is based on increasing demand, which has allowed utilities to implement capital improvements without drastic rate changes. This change in consumption means that the traditional water business model needs updating. A similar problem is happening with distribution systems, which have historically been designed to fight fires with large tanks, pumps, and pipes, but to control water quality the opposite is necessary (e.g. smaller tanks to reduce detention time and water age). In his opinion there is an inherent conflict in distribution system design. Means added that as water is conserved (such as with low-flow toilets), the concentration of waste in sewage increases, which in turn stresses the wastewater collection and treatment systems.

Mr. Kane agreed that access to information is very important and added that it is even more critical how information is distributed to the community. How are these new paradigms understood by the public? As part of this decision process there needs to be a public education methodology developed to explain the technologies. He suggested using case studies as was done during this workshop because people respond well to them. The internet allows for quick distribution of information. Changes need to be described in terms of the costs and benefits.

Dr. Hrudey commented that prevention is always popular and risk management is really about learning from past events, such as outbreaks. These outbreaks have been linked to distribution system problems, source protection, and small systems. He emphasized Snoeyink's point about being very cautious about adopting technologies that are operated by untrained people because the public health impacts can be severe,

including loss of life.

Ms. Wu noted that there are big picture efforts that WA could do besides treatment, including working on upstream issues and getting involved in the regulatory process (e.g. atrazine).

12:10-12:40 p.m. **LUNCH BREAK**

12:40-1:10 p.m. **Community Criteria Discussion Period (continued)**

The discussion period of community criteria continued as follows:

Mr. Kiely asked whether the impact of different treatment technologies on the distribution system will be included in this analysis and if pipe condition data has been looked at. Speight replied that the impact will be considered as part of the analysis. Pipe condition data has not been included in the analysis but it can be considered if WASA is able to provide it.

Mr. Means asked for opinions on how the issues of sensitive subpopulation should be addressed in this process.

Mr. Fellows said that the outreach efforts need to include representation from sensitive populations.

Mr. Schwartz indicated that there needs to be better communication especially with sensitive subpopulations. He suggested identifying the different sensitive subpopulations, and who they trust, and engage them in the conversation. He pointed out that it is commonly said that the water is safe for most of the people; however, Joan Rose [of Michigan State University] estimates that up to 30-40% of the total population can be considered sensitive. He also added that real options and solutions for these groups need to be communicated.

Mr. Chen said that water utilities tend to focus on centralized efforts (i.e., they treat the water for the general population) and that sensitive populations need to be educated on additional steps that might be required to make the water safe for their specific needs. In some cases they may require point of use (POU) devices but not everybody can afford them, in which case an option might be to implement subsidy programs.

Ms. Wu indicated that if the health risk analysis is conducted with sensitive subpopulations in mind, the results would probably be different. She was curious about how the results would compare.

Dr. Best realized that it is difficult to treat the water for everyone. She is concerned that people do not always know that they are vulnerable. She

said that it is important to perform a cost-benefit analysis of the risk for subpopulations and have that become part of the public discussion. She also indicated that a line should not be drawn between the WA system and its customers because a common effort is needed.

Mr. Fellows indicated that external costs need to be captured and that polluters upstream of treatment plants should share the cost of additional treatment.

Dr. Lambrinidou said that the way information is communicated can give the idea that people who are not in a sensitive subpopulation are not at risk, which may not be true. There is a false impression of safety. It needs to be clear that "healthy adults" are not able to be exposed to unlimited contaminants and the sensitive population discussion should be framed that way.

Dr. Lambrinidou also clarified that the message that they wanted to convey in their presentation is that they are willing to move forward and for that to happen, communication needs to continue and systemic problems need to be addressed. She hopes that the commitment to public participation is genuine and meaningful for everyone to move forward in a collaborative way.

1:10-1:40 p.m. **Presentation #4 – Air Pollution Emissions from Water Treatment**
Joel Bluestein, ICF International

Mr. Bluestein gave a presentation on the issues related to energy consumption in water treatment. (slides follow)

Air Pollution Emissions from Water Treatment

Joel Bluestein

March 3, 2010

Passion. Expertise. Results.

Overview

- Air emissions from electricity generation
- Electricity consumption from WA operations
- Indirect air emissions from WA operations

Passion. Expertise. Results.

