Back to the Future:

Water Supply and Public Health — A Mission To Share

This speech, prepared by Douglas B. MacDonald, was first published as the Keynote Address at the New England Water Works Association 118th Annual Conference in Burlington, Vermont on September 20, 1999. It was published in the Journal of the New England Water Works Association.

In an ad many of us have recently seen on television, a child watches her father hand a glass to her mother:

"Dad, can I see that glass of water?"

Father: *"Sure. Why?"*

Child: *"I'm looking for lead and pesticides in Mom's glass. They could be in anyone's tap water. It's not your fault. Most people don't know."*

And then comes the sales pitch for a tap filter that sells for $40, and probably needs two hundred dollars worth of replacement cartridges every year. That could double the cost of water for our now panicked family of four if they live in greater Boston.

Today in the water business, we think a lot about our industry and its future. We know that success, as for any business, ultimately depends on whether we can generate the resources — measured in money and public support — to invest in people, programs and facilities. We meet with competitiveness consultants, business re-engineering experts and outsourcing vendors, and we listen for the wolves at the door, the privatizers. Whether we actually trust all their claims of benefits for our customers, we have largely accepted that their issues fundamentally matter in our brave new world.

I do not disagree. But I believe we should listen first to the words put in that child's mouth by the ad writer:

"I'm looking for lead and pesticides in Mom's glass. They could be in anyone's tap water. It's not your fault. Most people don't know."

If we miss that message, all the competitiveness consultants in the world will never lead us to a successful future.

* * * * *

My talk today is about water professionals forging new connections, alliances, conversations and partnerships with our not-so-distant cousins in the public health community.

What could be more timely, when our new president, Jon Beekman, has challenged us to build our own organization's dedication to the public health mission?

My theme comes from our experiences at MWRA. For several years we have been learning how much we can gain from closer work with the public health community, how much potential still lies ahead, and how much inspiration we can draw from reflecting on an earlier day when public health and water professionals thought of themselves as a single community. Which they could hardly avoid, because often they came in the form of a single person!

Everyone knows that the professions of public health and water supply sprang from a single evolutionary seed. Each of the fields can trace its professional lineage to symbolic moments like the day in 1854 when Dr. John Snow, a physician with a gift for statistical mapping, convinced the City of London to arrest a cholera outbreak by removing the handle from the Broad Street Pump.

That's a famous story, but London is far away. We should proudly study our own history here in New England, too. It is all part of a much larger nineteenth century picture, the Sanitation Movement, in which Boston was one of the intellectual centers.

The Sanitation Movement believed that the causes of disease lay in environmental conditions and that freedom from disease could be achieved through personal hygiene, health education and civic promotion of sanitary improvements and sanitary protection.

It was in Boston in 1850, that Lemuel Shattuck, an internationally recognized pioneer in gathering and analyzing health statistics, prepared for the Massachusetts legislature the first comprehensive report on public health published in the United States, urging the responsibility of the public authorities to take action. His key action items? They included:

"Every house should be supplied by water." And "[d]rains and sewers should be made to carry off water introduced in any way into cities and villages."

Living in Boston, Shattuck spoke for a community where these were living precepts.

1848 was a year of civic celebration in Boston for a major public works achievement: new supplies of clean water first arrived in October from John Jervis' marvelous Cochituate Water System. A public health advocate like Shattuck had to have been intimately involved in that project in his own community. Indeed, he had pamphleteered during the planning that the better source would be Spot Pond. But by 1850, he was not only a convert to the Cochituate Water System, he had become its publicist, calling it "a structure that for artistic skill and thorough workmanship, is probably unsurpassed anywhere."

But the greatest merit of Boston's water system Shattuck could hardly have foreseen in 1850 in his wildest dreams: after the Cochituate Water System brought clean and abundant water to Boston, the city never again was visited by epidemic!

Through the rest of the nineteenth century, public health professionals and water engineers marched forward together.

The State Board of Health was created by the legislature in 1869.

In the 1870's, the Board studied water supply sources and researched the relationship between lead in water pipes and lead poisoning.

Through the 1870’s and 1880’s the Board promoted plans for sewage pollution prevention in various rivers, including the Charles and the Mystic.

