SPEAKERS CONTENTS INSERTS

Page 1 TOP OF DOC

76–415PS
2001

H.R. 3178 AND THE DEVELOPMENT OF ANTI-TERRORISM TOOLS FOR WATER INFRASTRUCTURE

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

NOVEMBER 14, 2001

Serial No. 107–29

Printed for the use of the Committee on Science

Available via the World Wide Web: http://www.house.gov/science

Page 2 PREV PAGE TOP OF DOC

COMMITTEE ON SCIENCE

HON. SHERWOOD L. BOEHLERT, New York, *Chairman*

LAMAR S. SMITH, Texas
CONSTANCE A. MORELLA, Maryland
CHRISTOPHER SHAYS, Connecticut
CURT WELDON, Pennsylvania
DANA ROHRABACHER, California
JOE BARTON, Texas
KEN CALVERT, California
NICK SMITH, Michigan
ROSCOE G. BARTLETT, Maryland
VERNON J. EHLERS, Michigan

DAVE WELDON, Florida
GIL GUTKNECHT, Minnesota
CHRIS CANNON, Utah
GEORGE R. NETHERCUTT, JR., Washington
FRANK D. LUCAS, Oklahoma
GARY G. MILLER, California
JUDY BIGGERT, Illinois
WAYNE T. GILCHREST, Maryland
W. TODD AKIN, Missouri
TIMOTHY V. JOHNSON, Illinois
MIKE PENCE, Indiana

Page 3 PREV PAGE TOP OF DOC

FELIX J. GRUCCI, JR., New York
MELISSA A. HART, Pennsylvania
J. RANDY FORBES, Virginia

RALPH M. HALL, Texas
BART GORDON, Tennessee
JERRY F. COSTELLO, Illinois
JAMES A. BARCIA, Michigan
EDDIE BERNICE JOHNSON, Texas
LYNN C. WOOLSEY, California
LYNN N. RIVERS, Michigan
ZOE LOFGREN, California
SHEILA JACKSON LEE, Texas
BOB ETHERIDGE, North Carolina
NICK LAMPSON, Texas
JOHN B. LARSON, Connecticut
MARK UDALL, Colorado
DAVID WU, Oregon
ANTHONY D. WEINER, New York
BRIAN BAIRD, Washington
JOSEPH M. HOEFFEL, Pennsylvania
JOE BACA, California
JIM MATHESON, Utah
STEVE ISRAEL, New York
DENNIS MOORE, Kansas

Page 4 PREV PAGE TOP OF DOC

MICHAEL M. HONDA, California

C O N T E N T S

November 14, 2001

Page 5 PREV PAGE TOP OF DOC

Page 6 PREV PAGE TOP OF DOC

Page 7 PREV PAGE TOP OF DOC

Appendix 2: Additional Material for the Record

Submitted Testimony of the United Telecom Council

H.R. 3178 AND THE DEVELOPMENT OF ANTI-TERRORISM TOOLS FOR WATER INFRASTRUCTURE

WEDNESDAY, NOVEMBER 14, 2001

House of Representatives,
Committee on Science,

Page 8 PREV PAGE TOP OF DOC

Washington, DC.

The committee met, pursuant to call, at 10:17 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert (chairman of the committee) presiding.

76415a.eps

HEARING CHARTER

COMMITTEE ON SCIENCE

U.S. HOUSE OF REPRESENTATIVES

H.R. 3178 and the Development

of Anti-Terrorism Tools

for Water Infrastructure

WEDNESDAY, NOVEMBER 14, 2001

10:00 A.M.–12:00 P.M.

2318 RAYBURN HOUSE OFFICE BUILDING

Page 9 PREV PAGE TOP OF DOC

Purpose

On Wednesday, November 14, 2001, at 10:00 a.m. in 2318 RHOB, the Science Committee will hold a hearing on "H.R. 3178 and the Development of Anti-Terrorism Tools for Water Infrastructure." Testimony and discussion will focus on H.R. 3178, the Water Infrastructure Security and Research Development Act

and, particularly after events on September 11, 2001, the need for increased research on and development of technologies and techniques to prevent, mitigate, and respond to physical and cyber threats facing drinking water and wastewater systems.

