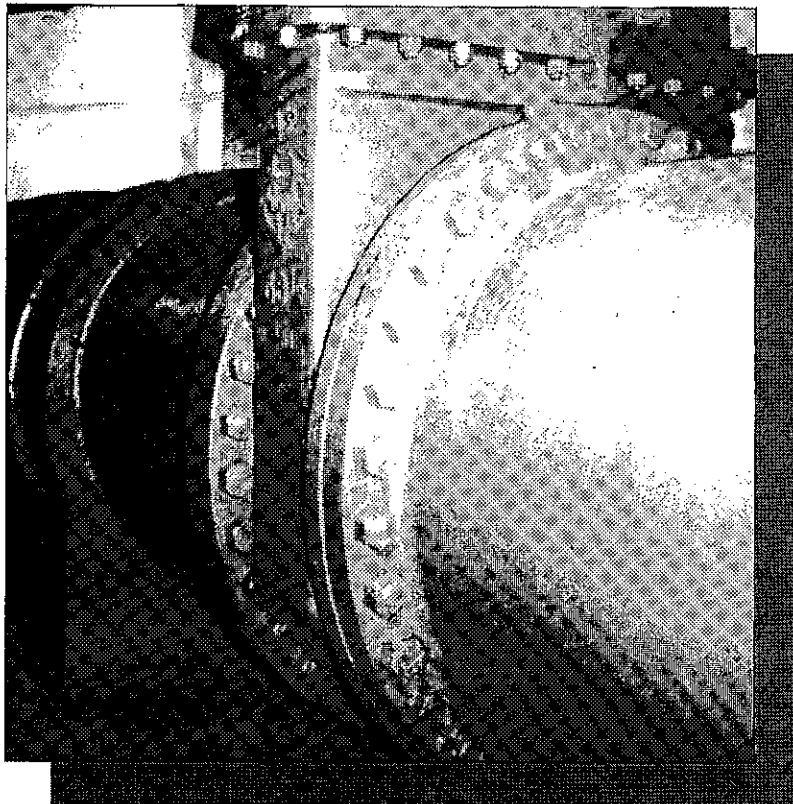




In The Main.

The Technical Assistance Newsletter for Public Drinking Water Professionals

DEP Division of Water Supply
In The Main
One Winter Street
Boston, MA 02108



Division of Water
Supply

Department of
Environmental
Protection

Executive Office of
Environmental Affairs

Commonwealth of
Massachusetts

Volume 2, Number 3
Summer 1989

Surface Water and Long Term Water Quality Assurance Strategy

Yvette dePeiza

Public Water Suppliers using surface water as their source will need to examine their systems carefully to determine whether or not they need to filter their systems in response to the mandatory filtration requirement of the Safe Drinking Water Act (SDWA) of 1986.

To assist suppliers in determining their strategy for dealing with the filtration requirement, the Massachusetts Department of Environmental Protection (DEP) Division of Water Supply (DWS) has developed the following guidance.

It is the opinion of the DEP/DWS that in order to adequately protect the quality of all public drinking water sources, pollution prevention must be the cornerstone of any water supply protection strategy. Multiple barriers need to be erected between the sources of pollution and the consumers on the distribution system. These barriers can be considered as insurance against water quality problems and are essential to safeguarding the quality of the water supply. The barriers that provide effective insurance against surface water quality problems are:

1. Watershed land use protection via ownership, deed restriction, and/or control;
 - a. Identification and control of existing land use and point and non point source pollution.
 - b. Zoning of undeveloped watershed land to prohibit land uses likely to degrade water quality.
 - c. Surveillance of the watershed via patrolling and monitoring.
 - d. Adoption of a watershed emergency contingency plan.
2. Disinfection;
3. Adequately maintained and protected distribution system, via an adequately staffed and DEP/DWS delegated cross connection control program and leak detection and rehabilitation program;
4. Sufficient and adequately trained staff to operate the entire system effectively;

Continued on page 4

A Letter from Commissioner Greenbaum

Greetings from the Department of Environmental Protection! When Governor Dukakis signed the fiscal year 1990 budget, he gave the Department of Environmental Quality Engineering a new identity.

Put simply, the new name better reflects what we are all about. Our mission is to protect and enhance the Commonwealth's natural resources. "Engineering" is still vital to what we do, but today we engage in a very broad range of activities: identifying critical resources, implementing programs to protect them through waste prevention, cleaning up hazardous waste sites and providing assistance—both financial and technical—to cities and towns.

Keeping the public and those we regulate informed about the need for programs that will lead to cleaner air, land and water is another critical part of our mission. The name change will help clarify DEP's role.

Protecting drinking water supplies has always been a priority at DEP. As water suppliers and health professionals, your comments are vital to the process. Through letters to the editor of this publication you can address the issues that affect you. So feel free to drop us a note, we would like to hear from you.

Sincerely,

Daniel S. Greenbaum, Commissioner

EPA Proposes New Standard for PCE

Debra Northrop

The U.S. Environmental Protection Agency (EPA) has proposed a maximum contaminant level (MCL) of 5 µg/liter for tetrachloroethylene also called perchlorethylene (PCE) to be monitored at the entrance to the local public water distribution system. The current MCL for PCE is 40 µg/liter.

In Massachusetts, there is a unique situation where PCE is introduced into the distribution system of the water supply through vinyl-lined asbestos cement pipes within the distribution system.