In 1878, the legislature conferred direct regulatory powers on the Board of Health to keep the rivers clean.

In 1879, the legislature instructed the Board to collect and publish water works statistics.

In 1885, the Board filed a major report on drainage engineering and was given authority by the legislature in 1886 to protect the purity of inland water. This led to the creation of the Board's engineering department.

In 1886, the Board created the Lawrence Experiment Station, which was early established as the most important research facility in the country on water and sewage purification and on water quality testing.

In 1893, jointly with the Metropolitan Parks Commission, the Board recommended construction of the Charles River Dam and creation of the Charles River Basin.

In 1895, the Board published its recommendation for the use of the Nashua River for the expansion of the greater Boston water supply, including the construction of the Wachusett Dam.

In 1900, the Board recommended the plan for the South Metropolitan Sewer System, operating today as the single most important component of the MWRA system.

These are just a few of the highlights!

Meanwhile, the Board attended to the statistics, a key public health mission. The statistics painted a powerful message. Where good public water supplies were installed, disease rates dropped. And where improvements were slow to come, Lowell, Lawrence, Chicopee

and Holyoke were examples, disease rates rose. The difference was clear to see: the communities that enjoyed the protection of good public water saw the terror of disease lifting from urban life.

The professional staff of the Board of Health itself included the most esteemed water and environmental scientists and engineers of the day. One was Frederic Stearns, its Chief Engineer, whose largest contribution, the Wachusett system, remains today, nearing age 100, the backbone of the metropolitan Boston water system.

What an age of giants it must have been, when one person like Stearns could conceive and design the Wachusett system, persuade city officials and legislators that it should be built, and then supervise its construction. But imagine the enormous force of his message: good water supply was the visible deliverer and guarantor of health gains that in that era literally changed the quality of life within a single lifespan.

And we should note and admire the political genius of the State Board of Health, just when public support for those projects was so necessary. In 1896, where did the Board of Health locate the water quality testing laboratory for the Commonwealth of Massachusetts? Does anyone in the audience know this remarkable piece of water history trivia? Answer: the Massachusetts State House. What a world it would be today if our state legislators walked past the water lab as they considered where drinking water should fit in the scale of priorities for precious public dollars.

* * * * *

The nineteenth century seems a long time ago, when we look at old photographs of reservoirs being shaped with shovels and horse-drawn carts, and watermains being installed with steam derricks.

Yet it seems very near, when we think that then, as now, citizens worried about the risks of disease from environmental causes while public health and water officials went to lobby citizens and the legislature for new investments to meet clean water goals.

So how should we explain why one profession in the last third of the nineteenth century is now two professions at the end of the twentieth?

The answer, I think, lies in an evolutionary tendency toward divergence that has affected many professions in our time.

Here are just two snapshots of that evolutionary divergence affecting our industry, highlights to remind us that a historian could find a thousand evidences that the divergence has been real.

First, in the 1920s. In 1922, MIT and Harvard abandoned a joint program, a leader in the country, called the School for Health Officers. The school offered a post-graduate curriculum in environmental science, sanitary engineering and public health practice. Immediately from its ashes, there arose the Harvard School of Public Health. New and improved, especially in the view of the Rockefeller Foundation, which provided a generous endowment so it would focus only on the medical issues and leave to others those down-and-dirty engineering courses. The Harvard School of Public Health, would both lead and define the field, but with a much narrower vision than its predecessor.

Second, from 1970. A Presidential Order segregated the new Environmental Protection Agency from the Department of Health, Education and Welfare. When it began, 650 staffers transferred to EPA were commissioned public health officers. By the mid-nineties, EPA had doubled its workforce, but public health representatives at the agency had shrunk to 200. 1970, by the way, was the year Massachusetts DEQE was split off from the Massachusetts Department of Health.

We would only waste time if we re-argued whether or not DEQE-now-DEP should have been unjoined from DPH. And I would not suggest that nothing more than fashion was involved. Real shifts in terrain had occurred. For example, as the century proceeded, public health professionals turned to new concerns about chronic disease, precisely because the threats of infectious disease had been so diminished as the gains of sanitation and vaccination had been secured.