WITNESSES

James Kallstrom, the Director of New York State's Office of Public Security;

Dr. Richard Luthy, Silva H. Palmer Professor of Engineering, Stanford University, and Chair of the National Research Council's Water, Science, and Technology Board;

Jeffrey Danneels, Department Manager, Security Systems and Technology Center, Sandia National Laboratories; and

Jerry Johnson, General Manager of the District of Columbia's Water and Sewer Authority, representing the Association of Metropolitan Water Agencies and the American Water Works Association Research Foundation.

BACKGROUND

Page 10 PREV PAGE TOP OF DOC

Water Infrastructure

Approximately 170,000 "public water systems" provide water for more than 250 million people in the United States. The Safe Drinking Water Act defines public water system as "a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves at least 25 individuals. . .and includes collection, treatment, storage, and distribution facilities used primarily in connection with the system." Environmental Protection Agency (EPA) regulations recognize two primary types of such systems: 1) "community water systems," which provide drinking water to the same people year-round; and 2) "non-community water systems," which serve people on a less than year round basis at such places as schools, factories or gas stations.

There are approximately 16,000 municipal sewage treatment works, servicing 73 percent of the U.S. population. Privately owned treatment systems, including septic tanks, serve the remaining population. The Federal Water Pollution Control Act (also known as the Clean Water Act) defines treatment works as "any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. . .including intercepting sewers, outfall sewers, sewage collection systems. . .and any works that will be an integral part of the treatment process."

Threats to Water Infrastructure

Physical threats to drinking water systems include chemical, biological, and radiological contaminants and disruption of flow through explosions or other destructive actions. In recent years, most attention has focused on threats to drinking water systems, particularly to water storage reservoirs. Like sewage treatment

plants, drinking water facilities may have stockpiles of chemicals that could create fire, explosion, or other hazards. Cyber threats are an increasing concern, given the automated, remote-control nature of most drinking water treatment and distribution systems. Systems are also dependent on other critical infrastructure systems such as energy, telecommunications, and transportation. For example, a water treatment plant that depends on daily deliveries by truck of aluminum sulfate, chlorine, or other chemicals needs an emergency operations plan if such deliveries are interrupted.

Page 11 PREV PAGE TOP OF DOC

Wastewater treatment facilities have received increasing attention after the September 11, 2001 attacks. Like drinking water plants, they face physical and cyber threats and the vulnerability of dependence on other critical infrastructures. Particular attention has also focused on the large volume of liquid chlorine, sulfur dioxide, and other toxic chemicals that may be stored or in use at sewage facilities and the potential for an explosion to create a toxic cloud that could threaten employees and communities. Some research has occurred with respect to alternative treatment systems and chemicals (such as chlorine bleach or sodium hypochlorite in lieu of liquid chlorine).

Security Reports and Actions

There has been increasing, though still limited, attention to infrastructure security in recent years. In response to a 1995 Congressional directive, President Clinton established a Commission on Critical Infrastructure Protection, which issued an October 1997 report, "Critical Foundations, Protecting America's Infrastructures." The report addressed various infrastructure systems, including water, and recommended greater cooperation and communication between government and the private sector. In 1998, Congress established an advisory panel on responding to terrorist weapons of mass destruction. The resulting 1999 report concluded, among other things, that it was difficult for state and local authorities to obtain federal information and assistance and that much more information should be obtained and shared among all levels of government.

In May 1998, President Clinton issued Presidential Decision Document 63 (PDD63), which included the goal of protecting the nation's critical infrastructure from intentional physical and cyber attacks by 2003. The report identified water supply as one of eight critical infrastructure systems requiring attention, specifically focusing on the 330 largest community water systems that each serve more than 100,000 persons. PDD63 designated EPA as the lead federal agency for liaison with the water supply sector.