Power Plant Environmental Impacts Overview

- According to the EPA an estimated 3% of energy consumption, equal to 56 billion kWh, is used for drinking water and wastewater services.
- In western states, energy consumption, for water treatment and transportation and wastewater treatment, is as much as 25% of stationary energy consumption.
- A number of states such as California and New York have created laws or set goals seeking emission reductions from water utilities, with a focus on reducing GHG emissions. Massachusetts and Wisconsin along with other states have developed programs to help water facilities increase their energy efficiency.
- The EPA's Energy STAR program now has a number of energy efficiency tools focused on wastewater plants and drinking water systems.

Passion. Expertise. Results.

Emissions from Electricity Generation

- Power plants emit pollutants including nitrogen oxide (NO_x), sulfur dioxide (SO_2), particulate matter (PM), mercury (Hg), and greenhouse gases (GHG), primarily carbon dioxide emissions (CO_2).
- These emissions are associated with a number of detrimental environmental effects:
  - SO_2 is the primary precursor for acid precipitation.
  - NO_x is a precursor of ozone and contributes to nitrification of great waters.
  - SO_2 and NO_x are precursors of haze and fine particulates.
  - Ozone pollution and airborne fine particles can cause a number of health problems, mainly respiratory conditions.
  - Mercury affects the public through bioaccumulation in fish.
  - CO_2 is the major greenhouse gas.

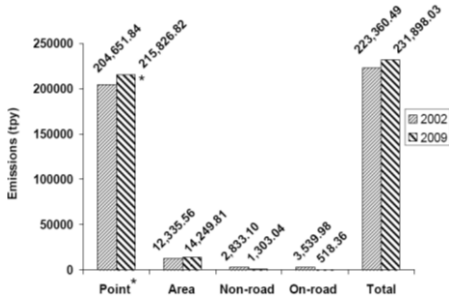
Passion. Expertise. Results.

Power Plant Environmental Impacts Continued

- D.C. is currently in moderate nonattainment with current 8-hour ozone standards (EPA has proposed new, more stringent standards in January 2010) and is in nonattainment with PM-2.5 standards.
- Another primary concern, is GHG emissions, of which power plants are the largest contributor. The EPA is currently developing regulations to limit these emissions.

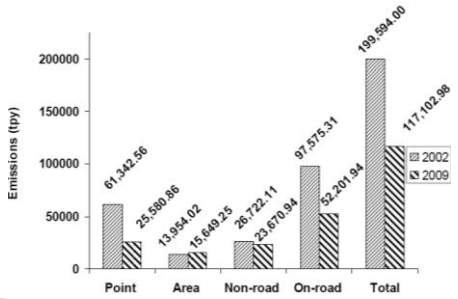
Passion. Expertise. Results.

SO_2 Emissions by Source – 2002 v 2009



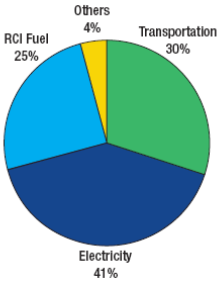
Passion. Expertise. Results.

NO_x Emissions by Source - 2002 v 2009



Metropolitan Washington Greenhouse Gas Emissions: 2005

- In 2005, greenhouse gas emissions in the metropolitan Washington region totaled 74 million metric tons of CO2e.
- Two sectors, transportation and electricity use, contributed over 70% of regional CO2e emission:
- 23% (163,454 mtCO2e) of the D.C. government's GHG emissions inventory were from wastewater and water treatment facilities (includes water transport).



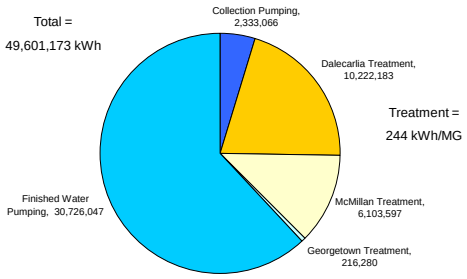
Power Plants Serving D.C.

- Most of the electricity that is delivered to the District is from 4 power plants in Maryland and Virginia owned by Mirant, and then distributed in the District by Potomac Electric Power Corporation (PEPCO). The facilities are all older facilities and are primarily coal-fired, with some use of natural gas/oil.
- Chalk Point Generating Station, 2,423 MW, located on the Patuxent River in Prince George`s County, MD;
- Dickerson Generating Station, 837 MW, located on the Potomac River in Montgomery County, MD;
- Morgantown Generating Station, 1,412 MW, located on the Potomac River in Charles County, MD;
- Potomac River Generating Station, 482 MW, located on the Potomac River in Alexandria, VA.