In the divergence of the professions, however, we do see a microcosm of one of the most important and not wholly positive intellectual trends of the entire century: the quest in almost every professional realm for ever greater specialization, the focus by professionals everywhere on narrower and narrower fields of inquiry. Edward O. Wilson, a great writer as well as a great scientist, has bemoaned that matters have come to the point where physicists don't know what a gene is and biologists think that string theory is something to do with violins. Wilson thinks that intellectual re-convergence would be a good thing for most professions and disciplines.

I'm not sure that the public health and water supply split is quite as dramatic as Wilson's example of the physicists and biologists. But we should work very hard to re-establish a common forum. A lively place to build new understandings of each others' concerns and approaches.

Because we in the water field should not feel like travelers in a foreign country, afraid of the food and anxious about misunderstanding the street directions, when we face new issues with captions like cryptosporidiosis and bromodichloromethanes.

Because our public health friends must come to appreciate that distribution system conditions can't just be waved out of the water quality agenda with a magic wand.

Because we must all become more thoughtful about how to speak to the public. Particularly when the public is asked to discern subtle semantics of risk assessment after it has been amplified through a boom box which is uncontrollably powered by the media's interest in selling controversy and apprehension.

And finally, because on the water side we must specially recognize the finding of every poll and study that asks citizens about their perception of whether their drinking water is safe. When the public hears the answer delivered from the podium by a public health expert, its credibility is many times higher than the answer delivered even by the best-informed and best-intentioned spokesperson for the local water supplier. This may be an unpleasant fact, but it is perhaps the most important of all.

* * * * *

At MWRA, by luck, circumstance, trial-and-error and a growing sense of intentional direction, we've begun to accumulate some experience with building the renewed common forum with public health professionals of which I speak. I'd like to share some of that experience.

In 1993, the results from the first round of tap water lead testing from selected households in many of the MWRA communities were not good. Not good at all. What should we then do to meet the generic regulatory mandate to optimize corrosion control?

We decided not to spend all our energies parsing the ins and outs of the regulations to meet a regulatory minimum.

Rather, we took a step back and focused on children: what was the best course for us to lessen overall health risks?

We invited the formation of a working group on lead at the tap that included a pediatrician, child health advocates and public health officials.

Asking for guidance, we were taken to two fundamental points. Yes, we should fast-track an Interim Corrosion Control facility to deliver incremental benefits to our water chemistry, even if only for the five- or six- year period until our permanent new water treatment plant was expected to come on line. No, we should not embark on a high profile campaign to draw attention to tap water lead risks. Doing so would actually be counter-productive to the broader messages that health officials wanted the public to hear. Tap water risks should not be allowed to obscure the larger risks, for example, from lead paint chips or contaminated soil.

We were also told not to waste money by trying to communicate with all MWRA's customers. The health people guided us that the customers who needed the message were families with the youngest children most at risk. So together we designed the brochures and their distribution to focus on the WIC programs for new mothers and on the day care networks.

Later in 1993, the Milwaukee cryptosporidium crisis challenged all water suppliers' ability to offer wise responses. In our own actions in the post-Milwaukee environment we co-sponsored a cryptosporidium workshop for public health and water supply professionals attended by almost seventy-five people. The workshop resulted in our directing our efforts to support health professionals' ability to give good advice to people with compromised immune systems.

Out of that workshop came the MWRA Public Health Advisory Group, coming together essentially as a mailing list and network of about twenty health and water activists, doctors, researchers and state and local public health officials.

The Advisory Group helped identify issues of broadly shared concern. Therefore, in 1996, we brought local health officers and local water departments together in a workshop on disinfection issues. Also in 1996, we began publishing *Water Quality Update,* our monthly recap of water quality testing statistics, sent to public health officials and water departments throughout our service area.

Later in 1996, a potential crisis again demonstrated the enormous value both of the professional relationships that had developed and exchanges of technical information that had begun to take hold. You all recall the furor in Washington. D.C. A run of bad total coliform

sampling results caught public health officials unaware and uninformed and communications were bungled by all concerned. The ensuing public relations fiasco shattering drinking water confidence in our nation's capital.