Page 12 PREV PAGE TOP OF DOC

EPA responded with a plan in 1998 to address water infrastructure security and continues to carry out the action items included in this report. For example, in 2000 EPA entered into a partnership with the Association of Metropolitan Water Agencies (AMWA) and the American Water Works Association (AWWA) to reduce the vulnerability of water systems. AWWA's Research Foundation has contracted with the Department of Energy's Sandia National Laboratories to develop vulnerability assessment tools for water systems. EPA has also received appropriations (e.g., $2M in FY O1) for projects with Sandia to pilot test

physical vulnerability assessment tools and develop a cyber vulnerability assessment tool. Additional actions (e.g., upgrading security technologies and developing real-time monitoring technologies) on a variety of important security related issues have yet to be completed.

PDD–63 also called for the Federal Bureau of Investigation (FBI) to establish a National Infrastructure Protection Center to provide information sharing and analysis and to coordinate with and encourage private sector entities to establish Information Sharing and Analysis Centers (ISACs). AMWA volunteered to be the Water ISAC coordinator. The purpose of the Water ISAC is to provide to water managers early warnings and alerts about threats to the integrity and operation of water supply and wastewater systems.

While various federal agencies are conducting research on water-related security issues, the January 2001 report of the President's Commission on Critical Infrastructure Protection characterized ongoing water sector research efforts as relatively small with a number of gaps and shortfalls.(see footnote 1) Four major areas for further research are identified: 1) threat/vulnerability risk assessments; 2) identification and characterization of biological and chemical agents; 3) establishment of a center of excellence to support communities in conducting vulnerability and risk assessments; and 4) application of information assurance techniques to computerized systems used by water utilities.

Page 13 PREV PAGE TOP OF DOC

RECENT DEVELOPMENTS

EPA has taken various administrative actions in response to the September 11 attacks. For example, it established a Water Security Task Force to increase information and assistance to water management officials and to improve coordination among the FBI, the Federal Emergency Management Agency, and other federal agencies involved in water, science, and public health (such as the Centers for Disease Control and Prevention, the Department of Health and Human Services, and the Department of Energy). EPA also provided in late September 2001 a $600,000 grant to AMWA for development of a Water ISAC. AMWA anticipates the Water ISAC to be operational in early 2002.

The President's detailed request for $20 billion emergency supplemental appropriations also included $34.5 million for water infrastructure vulnerability assessments.

Congress has been active on various fronts, as well. The VA–HUD and Independent Agencies Appropriations Act for FY 2002 (H.R. 2620, Conf. Rpt. 107–272), recently cleared for Presidential action, includes $500,000 for the Association of Metropolitan Sewerage Agencies to increase information dissemination and coordination regarding security measures. There is also a range of proposals, including Senate economic stimulus packages and House and Senate emergency supplemental appropriations, that reportedly include or are likely to include funds for drinking water and wastewater security measures. For example, House Appropriations Committee Members are considering the inclusion of $165 million in an emergency supplemental appropriations bill for drinking water related security measures (e.g., increased security for EPA labs and other EPA facilities and grants to states).

Page 14 PREV PAGE TOP OF DOC

H.R. 3178 and S. 1593

To address concerns about research gaps and the need for new and improved technologies and practices, Chairman Boehlert and Chairman Jeffords of the Senate Environment and Public Works Committee introduced companion, bipartisan bills on October 30, 2001. The introduced bills are not identical. For example, S. 1593 authorizes a six year, $12 million per year program, while H.R. 3178 authorizes a five year, $12 million per year program. The Senate Environment and Public Works Committee also included other revisions as it approved the bill during its November 8, 2001 markup. Both bills have the strong support of drinking water and wastewater and engineering associations and research foundations.

A section-by-section analysis of H.R. 3178 follows:

Water Infrastructure Security and Research Development Act

(introduced 10–30–01, referred to Science Committee)

SUMMARY

Authorizes EPA grants ($12m/yr for 5 years) to public and private nonprofit research organizations for research, development and demonstration projects that increase security of drinking water and wastewater infrastructure.

SECTION 1

Page 15 PREV PAGE TOP OF DOC

Provides short title.

SECTION 2

Defines the terms "Administrator," "research organization," and "water supply system." Research organizations include foundations, national laboratories, and universities. Water supply systems include drinking water and wastewater facilities.