PJM Power Plant Emissions

Emissions	lb/MWh
CO_2	1,272
SO_2	8.2
NO_x	2.2

Washington Aqueduct Electricity Consumption (kWh)



Indirect Emissions From WA Water Treatment

	kWh	SO_2	NO_x	CO_2
Collection Pumping	2,333,066	10	3	1,484
Dalecarlia Treatment	10,222,183	42	11	6,501
McMillan Treatment	6,103,597	25	7	3,882
Georgetown Treatment	216,280	1	0	138
Finished Water Pumping	30,726,047	126	34	19,542
Total	49,601,173	203	55	31,546

Thinking Ahead

- Consideration of future treatment alternatives should consider air and other environmental implications.
  - Some alternatives might include direct on-site emissions
  - Some treatment alternatives could affect pipe friction/pumping energy
- Some projects are already on the drawing boards that will increase electricity consumption.
- A broader review could include "life cycle assessment" including off-site emissions such as emissions from trucks bringing chemicals to the facility.

Summary/Conclusions

- A significant amount of electricity consumption goes towards water treatment and distribution.
- Goals and standards have been established for reducing electricity consumption/indirect emissions from water treatment.
- Enhanced water treatment could lead to on-site emissions and/or increased electricity consumption, and as a result, increased air emissions.
- The benefits of enhanced water treatment need to be weighed against the associated environmental effects.

Resources

- D.C. *Greenhouse Gas Emissions Inventory. 2006 Calendar Year Baseline*. January 2010. http://green.dc.gov/green/lib/green/2010_1_12__ghgemissionsinventoryreport.pdf.
- U.S. EPA. Clean Energy, *eGRIDweb*. http://cfpub.epa.gov/egridweb/view_st.cfm.
- U.S. EPA. *Sustainable Infrastructure for Water & Wastewater, Energy and Water*. http://www.epa.gov/waterinfrastructure/bettermanagement_energy.html.
- U.S. EPA. Memorandum: *The Nexus between Water and Energy: Promoting Energy Efficiency for the Water Sector*. February 14, 2008. http://www.epa.gov/waterinfrastructure/pdfs/memo_si_bengrumbles_nexus-between-water-energy_02142008.pdf.

GHG Emissions by DCWASA Department

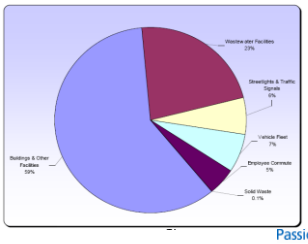
- The Department of Water Services (DWS) contributes 8.1% of total GHG emissions in D.C. associated with electricity and natural gas energy use (12,604 $mtCO_2e$ out of 154,746 total).

Table 3.5: Energy Use and Emissions from DCWASA Facilities

Source	Greenhouse Gas Emissions (metric tons CO_2e)	Percent of Emissions	Energy Use (kWh & therms)	Cost
DWT	132,619	87%	255,190,205	$22,682,482
DWS	10,671	7%	20,534,096	$1,825,165
DSS	8,725	6%	16,789,781	$1,492,353
Electricity Total	**152,016**	**100%**	**292,514,082**	**$26,000,000 (estimated)**
DWT	1,933	71%	363,391	$18,392
DWS	317	12%	59,505	$3,012
CS	262	10%	49,186	$2,489
DSS	191	7%	35,944	$1,819
Natural Gas Total	**2,730**	**100%**	**513,185**	**$25,973**

D.C. Government Operations 2006 GHG Emissions by Sector

- 23% (163,454 $mtCO_2e$) of the D.C. government's GHG emissions were from the operation of District of Columbia Water and Sewer Authority (DCWASA) systems (this includes energy use associated with the transport & treatment of water). Total 2006 D.C. government emissions were 719,896 $mtCO_2e$ (from electricity consumption and indirect sources).



During the discussion period that followed, the following comments were made:

Mr. Hotaling said that Newport News has seen large fluctuations in both energy and chemical costs and asked Bluestein his opinion on the direction of electricity prices in the future years. Bluestein answered that, like the water industry, the power sector will see more regulations and that the new technologies required for emissions control will make the price of electricity increase. Means pointed out that a change in energy prices will affect all treatment technologies the same way.