What few people know is that Boston had its own TCR bloom that summer. MWRA staff and our colleagues at Boston Water and Sewer Commission had already built the base for what needed to be done. Public health officials in the City of Boston and at the state, far better prepared than their counterparts in Washington both to assess the data and the water system from which it was generated, were able to give assurances, rather than spread confusion, or worse, panic, amongst officials and the public.

In 1997, the public health community began to contribute to MWRA's technology assessment of treatment choices for the new Walnut Hill treatment plant. Experts from around the country came together in Boston to advise on the needs and the opportunities for improving MWRA's system. Even though full agreement eluded the participants, the process enormously strengthened MWRA's capability to prepare to make a decision grounded in relation to public health principles.

In 1998, more workshops were held. One, co-sponsored with the Massachusetts Health Officers Association, focused on corrosion control and microbial risks. The free and collegial discussion at that workshop guided MWRA's decision that pH and alkalinity management, rather than the application of orthophosphate corrosion inhibitors, should be MWRA's main strategy for long-range corrosion control.

Another workshop brought researchers and practitioners from all over the country to an MWRA-sponsored conference on disinfection by-products. That day's discussion was probably the single most important of days and days of work leading up to the technology determination for the new treatment plant made by the MWRA Board of Directors in October 1998.

By this time we were not only inviting public health professionals to our meeting, they were inviting us to theirs. So, in April 1998, we sought to present our message to an important conference of public health researchers sponsored by Tufts. This was a critical time for expressing to the public health community the seriousness of MWRA's commitment to public health measurements and improvements.

* * * * *

If our goal is to find reconnections to the public health community, there is one piece of very exciting news. On the other shore, they're trying to reach us, too. Today, the public health profession has its own challenges. There, too, arise the questions of how to communicate with the public. About how to generate and commit resources. About new ways of looking at environmental health risks that seem to span the old cleavages between infectious disease and chronic disease.

Indeed, questions of contagion are probably of greater interest today than at any time since state boards of health shut down the tuberculosis programs in the 1970's. Now, for example, the public health people, like us, worry about emerging pathogens. To say nothing of diseases we all thought had been conquered, like typhoid, cholera, malaria and tuberculosis. We are re-learning that those scourges are shown to be ready to exploit any breach in sanitary standards, anywhere in the world, to the risk of us all when we must share so small and ever-shrinking a planet.

Listen to a voice from within the public health profession, Dr. Bernard Goldstein from Rutgers University. He wants a change in direction from what he sees, that in the environmental arena, the public health foundation has been "obscured by legalistic command and control approaches and by technically based, centralized decision-making processes that are unrelated to the problems faced by local communities."

If public health professionals aren't involved, he says, risk analysts can become "so enamored of their process that they calculate risk probabilities to decimal places that reflect technical feasibility rather than public health necessity."

There are way too many lawyers and too many regulators that have no touch with public health principles, Goldstein says. Become more engaged, he urges fellow public health professionals, because "it is not enough to write a law or assign a government technician to develop a numerical formula that arbitrarily determines local action."

(Here, by way of an aside, is a kernel of an idea with enormous appeal for someone like me who has to admit that some of his best friends are lawyers. I nervously hear myself becoming ever more strident in my dismay at the way lawyers and legalisms are now running our environmental enterprise. Maybe it's not actually the lawyers' fault? Maybe it's because, back in 1922 when Harvard and MIT set the trend that the public health experts and the environmental engineers would slowly stop talking to each other, a vacuum inadvertently was created. Can the lawyers be blamed for having rushed in to fill it?)

In any case, Goldstein seems to say to his colleagues, that if you think the regulators are losing perspective and real-world communities are not having their needs met, then take up your voices and work to bring public health perspectives back on to the field of environmental protection.

Views of Goldstein and others of similar mind found influential expression in the work of the Presidential/Congressional Commission on Risk Assessment and Risk Management in 1997. The Commission's reports argued for placing environmental health risk problems in the larger public health context. This requires modernizing environmental regulation and moving away from "fighting the last war . . . using prescriptive, media-specific laws and centralized institutions designed in the 1970s to address — quite successfully — the legacy of environmental contamination from the post-World War II industrial boom. Problems and knowledge have changed dramatically over the last twenty-five years." The Commission suggested, "[t]he likely synergy between environmental and public health agencies in a reservoir of untapped potential. . . . It is vital that environmental and public health agencies collaborate in deploying the tools of public health . . . to identify and evaluate the most cost-effective ways to reduce risks and improve public health in all segments of the population. The public health community should accept the challenge to play an influential role in setting national, state and local priorities and in developing strategies to understand, manage and prevent environmental risk."