PCE becomes a problem primarily on dead-end vinyl-lined asbestos cement pipes because of the length of time water resides

in the pipe. The Massachusetts Department of Environmental Protection (DEP) Division of Water Supply (DWS) has a policy to adopt EPA standards as Massachusetts guidelines. Therefore, the proposed EPA standard for PCE is now a Massachusetts water quality guideline that all public water systems should be prepared to meet. DWS would like to help each public water supplier prepare for these regulations and has produced the following strategy to assist you in compliance:

- ◆ If your system has vinyl-lined asbestos cement pipes and has not initiated a monitoring program, DWS requires that the system should immediately begin to monitor all

Continued on page 4

"Supermap" is Coming!

Donovan Bowley, Ph.D., DEP GIS Coordinator

As hoped for ten years ago when we began the production of the *Water Supply Protection Atlas*, advances in computer programs and equipment have made it possible for the next edition of the ATLAS maps to be produced in an electronic edition.

What this will mean to the map user is that for the greater part, bulky map files can be eliminated; that the desired maps may be called up on a computer; that the scale can be varied infinitely, and the computer screen can "zoom in" on specific areas as desired by the user; that layers of information containing different types of information can be combined as available and desired by the user; and that printed "special purpose" maps can be produced. For example, if a person wanted to have a map showing water supply sources, wellhead protection areas ("Zone II's"), publicly and privately owned conservation, reservation, and parkland, it could be composed on the computer and printed as a special edition map—provided that the information had been put into the database, and accurate to within the tolerances of the original mapping. The Department of Environmental Protection (DEP) is currently constructing its portion of that database, as are each of the agencies in the Executive Office of Environmental Affairs (EOEA). One of the most significant aspects of increased efficiency in the use of staff through computerization in the EOEA agencies is the construction of an environmental database, accessible to all member agencies and the general public. This mapping project is part of that effort.

What will make the new ATLAS a "super-map" is a fascinating trait of what are called "geographic information systems"—"GIS" for short. To each map location can be attached information files—"attribute files" concerning specific mapped features at that location. For example, at a well location, a person at the computer could review the wellhead protection area, observe permitted discharges within that area, then call up a text file of each of the permits in turn. Immediately, many uses will suggest themselves to each reader!

Constructing the system and putting the information there in the first place is the hard part. Rick Taupier (Assistant Secretary at EOEA), Mike Turner and Dave Weaver (MASS GIS), Jackie Doherty (DEP) and others have worked diligently with our state agencies, U.S.

EPA, and the U.S. Geological Survey to bring this about. We are working basin-by-basin, to ensure a reasonably complete set of information on an environmentally logical basis.

The Divisions of Water Supply and Water Pollution Control have been working cooperatively on an EPA-funded project (see accompanying article on this page). Carl Verro (DWPC), and Dorothea Williams and Anita Beinikis (DWS), have been instrumental in doing this prototype work.

Updates on the work in progress will appear in this newsletter from time-to-time. □

Water Suppliers Input Needed for GIS

Anita Beinikis

The Merrimack River basin in northern Massachusetts is the source of a concentrated data collection effort. Cooperation between the Divisions of the DEP and the public water suppliers is crucial to the development of DWS' Geographic Information System (GIS).

To create a complete environmental database for the Merrimack River basin, the following layers of information are being collected: National Pollutant Discharge Elimination System (NPDES) discharge points, 21C RCRA regulated facilities, 21E hazardous waste sites, landfill locations, emitters of volatile organic compounds (VOCs), and water supply locations. The water suppliers of the Merrimack area have already met with a DEP intern who is helping the Division pinpoint well locations and update the inventory of these supplies.

Information is first gathered at DEP from old supplier-provided maps, engineering reports and our own Water Supply Atlas overlays. The data is put on photocopied maps and then brought out to the water suppliers. Here the suppliers' intimate knowledge about the supplies is reflected in the quick and simple verification process. Without the water supplier input, the field work involved would be immense and incredibly time consuming.

Once complete, this project will serve, not only as a prototype for the rest of the state, but as a model of the cooperation generated between the water suppliers and the Division of Water Supply. Up-to-date information will be maintained on the GIS to allow for accurate, graphic representation of the spatial relationship between waste sites and water supplies.

With the project nearing its final stages, efforts are being made to collect additional data by basin and also statewide. The Assabet, Concord and Sudbury basins will be next on the list of updating the water supply database, with a long-term focus on the Blackstone River basin and Cape Cod areas. The basin by basin approach will allow for small, complete pieces to slowly build a statewide water supply layer, or coverage, that will be housed in the GIS. □

DEP Moves to Protect Plymouth-Carver Aquifer

Tony Abruzese

The Department of Environmental Protection (DEP) has taken a major step toward protecting groundwater supplies in Plymouth County and on upper Cape Cod.

In cooperation with the Plymouth County Coalition for a Better Environment and the Town of Kingston, the agency has petitioned the U.S. Environmental Protection Agency (EPA) to designate the Plymouth-Carver aquifer a sole source aquifer. This is the first time DEP has applied for such a designation.

"People whose drinking water comes from the Plymouth-Carver aquifer are entirely dependent on that source," said Commissioner Daniel S. Greenbaum. "It is particularly important right now, given the water shortages experienced elsewhere in Massachusetts, that we provide residents of the area with a greater measure of protection."