SECTION 3

"Water Supply System Security Research Assistance"

Subsection (a): Directs the EPA, in conjunction with other relevant agencies, to establish a program for the research, development, and demonstration of technologies and related processes to increase the security of water supply systems.

Subsection (b) Projects Provides that awards may be used to:

(1) conduct research related to or develop technologies and related processes to assess physical and

information systems vulnerabilities;

(2) conduct research related to or develop technologies and related processes for protecting physical assets and information systems;

Page 16 PREV PAGE TOP OF DOC

(3) develop programs to disseminate the results of research to increase public awareness of threats to water supply systems, and to help managers of water supply systems respond to threats;

(4) demonstrate and assess upgraded security technologies and related processes, including the operational and cost impacts of enhanced security measures;

(5) develop guidelines, standards, and procedures for physical and information systems security at water supply systems;

(6) conduct research related to or develop real-time monitoring systems related to chemical, physical, and radiological attacks;

(7) conduct research related to or develop technologies for the mitigation, response to, and recovery from biological, chemical, and radiological contamination; and

(8) carry out other research, development, and demonstration activities EPA considers appropriate for improving water supply system security, including information sharing and analysis.

Subsection (c) Guidelines, Procedures, Criteria

(1) Requires EPA to consult and coordinate with various entities, including water supply agencies, in developing guidelines, procedures, and criteria for applications and the selection of awards.

Page 17 PREV PAGE TOP OF DOC

(2) Requires EPA to transmit to Congress proposed guidelines, procedures, and criteria at least 90 days before finalizing such proposals.

(3) Directs the EPA to ensure, to the maximum extent practicable, that awards are distributed to a wide variety of projects and to geographically diverse recipients.

(4) Requires, as a condition of receiving an award, that research organizations have in place appropriate security measures regarding entities and individuals carrying out activities under the award.

(5) Requires the appropriate dissemination of the results of research, development, and demonstration activities.

Subsection (d) Cost Sharing

(1) Directs EPA to require at least 50 percent cost sharing from non-Federal sources on all demonstration projects, except that EPA may reduce this requirement under specified circumstances.

(2) Provides that the non-federal cost share may include in-kind contributions such as personnel, services, equipment, and other resources.

SECTION 4

"Authorization of Appropriations"

Page 18 PREV PAGE TOP OF DOC

Authorizes $12 million for each of fiscal years 2002 through 2006 for EPA to carry out the Act and requires that such funds remain available until expended.

Other Bills

Several bill have been introduced that either address non-research aspects of the problem or address limited portions of the research needs. S. 1608, introduced by Senator Smith of New Hampshire, cleared the Senate Environment and Public Works Committee on November 8, 2001. Unlike S. 1593, this legislation focuses on nonresearch related measures to "harden" and secure the physical assets of water infrastructure facilities. It authorizes $50M for EPA grants for, among other things, fences, improved lighting, closed circuit television monitors, security guards, and training of water system personnel. H.R. 3227, introduced by Rep. Jackson Lee and referred to the Energy and Commerce Committee and, in addition, the Science Committee, would authorize such sums as may be necessary for EPA grants to conduct research on biological contaminants in drinking water.

POSSIBLE QUESTIONS/ISSUES

Is the Federal Government, particularly EPA, providing adequate attention to research, development, and demonstration of technologies and processes to secure drinking water and wastewater facilities against terrorist attacks?

Do existing research and training provisions under the Safe Drinking Water Act and the Clean Water Act provide adequate authority and direction for EPA to help water officials and communities prepare for and respond to terrorist attacks? Do existing research and training provisions and activities adequately address threats beyond chemical, biological, and radiological contamination (e.g., destruction or impairment of physical assets; cyber threats; and water system dependencies on energy, transportation, telecommunications, and other critical infrastructure sectors)?

Page 19 PREV PAGE TOP OF DOC

What are priority areas for water security research and development? Is there adequate attention given to real time monitoring and detection of contaminants? Are technologies being researched, developed, or demonstrated to increase security of physical assets and information systems?

To what extent are EPA activities coordinated with the Department of Energy, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, and the United States Geological Survey? What roles and opportunities are available or should be made available for universities, national laboratories, private entities, and research foundations?