Believe it or not, there are even lawyers, or at least judges, out there who also would appear ready to welcome these directions. Today is not for arguing the merits of MWRA's very interesting dispute with EPA over the treatment technology for our new $200 million Walnut Hill Treatment Hill. As they say, it's in litigation.

But I believe the most important outcome in this case, whichever side prevails, is that Judge Stearns' procedural ruling last May rejected narrow legalisms as the basis for deciding the case. Judge Stearns said that he will try to determine which strategy argued to the court through the testimony of the experts, will "better serve Congress' objective of providing 'maximum feasible protection of the public health.'" That is the standard on which MWRA sought to reach its own decision. If the court really can use that standard to decide the case, MWRA will surely accept the decision of the court, whatever it shall be.

Now I want come full circle back to the child in the television commercial and talk for just a minute about the Consumer Confidence Report that many of us are right now in the course of sending to our customers.

The Consumer Confidence Report can be a springboard to shape our dialogue with the public health community in a new way.

Now we can directly respond to our television child's consumer un-confidence:

Oh, yes. We do know what's in our tap water.

Most people don't know? We're going to fix that right now!

And we're going to show you that the news is good: clean water from protected reservoirs, properly treated and free of harmful-level contaminants.

Do we believe that message? Let's test our conviction in two-way conversations with the public health professionals to whom we reach out in our communities.

Can we take that message to the right places? Not without delivering it to people when and where they are looking for information about health–like when they are seeing their doctors and other health care providers. And only when heard from health professionals can people effectively use the appropriate cautionary advice for special water customers whose needs may be different from the general public.

Can we sell a strong and good message about public water supplies? Not half as effectively as the message can be delivered if it can carry the credibility and the imprimatur of a public health expert.

Does the public health community care? Yes, and here's the most important reason why. Do the math. One hundred thousand water filters sold by the little girl in the commercial aggregates to a consumer expenditure of $25,000,000 per year in the supposed quest for better health.

That happens to be larger than the entire preventive health budget of the State of California.

You will not find a public health expert in the United States, I feel sure, who will say that the best health benefit you can buy for 100,000 people is to spend $25,000,000 on that child's advice to put that filter on the tap at the kitchen sink. You could get a hundred times the

return for those dollars by investing, for example, in better food safety protection and food handling education. Or in a dozen other ways that are very high on the public health community's lists of urgent concern.

Will the public health community help us? Yes. If they believe that we're on their program, too. This is a two way street and we must listen and respond to their questions and concerns about water. And their insistence that our systems are well and carefully run.

So at MWRA I hope that all our efforts to date will prove to be just a beginning for the activities we are going to try to do next. It is time to stretch for a new level. Here is where we have to go:

People we're going to speak to: in the public health community, people we already know like state Department of Public Health officials and local health officials with whom we've already been involved in activities.

And very important people we still have to meet: like primary care physicians and other providers, medical educators, and everyone who writes a newsletter for HMO customers or the health column in the newspaper.

And places we haven't gone: like nursing schools and the health science campuses of our state higher education system. And the professional associations and continuing education meetings where health professionals come together to learn from each other.

With new tools: like reports in plain English and multilingual brochures the health professionals themselves can read, and use. And audiotapes they can listen to while they commute.

With support for public health research on water: like new studies of disease incidence among users of our own water system to help us all understand basic facts of risk and exposure.

With a welcome to the public health community: to review and participate in our own engineering and environmental investigation of the water system we manage, as we intend to do in greater Boston to pursue our interests and concerns about controlling bacterial regrowth in pipeline environments.

And finally, with sober and renewed attention to crisis planning: so that however small the risk of a water health emergency, we and the public health professionals can provide fast, accurate, understandable public communications and water system management strategies geared to health protection needs.

* * * * *

You can see I believe Jon Beekman has pointed us in an excellent direction for our coming year at NEWWA. In fact, Jon has simply declared the goals for a journey we've already started to take.