To qualify for EPA sole source status, an aquifer must supply at least half of the drinking water to a region where there would be no alternative source in the event of contamination. Second largest in Massachusetts, the Plymouth-Carver aquifer serves the two towns for which it is named, as well as parts of Bourne, Kingston, Middleborough, Plympton, Sandwich and Wareham.

"Applying for sole source aquifer status is just one of the tools DEP can use to protect a drinking water supply from pollution," said Arleen O'Donnell, newly-appointed Assistant Commissioner for Resource Protection. "This action is indicative of the agency's focus on protecting water resources."

Under the designation, any Federally-assisted project with the potential to contaminate the aquifer would be subject to EPA approval. Commissioner Greenbaum said sole source status also would encourage more intertown cooperation, thereby increasing local control over water supply protection efforts.

"The greatest benefit of sole source aquifer status will be heightened public awareness about the need for protecting groundwater," said David Terry, Acting Director of DEP's Division of Water Supply. "The research on which we based our petition should help towns in the area work together to carefully plan their growth."

Local legislators agree on the importance of gaining the EPA designation. Two of them—Representatives Peter Forman (R-Plymouth) and Robert Kraus (R-Kingston)—have been especially supportive of DEP's efforts to protect the aquifer, which supplies water to their districts.

EPA will conduct a thorough review and technical verification of DEP's petition before making a final decision on the status of the Plymouth-Carver aquifer. That process could take between three and six months to complete.

"We are confident EPA will rule in favor of our petition," said Groundwater Programs Manager Roy Crystal, who prepared the petition DEP submitted to the federal agency. "Plymouth-Carver clearly meets all federal requirements for a sole source aquifer designation." □

In The Main

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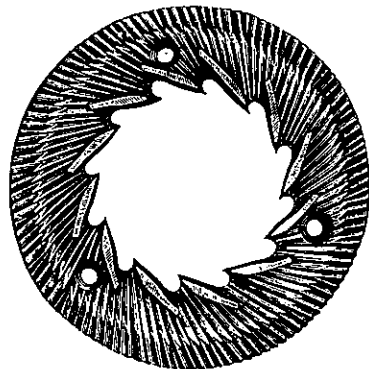
The Commonwealth of Massachusetts
Michael S. Dukakis, Governor

Executive Office of Environmental Affairs
John P. DeVillars, Secretary

Department of Environmental Protection
Daniel Greenbaum, Commissioner

Division of Water Supply
David Y. Terry, Acting Director
Tony Abruzese, Editor

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Water Management Update

Water Emergencies

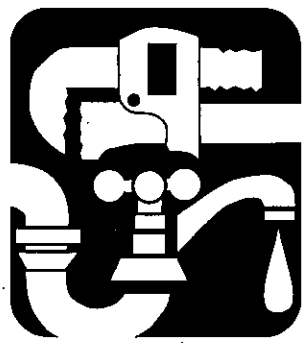
Andrew Gottlieb

As the summer moved toward its midpoint, the outlook for most public water suppliers was good. Precipitation was generally heavy in May and remained substantial through June and early July, leaving most suppliers with adequate reserves for the balance of the summer. The absence of a protracted hot and dry spell has also reduced the strain on public water systems experienced in the summer of 1988. As a result of this increase in precipitation and leveling of demand, fewer water supply emergencies have been declared than we had expected back in the late winter and early spring (see below).

Of particular note has been the MWRA situation. Responding to low reservoir elevations not seen in almost two decades and a demand which exceeded safe yield, the Department issued a declaration of water emergency in the communities comprising the MWRA system on February 16, 1989. Use restrictions and program requirements were issued on May 8, 1989 which included an 8:00 a.m. to 8:00 p.m. outdoor water use restriction. This order was modified on June 8, 1989 to prohibit outdoor use between 10:00 a.m. and 6:00 p.m. in the MWRA service area and to prohibit hosing off of sidewalks, driveways and streets at all times. Other provisions of the May 8 order emphasized the long term goal of reducing system demand to a 300 mgd maximum.

As a result of many factors the demand on the MWRA system has dropped dramatically over the past few months, accelerating a trend which had begun over 18 months ago with the MWRA's own demand management program. Leak repair efforts have recovered at least 15 mgd and consumer response to public education, device retrofit and outdoor use restrictions have contributed many millions in use reductions. Demand for the year through July was 288 mgd with the 12 month average running at 303 mgd. Continued public cooperation should result in a system demand below 300 mgd by the end of the year.

Despite these reductions, twelve month projections show Quabbin close to Drought Warning status within the next year if precipitation is below normal. The Department chose to discontinue the outdoor water use restrictions when the initial six month declaration expired August 16, 1989. However, the emergency declaration for the MWRA service communities will continue for an additional six months. In February the Department will once again decide



if emergency conditions still warrant and if outdoor water use restrictions will be necessary for next summer.