Ms. Brown indicated that Life Cycle Cost analysis is a good concept but there is big uncertainty around energy costs. Means replied that one possible approach could be to evaluate how changes in energy costs will affect the choice of treatment technologies by evaluating a range of prices. Bluestein added that 3 billion dollars per year are spent on energy efficiency programs already and additional spending may be ten times that amount due to upcoming regulations. Increase in efficiency might lower demand and result in static prices. Even if the number of customers increases, the total consumption could remain steady, which has happened to the gas industry.

Mr. Owen indicated that the GAC reactivation facility in Cincinnati uses natural gas and by optimizing its usage (e.g., reactivation occurs at night) they have been able to reduce their energy costs by 40 to 50%. They are also considering becoming a regional regeneration facility.

Mr. Schwartz inquired as to whether WA is considering increasing energy efficiency in operations, and if the discussion expands to the wholesale customers as well (e.g., fire-fighting options, heat exchange, reuse water, etc.). He indicated that there are many possibilities for energy efficiency if a more integrated approach is taken and these efforts could have a huge impact in the whole region. Cities like Seattle and Vancouver are already doing some work in this area and he asked as to how these models could be implemented in the DC area. He believes there is potential for a good symposium on this topic and that this region could be a great pilot area.

Mr. Bucceri indicated that it is necessary to consider the reliability of new technologies and other requirements that would be specific to the water industry.

Mr. Hotaling explained that in Newport News they have already taken small steps towards reducing energy consumption such as retrofitting light bulbs and operating pumps at their best efficiency point. He is part of the Water Research Foundation advisory committee and could suggest ideas for projects.

Mr. Bluestein asked about dual drinking and reuse water systems. Means replied that there are cities in the western US, Florida and in Australia that have them. However, there are cost, operation and maintenance issues associated with dual distribution systems.

Mr. Schwartz said that the Washington region is not really "water-rich" and it is necessary to include the impacts of energy saving in overall efforts. A new business model for the drinking water industry needs to be considered.

1:40 - 2:00 p.m. **Presentation #5: Financial Criteria: Overview of Washington Aqueduct's Costs**
Dr. Vanessa Speight, Malcolm Pirnie

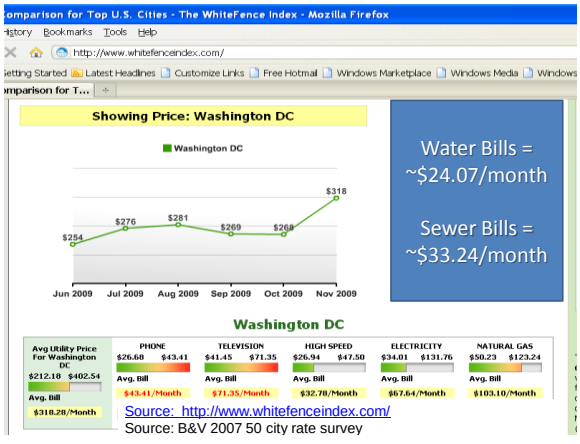
Dr. Speight gave a presentation on background funding information for WA and rate information for several DC area water utilities. (slides follow)

Presentation 5: Financial Criteria: Overview of Washington Aqueduct's Costs

Dr. Vanessa Speight
Malcolm Pirnie

Introduction

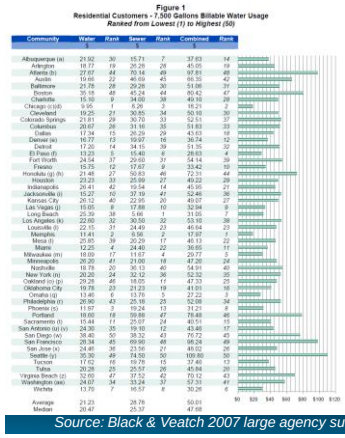
- 100% of Washington Aqueduct's costs are paid by the wholesale customers:
  - DC WASA
  - Arlington County
  - City of Falls Church
- In addition to Washington Aqueduct expenses, customer costs include items such as:
  - Debt Service
  - Infrastructure O&M (including pumping)
  - Personnel Services
  - Capital Improvements



Water Bills = ~$24.07/month

Sewer Bills = ~$33.24/month

Source: http://www.whitefenceindex.com/
Source: B&V 2007 50 city rate survey



- For purposes of this survey, the metering fee and Right of Way Rate were divided equally between water and sewer bills.
- $24.07/mo water
- $33.24/mo sewer

Source: Black & Veatch 2007 large agency survey

The following section captures the key comments and questions that were posed during the discussion period:

Mr. Kane said that the rate structures influence household costs. For example, Arlington County does not permit individual metering per unit for multi-family residences. He also said that options to reduce the burden for low-income communities should be considered.