And as is so often the case, to best get to the future, we must recapture something very valuable from our past -- a unity of vision, voice and purpose with our public health colleagues.

Why?

To get better-informed customers.

To gain public support for that which we should be doing.

To benefit from new collegial insights on our goals and challenges.

Very simply, to get better water.

Or, if you don't like any of those reasons, because it's the best advice I found in the last three weeks on how to help you get rid of some of us lawyers!

With that, may I wish us all a most successful annual conference.

[1] The story of the Broad Street pump can be found in many histories. A telling which is of particular interest to modern water professionals delighted at the new tools of analysis provided by their GIS systems is found in Edward Tufte, *Visual Explanations* (Cheshire, Conn. 1997) 27-37.

[2] John Duffy, *The Sanitarians, A History of American Public Health* (Urbana, 1992)

[3] Barbara Rosenkrantz, *Public Health and the State; Changing Views in Massachusetts, 1842 — 1936* (Cambridge, Mass. 1972), 17-36. Shattuck's Report is abstracted at length in George Whipple, *State Sanitation: A Review of the Work of the Massachusetts State Board of Health* (Cambridge, Mass. 1917), v. 1. 241-349. *State Sanitation* also contains invaluable summaries of the principal investigations and reports produced by early Massachusetts investigators and the State Board of Health in the years 1870 to 1914. Whipple, *supra*. v. 2. After Shattuck's report was accepted by the legislature, it was distributed to the clerk of every Massachusetts city and town, boards of health throughout the United States, federal agencies, the editors of 100 newspapers, and to physicians and public health officials in Europe. Rosencrantz, *supra*, 33. But despite favorable notice, its full impact was not felt until many years after its publication. *Id*., Whipple, *supra*, 30, 33.

[4] Lemuel Shattuck, *Report of the Massachusetts Sanitary Commission;* abstracted in Whipple, *supra*, v. 1, p. 307-308.

[5] Fern Nesson, *Great Waters, A History of Boston's Water Supply* (Hanover, 1983), 4-10; Michael Quinlin, "Water for Boston", October 23, 1998, *Boston Globe.*

[6] John Blake, "Lemuel Shattuck and the Boston Water Supply, *Bulletin of the History of Medicine* 29: 554, 582 (Nov. - Dec. 1995).

[7] Whipple, *supra*, v. 1, 308 see also Rosencrantz, *supra*, 70.

[8] Whipple, *supra,* v. 1, 64-88, v 2, *passim*; Rosencrantz, *supra*, 70.

[9] Rosenkrantz, *supra,* 102-3.

[10]Nesson, *supra,* 15-35, contains an excellent summary of Stearns' work on water supply and documents his high standing in the eyes of his contemporaries. His broader contributions can be gauged by the references in Whipple, *supra,* to his many achievements during his tenure as Chief Engineer to the State Board of Health. Later, his annual reports for the years 1895 to 1907 printed in the Annual Reports of the Metropolitan Water Board (1896 to 1901) and then of the Metropolitan Water and Sewerage Board (until his resignation in 1907) are a rich source for the history of the greater Boston water system and a literary record of the mind of an outstanding engineer. Stearns' participation in 1905 in the panel of international engineering luminaries assembled to guide President Roosevelt's judgments on the plan for the Panama Canal is noted briefly in David McCullough, *The Path between the Seas* (New York, 1977). (It was on this project that Stearns must have met this author's other favorite engineer, John Stevens, whose achievements included not only the construction of the Panama Canal, but the lay out and construction of much of the Great Northern Railway. Watch this space.) To the best of the author's knowledge, there is no general biography of Stearns, an unfortunate gap.