The following municipalities or water districts are under a formal state of water emergency as of August 16, 1989:

Arlington*	Northborough*
Ashland ♦	North Raynham ♦
Bedford ♦	Norwood*
Belmont*	Peabody*
Bondsville	Pembroke
Boston*	Plainville ♦
Braintree ♦	Provincetown
Brockton ♦	Quincy*
Brookfield	Randolph ♦
Brookline*	Revere*
Cambridge*	Rockport ♦
Canton*	Saugus*
Chelsea*	Shrewsbury
Chicopee*	Somerville*
Clinton*	Southborough*
Dudley ♦	South Hadley FD2*
Edgartown	Stoneham*
Everett*	Stoughton ♦
Framingham*	Swampscott*
Franklin	Thorndike
Hanson ♦	Wakefield*
Holbrook ♦	Waltham*
Leominster*	Watertown*
Lexington*	Wellesley*
Lynn*	Westfield
Lynnfield*	Weston*
Malden*	Whitman ♦
Marblehead*	Wilbraham*
Marlborough*	Winchester*
Marshfield	Winthrop*
Medford*	Woburn*
Melrose*	
Milford	* MWRA
Milton*	Communities
Nahant*	♦ Water Hookup
Needham*	Moratorium and/or
Newton*	Water Bank □

Water Management Permits

Beth McCann

Ipswich And North Coastal Basins

The Division of Water Supply conducted the second of two workshops for permit applicants in the Ipswich and North Coastal River Basins on July 27th in Beverly.

The workshops were intended to assist applicants in assembling the information needed to complete a Water Management permit application. Permit applications in these two basins were due on August 31, 1989. Applicants will now have six months in which to complete any additional application requirements and to respond to any public comment received concerning their proposals.

Boston Harbor And Taunton River Basins

Permit application forms for the initial round of Water Management Act permitting in the Boston Harbor and Taunton River Basins will be available from the Department of Environmental Protection during the last week in September, 1989. The permit application filing date for these two basins is February 28, 1990.

Water withdrawers will need to apply for a permit if they withdraw more than 100,000 gallons per day from ground or surface waters and do not have a Water Management Act registration. Water Management Act registrants who are now withdrawing more than 100,000 gallons per day over their registered volume will also need a permit.

For more information or to receive an application form, contact the Water Management Program staff at (617) 556-1077. □

Thanks!

Andrew Gottlieb

A large amount of credit for reducing demand during the MWRA area water emergency has to go to local water superintendents.

The MWRA's demand management programs and the additional requirements found in the Department's declaration all placed increased responsibilities on the superintendents to reduce demand and improve system efficiency. Throughout the service areas, the Department found the communities willing and able to respond to the challenge of the situation.

Several communities went well beyond the level of effort which was expected and showed an exceptional commitment to water conservation efforts and public education. The Department cannot thank all of the communities separately but would like to note the commitment and efforts of Dana Snow of Marblehead, Bill Hadley of Lexington, Andrew Pappastergion of Brookline, Joseph Attubato of Saugus, John Sullivan and Amy Keith of the Boston Water and Sewer Commission, and Joseph Swiatlowski of Chicopee.

The efforts of these people and many others greatly improved the results of the conservation programs. □

Community Public Water Suppliers - Fall Training 1989

Yvette dePeiza

Dates	Regions	Location	Session I	Session II
10/11/89	Northeast	Middlesex Community College, Burlington	9:00-12:00	1:00-3:00
10/13/89	Central	Stoddard USAR Center, Worcester	9:00-12:00	1:00-3:00
10/16/89	Western	Western Reg. Office, Springfield	10:00-1:00	1:45-3:45
10/18/89	Southeast	Southeast Reg. Office, Lakeville	9:00-12:00	1:00-3:00

Agenda

Session I: Surface Water Treatment Rule

Session II: Coliform Treatment Rule

The Department of Environmental Protection, Division of Water Supply, strongly urges you to attend the above training. Public water suppliers should call their regional office during the week of October 2 through 6 to reserve their space in this course.

■ **PCE Standards, continued from page 1**

dead-end and low flow regions of vinyl-lined water mains. Monitoring frequency will be determined by your Regional DWS. Copies of all monitoring results must be forwarded to the DWS Regional Office, to the attention of the PCE program.

◆ Public water suppliers are requested to perform their own technical review and to identify to their Regional DWS office in writing no later than August 18, 1989 the strategy they have chosen to reduce their PCE levels to the proposed standard.

◆ DWS further requires that all Public Water Suppliers who have dead-end and low flow areas served by vinyl lined asbestos cement pipes in their distribution system immediately, no later than August 25, 1989, notify their affected consumers of the new proposed standards and the plans of the water supplier to rectify or mitigate the problem. Water suppliers are encouraged to use the sample letter for notifying their customers available from the DWS Boston Office. A signed copy of the letter or other form of approved notification should be sent to the DWS Regional Office.

The following strategies and information are provided to assist you in making your decision on how to reduce PCE levels. Some of the strategies available for consideration, in order of priority, include:

1. **Pipe replacement.** This process replaces the vinyl-lined pipe with alternate piping. (This is the most absolute method to remove all traces of PCE. Both pipe replacement and pipe relining provide a permanent, one-time cost option with little or no follow-up testing and eliminate the cost of water lost by bleeding.)

2. **Pipe relining.** This process strips out the vinyl lining, which is the cause of PCE leaching, and relines the asbestos cement pipe with a cement lining. The cement lining can also be applied directly over the vinyl lining.

3. **Pipe looping.** This process installs pipe from the end of a dead-end water main and then "loops" back to reconnect with the water main. This facilitates water flow and slows down PCE buildup due to water standing in the pipe for extended periods of time.