Mr. Fellows inquired as to whether there is a negotiation process with the public when WA rates are increased. Jacobus answered that, for daily operating costs, there is a budget review with the wholesale customers, who then include the WA costs as one component in their budgets. There are no retained earnings for WA, only recovery of the operating cost. On the capital planning side, WA must have 100% of the cash up front to be able to award contracts for improvements. The wholesale customers must work out the financing for capital improvements either from their own funds or through bonds. Each customer goes through their own public process to set their budgets and rates. Fellows also asked whether any new treatment that is selected during this process must be approved by the wholesale customers. Jacobus replied the customers must be part of the decision for two reasons: 1) all systems are physically connected so different water cannot be directed to individual customers; and 2) they need to be able to agree on the steps taken and that the costs are warranted. Fellows also asked if there is a public process for the customers. Kiely replied that for WASA the rate-setting process includes a discussion of all projects in a public procedure. Fellows suggested that this project should include a clear explanation of the cost process.

Dr. Best inquired as to whether there needs to be unanimous agreement among the customers to move forward. Jacobus replied that they have always had agreement in the past either because the capital improvements were required to meet regulations or had been in planning stages for a long time. They have tried to put forward ideas that the community agrees on.

Mr. Kiely explained that WA would present a project concept to the WASA Board, which includes elected officials, during the early project stages. The budgeting process for WASA is an open public process.

Dr. Best asked what would happen when the driver of a project is not only for meeting regulations and instead includes a proactive approach, which could then create some disagreements between customers in the future. She is concerned that individual retail customers are not currently involved and they only become involved later in the process, when it might be too late to change the direction of a project.

Mr. Schwartz said that this discussion shows the complication of the water

delivery system in the Washington region. There are many other items requiring rate increases and competing for public money, not just WA. The situation is further complicated by the economic conditions, high DC unemployment, and other issues. He also pointed out that residents have not historically been at the table during cost discussions. He has been advocating a utility advisory board that provides expertise that the public could access to try to understand the range of complex issues.

Mr. Roberson inquired whether there is an understanding of the demographics of the three customer's service areas. He also said that engaging the public can be hard because many people do not care about water and rates. He said that utilities should advertise more about the rate hearings to get more people to attend. The experience of Fairfax Water is that not many people attend rate hearings or public meetings. In general it is people from advocacy groups, such as the ones represented in this stakeholder group, who are advocating for the public during these processes.

Mr. Kiely indicated that there is a wide variation of income in DC and that WASA has options available for low-income households. For example, for those that qualify, a base level of water and sewer service is provided at no charge.

2:00 - 2:20 p.m. **Public Comment Period**

Mr. Means opened the floor for any additional comments regarding any of the topics discussed during this workshop. The following questions and statements were posed:

Mr. Fellows suggested that if there is the potential that a state-of-the-art treatment might be selected from this process, the sooner the customer governments get involved, the better. Jacobus said that WA regularly briefs the board about operations and projects like this one.

Mr. Jacobus recognizes that there is room for improvement to engage the public, even if they already participate in many regional initiatives. He inquired as to how the idea of an advisory board could be implemented. He would like to get elected officials more involved, including such things as a water "drink off" competition.

Ms. Craig said that Arlington County has a public process to set water rates and develop a capital improvements plan. This study has been included as an item on the long-term horizon for funding. She added that currently the sewer rates are much higher than water due to the on-going construction at the WWTP.

Dr. Singer indicated the need to look at the public health expenditure as a whole, which also includes schools, hospitals, etc. Public Health impact from water treatment should be placed in context, especially for elected officials and the public because a lot of money could be spent to remove contaminants with lower public health value than other expenditures. He added that a public education process is needed because data placed out of context is difficult to understand and can be misinterpreted.

2:20 p.m. **Wrap-up**

Means explained that the next steps in this project will include determining the criteria that will be use in the decision-making process. The comments heard today will be incorporated into the analysis. He added that participants are requested to call or email the following contacts with any further questions or comments.

Vanessa Speight vspeight@pirnie.com
Shabir Choudhary Shabir.A.Choudhary@usace.army.mil