If Stearns' career epitomized the linkage in an engineering sense between the State Board of Health and the metropolitan waterworks system, the even more remarkable contribution was afforded on the medical side by the estimable Dr. Henry P. Walcott. Walcott served as Chairman of the State Board of Health from 1886 to 1914. He was also president of the American Public Health Association, president of the Massachusetts Medical Society, and founder and president of the Massachusetts Association of Boards of Health. Rosencrantz *supra* 91, 108n. He also was a member of the Metropolitan Water Board and served as member or chairman of that body and subsequently of the Massachusetts Water and Sewerage Board until the formation of the Metropolitan District Commission in 1920. For good measure, he was also an Overseer of Harvard College and member of the Harvard Corporation from 1890 to 1927, and he was the Chairman of the Board of Trustees of Massachusetts General Hospital, a member of the State Civil Service Commission, an incorporator and long-time board member of Cambridge City Hospital and a member of the Cambridge School Committee! So far as the record shows, he never used a fax, a pager, or a cell-phone and he was never on the internet. These highlights of Walcott's career are drawn from Rosenkrantz, *supra*; interestingly, however, Rosenkrantz fails to note Walcott's long-term involvement with MDC and MWRA's predecessor organizations, the Metropolitan Water Board and the Water and Sewerage Board. *Cf*. Whipple, *supra*, v. 1, 202-206.

[11] Whipple, *supra,*147

[12] Rosenkrantz, *supra,* 169-170; Jean A. Curran, "The First School of Public Health," *Harvard Public Health Alumni Bulletin,* (January 1966), 23: 2-5, 20.

[13] Bernard Goldstein, "The Need to Restore the Public Health Base for Environmental Control," *American Journal of Public Health*, v. 85, no. 4, 481-483 (April, 1995).

[14] Rosenkrantz, *supra,* 128-176

[15] Edward O. Wilson, *Consilience, The Unity of Knowledge* (New York, 1998), 39.

16 The brochure (designed to stick to a refrigerator and constantly remind new mothers about lead reduction) was a joint effort with design by MWRA with assistance from staff at the WIC program, printing by an EPA grant, and a significant portion of the distribution by the WIC program. In addition to the brochure, WIC revised their schedule of post-partum counseling sessions to include a session on lead issues.

[17] The workshop was held on January 25, 1995, cosponsored by MWRA and the Massachusetts Department of Public Health. It brought together physicians, AIDS activists, state and local public health officials, and water suppliers, for day of expert presentations on cryptosporidium, its health effects, prevalence and treatment.

[18] The Washington Post published a dozen articles in July 1995, chronicling water and elected officials contradicting each other's statements; offering differing advice for consumers; and finally issuing and then retracting a boil water order.

[19] About a dozen prominent health researchers, water supply engineers, and representatives from health and environmental organizations were asked in late June 1997 to review and consider the state of knowledge about the MWRA system and the key questions facing it as a treatment decision was being evaluated. Meeting in Boston in June, the panel was not unanimous in its view of what treatment might ultimately be needed by the MWRA system, but there was agreement on the importance of the interim treatment steps already taken on lead and then underway for pathogens. MWRA undertook the focussed research efforts recommended by the panel and used their outcomes when the treatment technology decision was ultimately made in October 1998.

[20] The meeting on June 21, 1998 was actually the fourth of a series of expert workshops on how to optimize corrosion control for the MWRA system, in light of the complexities of communities which mix MWRA water with local, the interactions with sewage treatment and the ecology of Massachusetts Bay, and the inherent interactions of each element of water treatment with other elements and with the distribution system.

[21] On March 10, 1998, MWRA brought together a group of epidemiologists, toxicologists and risk analysts to discuss the state of knowledge about the potential health risks of disinfection by-products and how this issue might influence MWRA's treatment planning. As on earlier occasions, representatives of the MWRA staff, member communities, local and state public health organizations all participated in the workshop.

[22] On April 3, 1998, public health researchers at Tufts University School of Medicine sponsored a full day conference for academics and practitioners on *Drinking Water and Public Health*. MWRA participated in the presentations on specific aspects of the general issues.

[23] Goldstein, *supra.*

[24] The Presidential/Congressional Commission on Risk Assessment and Risk Management, "Symposium on a Public Health Approach to Risk Management," (August 1997), 1.

[25] The Presidential/Congressional Commission on Risk Assessment and Risk Management, "Risk Assessment and Risk Management in Regulatory Decision-Making, Volume I (1997), 22.

[26] United States v. Massachusetts Water Resources Authority, C.A. No. 98-10267 RGS (D. Mass), *Memorandum and Order on United States Motion for Summary Judgment*, 12 (Stearns, D.J.) May 3, 1999.

Back to: **Public Health and MWRA**