4. **Bleeding with mandatory intensive monitoring.** Raising the gallons per minute bled from dead end vinyl-lined water mains lowers the PCE level. Monitoring must be done on these water mains on a regular basis unless otherwise approved by the DWS Regional Section Chief. (Should your town experience water supply problems because of abnormally dry summer conditions, DEP will not allow bleeders on PCE contaminated lines to be shut off. Shutting off bleeders would raise the levels of PCE, endanger the health of your customers, and put the water supply out of compliance with DEP standards. Also, DEP has found bleeding to be extremely difficult to enforce and therefore does not consider this to be a long-term solution.) Please note Under the Water Management Act provision communities who choose bleeding as an option and experience a water shortage will be required to immediately implement another PCE reduction alternate.

5. **Flushing.** Flushing vinyl-lined water mains by releasing water out of fire hydrants on a five to seven day schedule also lowers PCE levels. Flushing on a frequent basis can cause scoring of pipes. Also, because some water suppliers do not flush on a regular basis, or only the day before samples are collected, proper PCE level control cannot be guaranteed. For this reason, flushing is not an acceptable method of long-term treatment, and may be prohibited in the future as a short term option.

Other considerations which are important to your choice of control method include:

1. **Permitting.** Though there is currently no permit requirements for the outflow of PCE contaminated water from water mains or hydrants, there is the possibility that permitting could be required in the future.

2. **PCE life expectancy.** Research has shown that the life expectancy of PCE in public water supply pipes is much longer than five years. PCE remains in pipes for 15 - 20 years at a minimum and may remain for the life of the pipe.

3. **Testing.** All water suppliers will be required to sample, transport, and pay for testing of future samples. These samples must be tested at a laboratory certified for VOC testing by Massachusetts DEP or as otherwise approved in writing by the Department.

4. **Drought.** Should your system continue to utilize bleeding as a method of PCE control, Public Water Suppliers should include this water use in their Drought Contingency Plans. However, because this usage of water in drought conditions is highly unfavorable, please consult with your Regional DWS on alternative control methods in drought conditions.

Cost Estimates

Costs for Method 502 analytical testing for PCE as of June 9, 1989 generally range between \$165-\$250 for single samples with discount rates for a greater volume.

An estimate of pipe replacement and relining costs as of June 1, 1989 is:

Construction	(material & labor)	Lining (alone)
4" DIP (cement)	\$ 55/ft	\$ 50/ft
6" DIP (cement)	65/ft	50/ft
8" DIP (cement)	80/ft	50/ft
10" DIP (cement)	95/ft	60/ft

All costs are "inclusive" of paving, dewatering, and engineering. Costs vary according to the time of year, number of bidders for the job, number of bends in the pipe, and location in the state.

Thank you for your cooperation with this problem. I hope that this information helps you with your decision on which control measure is appropriate for your water district. Please be sure to follow the time schedule and if you have any questions, please call your regional DEP office. □

■ **Water Quality, continued from page 1**

5. **Treatment** (see "Criteria For Determining If Filtration Is Required", available from Boston DWS); and

6. **An effective public education program** dealing with water conservation and contamination prevention.

In the ideal situation, these barriers together provide the best water quality possible, however, it is not necessary in every situation to have all the barriers in place.

In determining whether a public water supply system using a surface water source needs to filter or not, the DEP/DWS will take into account the rate, number, and quality of barriers that are in place or planned with a legally enforceable compliance schedule for the protection of the water quality. The DEP/DWS has also determined that because (1) water system improvements need to be planned and coordinated adequately, (2) systems need more time to plan, and (3) filtration is not the only requirement facing these systems (some of the other requirements are (a) mandatory disinfection for surface supplies and (b) monitoring and treatment if necessary to meet maximum contaminant levels for many contaminants and corrosivity no action levels), systems should consider: all of the planned SDWA changes; comprehensively review their options, including

Procedure for Preservation of Samples For VOC Analysis

Revised December 1, 1988

According to EPA guidelines, all water supply samples to be analyzed for volatile organics should be preserved with hydrochloric acid (HCL) as follows:

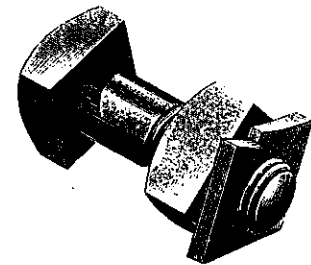
—Collect all samples in duplicate. Fill sample bottles to overflowing. No air bubbles should pass through the sample as the bottle is filled, or be trapped in the sample when the bottle is sealed.

—When sampling from a water tap, open the tap and allow the system to flush until the water temperature has stabilized (usually about ten minutes). Adjust the flow to about 500ml/min. and collect duplicate samples from the flowing stream.

—When sampling from an open body of water, fill a one-quart wide-mouth bottle or one-liter beaker with a sample from a representative area, and carefully fill duplicate sample bottles from the one-quart or one-liter container.

—Adjust the pH of the duplicate samples to <2 by carefully adding one drop of 1:1HCL for each 20ml of sample volume (a total of two drops for the regular 40ml VOA vials). Seal the sample bottles, teflon-face down, and shake vigorously for one minute.

—The samples must be chilled to four degrees Celsius on the day of collection and maintained at that temperature until analysis. Field samples that will not be received at the laboratory on the day of collection must be packaged for shipment with sufficient ice to insure that they will be at least four degrees celsius on arrival at the laboratory. □



piloting as necessary; and prepare a long range plan to upgrade their entire system. The plan should not exceed ten years and should:

1. Delineate all areas to be upgraded;
2. Identify all of the steps necessary to bring the system into compliance;
3. Estimate the time necessary to implement each step;
4. Prepare a work schedule with timelines that meet all of the SDWA mandatory deadlines. The DEP/DWS would review the plan with particular emphasis on two areas:
 - a. Does the system have enough barriers in place to ensure a quality supply without additional treatment; and
 - b. Is the long-range plan an effective tool to bring the system into compliance.

This plan, if acceptable to both parties, would become a consent order and legally enforceable. This signed consent order would give the DEP/DWS the needed proof that the system would be 1) implementing all necessary barriers; 2) providing a quality drinking water product; and 3) meeting all aspects of the SDWA. Suppliers who do not opt to prepare long-range plans for approval would be required to meet each new requirement separately as it becomes effective, thereby increasing the cost of implementation by at least 50%. □

Cryptosporidium —The Industry's New Superbug

Gary P. Silverman
Brown and Caldwell Consulting Engineers
Walnut Creek, Calif.

Cryptosporidium has been termed the "new superbug" of the water industry. It is very similar to *Giardia lamblia*, which first came into prominence on the water supply scene about 15 years ago.

In addition to being relative newcomers on the list of water quality concerns, there are many other similarities between *Giardia* and *Cryptosporidium*. In fact, they are probably more alike than different, from a water treatment perspective.

This article will give an overview of the current knowledge about *Cryptosporidium*, based on a representative, but not exhaustive, literature review. The organism's life cycle hosts, epidemiology (study of disease in a population), and treatment options, as well as two case studies, will be briefly discussed. Comparisons with *Giardia* will also be made where appropriate.

Cryptosporidium

Cryptosporidium, like *Giardia*, is a protozoan. The organism was first described in 1895. When found in a new host (animal, bird, fish, or reptile) a new species name was given to the organism. For example, *Cryptosporidium parvum* is the species name for the organism found in the domestic mouse. Currently, there is a disputed number of distinct species of *Cryptosporidium*, because cross-transmission studies have revealed that an organism from one animal host can infect other animals, including humans.

The *Cryptosporidium* oocyst (the dormant form of the protozoan found in the environment, pronounced oh-e-sist) measures 3-5 μm , which is about half the size of the *Giardia* cyst. The oocyst is round to egg shaped, colorless, and nearly transparent. The oocyst occurs naturally in the environment, where it can survive for up to one year due to its protective cyst wall.

Hosts and Disease

Virtually any animal found in a watershed can be considered a potential carrier of *Cryptosporidium*, although cattle seem to be a significant host. *Cryptosporidium* oocysts are commonly found in pasture runoff and in wastewater treatment plants.

In rural environments, the primary mode of transmission of human cryptosporidiosis (the disease caused by *Cryptosporidium*) is direct animal-to-human fecal contact. In urban settings, fecal/oral exposure, which is common in day-care centers, sexual activity, and food-borne and waterborne contamination are more prevalent.

Cryptosporidiosis can be contracted by humans from ingestion of as few as one oocyst. On ingestion, the oocyst sheds its protective wall in the human gastrointestinal tract. In this new form, a complex developmental and reproductive cycle begins.

Cryptosporidiosis is characterized by symptoms similar to giardiasis, including diarrhea, stomach cramps, nausea, dehydration, and headaches. During the acute stage of the infection, which may last for a few days to several weeks, the host will excrete up to 10 million trophozoites (the reproductive form of the organism) per gallon of feces. These trophozoites return to the oocyst form as they enter the environment.

Human cryptosporidiosis has recently become an issue because of the threat of waterborne contamination. More importantly, people have become aware of cryptosporidiosis because in individuals with suppressed immune sys-

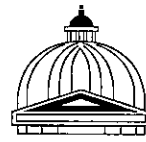
Steven J. McCurdy

While most of the recent media attention has focused on the battle over the state budget just signed, other important pieces are particularly significant for water purveyors. House Bill - 5550 (Representative Emmet Hayes, D - Whitman) was passed by the Legislature and Senate Bill - 1866 (Senator Henri Rauschenbach, R - Brewster) is awaiting action by the Governor.

Bill H - 5550, now chapter 275 of the Acts of 1989, is primarily a revolving trust fund to aid in the funding of water pollution abatement. However, the Act also contains language and \$20 million in funds to allow for the acquisition of watershed preservation rights throughout the Commonwealth.

Bill S - 1866, which at this writing appears to be close to passage, creates an innovative program to protect water resources. Participation in the program is not mandatory, but invites cities and towns to choose to participate, by vote of city council or town meeting.

In this program, two or more towns sharing a drinking water resource, including public wells, aquifers, or reservoirs, may create a Drinking Water Protection Fund, financed by water users within those towns. The cost is limited to a ten percent maximum either of the metered amount or of the average water bill in towns not having



Legislative Update

meters. Towns without public water systems may set a flat fee.

The fund shall be administered by a commission made up of two members from each participating community, who shall serve without compensation. The commissions will have certain authorities to issue bonds and incur debts.

The main thrust of the program is to empower the Commission to provide: technical assistance to the member communities in the areas of identification of recharge areas and potential new sources; long term land management; funding to acquire property or development rights in sensitive watershed or aquifer recharge areas; public education programs to encourage conservation and proper waste disposal practices. The Commission shall also inform the communities of the availability of State and Federal programs and funds for drinking water resource projects and provide comments on land uses impacting resources of concern to the Commission.

These two Acts will provide valuable tools to help the providers of drinking water to protect their sources.

For more information on these or other Legislative matters, contact Steven McCurdy at (617) 292-5779. □

tems, particularly those with acquired immune deficiency syndrome (AIDS), the disease is life-threatening.

Cryptosporidiosis was first recognized as a disease in cattle in 1971, and the first human case occurred in 1976, with very few others reported during the following five years. The AIDS epidemic of the 1980s, however, has produced far greater numbers. Between 1981-85 more than 400 cases of cryptosporidiosis in AIDS patients were reported, being cited as a major cause of death in these individuals. This total, representing about four percent of the AIDS population in the United States, is thought to be conservative because of the fact that secondary infections in AIDS patients are not routinely reported.

The disease is self-limiting in individuals with healthy immune systems. No cure is currently available for cryptosporidiosis, and once infected the host is a lifetime carrier subject to relapses of symptoms.

History

Texas outbreak. The Town of Braun Station, Texas, a suburb of San Antonio, is served by a groundwater supply that receives gas chlorination as its only form of treatment. Although there was no breakdown in chlorination and coliform counts were always negative, Braun Station had two distinct cryptosporidiosis outbreaks during the spring and summer of 1984.

A poll of houses showed that 72 and 34 percent of the population had been infected in May and July, respectively. During the second outbreak, eight raw water samples were taken that showed elevated fecal coliform counts, including consecutive day results of 2600/100 mL and 1300/100mL.

The original source of contamination was never pinpointed, but dye from a tracer study at the town's wastewater treatment plant was detected in the well, indicating a cross connection or improper well construction. Note that chlorine did not inactivate the *Cryptosporidium*.

Many other disinfectant solutions have been tested without success, including 5 percent for-

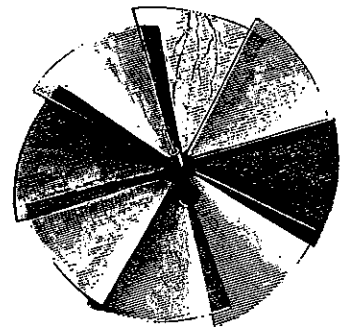
maldehyde for 24 hour, and 0.02 molar sodium hydroxide for 18 hours. As with *Giardia*, heat is highly effective in inactivating oocysts. Boiling water for 1 minute or maintaining a water temperature of 149°F (65°C) for 30 minutes are guidelines.

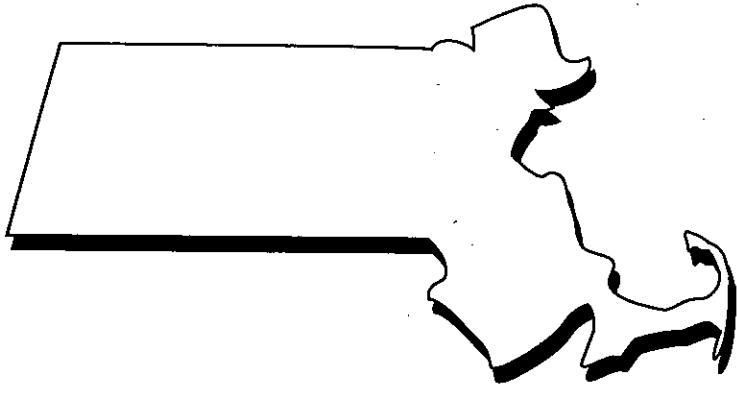
In the context of waterborne transmission of cryptosporidiosis, effective oocyst removal can be achieved with a properly designed and operated filtration facility. There can be no breakdown in this process though, because the traditional second barrier of post disinfection will not inactivate oocysts that pass the filters.

Summary

While the two outbreaks discussed above are the only documented cases to date in the United States, there probably have been other waterborne transmitted outbreaks that went unreported or unrecognized as cryptosporidiosis. Until recently, symptoms of giardiasis or cryptosporidiosis were diagnosed as generic gastroenteritis. The threat of a cryptosporidiosis outbreak is sufficient cause for utilities to upgrade facilities and reassess operating practices at their treatment plants. □

This article was adapted from an article that appeared in the March 1988 issue of the AWPCA Newsletter, a publication of the Arizona Water and Pollution Control Association. Reprinted with permission from the American Water Works Association as it appeared in the September 1988 issue of Opflow.





Round One Water Meter Grant Program

Lisa Dell'Anno

Thirty-four public water suppliers were offered grants from the State Water Meter Grant Program as part of the recent Round One Request for Proposals.

Most communities were offered funding from the Accelerated Meter Improvement Program for meter changeout programs and upgrading of existing meters. Some communities were offered funding from the New Meter Installation Program. This program provides for metering of unmetered services. In total, about six million dollars in state commitments were made with the grantee providing about fifteen million dollars to satisfy the local project cost share.

The following communities and water systems were offered grants:

Arlington	New Bedford
Brockton	Norwood
Brookline	Northboro
Boston Water and Sewer	Orleans
Chicopee	Peabody
Clinton	Plainville
Dedham/Westwood	Randolph
Easton	Reading
Fitchburg	Saugus
Hanover	Somerville
Mansfield	South Hadley FD#1
Marblehead	Wakefield
Marshfield	Waltham
Melrose	Westborough
Middleboro	Winchester
The Massachusetts Water Resources Authority	Winthrop
	Woburn
	Worcester. □

Salute to Communities

Jude Hutchinson, Environmental Analyst

The Community Technical Assistance Program within the Division of Water Supply provides guidance to municipalities on water supply protection measures. The Technical Assistance staff encourage the development of representative committees that work to establish comprehensive long-term protection regulations. Communities with established committees are an effective mechanism for addressing resource protection and growth management.

This column recognizes recent accomplishments at the local level.

Rowley:

Under the direction of Richard Hydren, the Water Supply Protection Committee worked for approximately one year to draft a bylaw acceptable to local boards and businesses. The Committee met with all boards and held several public meetings or hearings prior to town meeting. The "Town Water Supply Protection District" was unanimously adopted by the residents of Rowley on May 2, 1989. We also commend Ruth Alexander for acting as liaison to DEP and for her continued work in environmental protection.

Foxborough:

The Board of Water and Sewer Commissioners, chaired by Warren McKay, worked for several months to refine a zoning bylaw prepared for the town by SEA, Incorporated. Voters adopted the "Water Resource Protection District Bylaw" in May 1989. We commend Foxborough public for their active participation in the Canoe River Aquifer Advisory Committee, household hazardous waste collection days, educational outreach efforts, and efforts to develop comprehensive protection plans. Thank you to Joan Sozio, Water Commissioner, for her liaison work with DEP.

Grafton:

After defeat of a proposed Aquifer Protection District Bylaw in October 1988, the Board of Selectmen appointed a committee to study the issues and prepare a bylaw for town meeting in May 1989. This Committee, representative of town boards, local businesses and residents, worked arduously to draft a bylaw acceptable to all parties. The Aquifer Protection District Bylaw was adopted by unanimous vote! Thank you to John Hall, of the Grafton Water District and Committee member, for keeping DWS informed.

Sudbury:

In April 1988, voters unanimously adopted a Water Resource Protection District Bylaw.

Sudbury used a one-half mile (2640 feet) radius of the wellhead of each public supply well to delineate the protection district. This is in accordance with DEP Policy 88-03 (April 1988), Interim Wellhead Protection Area, which may be used in the absence of a hydrogeologic study.

All of these communities used their authority under M.G.L. Ch.40A to regulate land use for water supply protection. All but one community (Sudbury) requested and received technical assistance from DWS.

Salisbury:

Congratulations to Salisbury for adopting a new Aquifer Protection District Bylaw after conducting an ambitious public education program. Alan MacIntosh, Environmental Program Manager for the Merrimack Valley Planning Commission (MVPC), developed the bylaw in cooperation with the Planning Board, Conservation Commission, Open Space Committee, and the Salisbury Water Supply Company. The MVPC received a grant under the Clean Water Act's 205(j) Program, managed by Mary Wheeler, of the Bureau of Resource Protection at DEP. We salute all parties for their efforts to protect Salisbury's water supplies.

Easthampton, Holyoke, Southamptn, and Westfield:

All share the Barnes Aquifer and are working with the Pioneer Valley Planning Commission (PVPC) to permanently establish the Committee as a way for the communities to work together to protect the aquifer. Chris Curtis of the PVPC is coordinating the efforts under a Clean Water Act 205(j) grant. Thank you to Barbara Swords, City Councillor in Westfield, for liaison work with the Technical Assistance Program.

Ayer, Gloucester, Williamstown, Wilmington, and Worcester:

These municipalities are working arduously to establish appropriate controls on land uses that threaten water supplies. We encourage them to work with their Water Departments on these measures and to educate the public to the need for water supply protection regulations.

Please let us know when your town passes zoning bylaws, general bylaws or board of health regulations which place controls on land uses which may threaten water supplies. Do you know that many towns refer to model bylaws already prepared by other towns and are on file at the DWS resource library in Boston? These resources are available to your community! Please contact the staff at (617) 292-5931 or 5534 for assistance. □

DWS Holds Annual Information Exchange Meeting

Tony Abruzese

The Division of Water Supply held its annual informational staff retreat in June. The day-long event was held at the Great Meadows National Wildlife Preserve in Sudbury.

Several topics were addressed: DEP reorganization, the status of the MWRA water emergency declaration and contingency plans, and the impact of Safe Drinking Water Act (SDWA) amendments on public water suppliers.

The session started with a presentation by WBZ-TV weatherman Bruce Schwoegler. His talk on weather patterns and last winter's drought conditions was very informative.

Another highlight of the meeting was a panel discussion of the impact the SDWA will have on water suppliers. On the panel, chaired by EPA's Public Water Supply Supervision Coordinator Kevin Reilly, were Joe Duggan of the Wellesley Water Department and Wayne Southworth of the Easton Water Department. The panel discussion enabled DWS staff to gain insight on how water suppliers feel about the upcoming regulation changes and how DWS can make it easier to comply with them.

At the end of the day the various Boston and Regional DWS program staff gave creative presentations on what they do for the Department.

DWS thanks all staff, water suppliers and guests who attended the meeting. □