What is the appropriate balance between increased awareness and dissemination of information and the withholding of sensitive or classified information? What safeguards might ensure that research results are disseminated and used appropriately?

H.R. 3178 and the Development of Anti-Terrorism Tools for Water Infrastructure

Chairman **BOEHLERT.** This hearing will come to order. Let me welcome everyone here today for the fourth in our series of hearings on terrorism. Last month, we focused on cybersecurity and we are working on legislation in that area, which we hope to introduce within the next week or so. Last week, we focused on bioterrorism and have followed—what is that? Has a Budweiser frog escaped or something? Well, this is musical accompaniment.

[Microphone noise]

Page 20 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** Last week, we focused on bioterrorism and have followed up with a letter to the President, and we plan to undertake more hearings and activities in that area.

Today, we turn to the security of our water supply and sewage systems, an appropriate next step, as our water systems are vulnerable to both cyberterrorism and bioterrorism, as well as what I guess we must call the more mundane threat of explosions involving the volatile chemicals that they must keep on site.

As we have explored the threats to our water systems in preparation for this hearing, we have come to the same disturbing conclusion as we did in reviewing other aspects of terrorism. We simply don't know enough to respond adequately to the threat of terrorism.

We need to know more about how to assess and prevent terrorist threats, how to respond to terrorist incidents, and how to remediate any damage terrorists might cause. Guard dogs and fencing may help address these issues in the short run, but in the long run, only a focused research and development program will enable us to guard against and combat terrorism successfully. And right now, we simply do not invest enough in R&D on the most basic questions involving water security.

To remedy this deficiency, I have introduced H.R. 3178, along with my colleague, Mr. Baird, and other members of this Committee. We intend to both mark up and file the bill tomorrow, so it can move swiftly through the House. The bill can be passed and, perhaps, even enacted before Congress finally manages to adjourn this year. Senator Jeffords has already reported his companion bill out of his Committee in the other body, and we are working closely with him in the spirit of bipartisanship.

The bill ought to be an important first step in ensuring that we have the R&D our Nation needs to combat threats to our Nation's water and sewage systems.

And those threats are real. As in other areas of terrorism, official statements have generated some confusion. My gut feeling is that, prior to September 11, officials tended to publicly overplay the threats to our water supply, and since September 11, now that the threat is less abstract, officials have tended to downplay that threat. I hope our witnesses can give us some clear guidance on what our concerns truly are.

And I also hope our witnesses will be able to lay out a research agenda so we can get a better sense of how we need to move forward with the program that will be created by H.R. 3178. And I very much look forward to hearing from our Panel.

Let me ask unanimous consent that Ms. Wilson be allowed to sit with the Committee and, at the appropriate time, I will ask that she introduce one of our key witnesses. With that, let me turn the podium over to the cosponsor and partner in this endeavor, Mr. Baird.

[The prepared statement of Mr. Boehlert follows:]

PREPARED STATEMENT OF CONGRESSMAN SHERWOOD BOEHLERT

Let me welcome everyone here today for the fourth in our series of hearings on terrorism. Last month, we focused on cyber security and we are working on legislation in that area, which we hope to introduce within the next week or so. Last week, we focused on bioterrorism and have followed up with a letter to the President—and we plan to undertake more hearings and activities in that area.

Today, we turn to the security of our water supply and sewage systems—an appropriate next step, as our water systems are vulnerable to both cyberterrorism and bioterrorism—as well as what I guess we must call the more mundane threat of explosions involving the volatile chemicals that they must keep on site.

As we have explored the threats to our water systems in preparation for this hearing, we have come to the same disturbing conclusion as we did in reviewing other aspects of terrorism: we simply don't know enough to respond adequately to the threat of terrorism.

We need to know more about how to assess and prevent terrorist threats, how to respond to terrorist incidents, and how to remediate any damage terrorists might cause. Guard dogs and fencing may help address these issues in the short-run, but in the long-run only a focused research and development program will enable us to guard against, and combat terrorism successfully. And right now, we simply do not invest enough in R&D on the most basic questions in water security.

To remedy this deficiency, I have introduced H.R. 3178, along with my colleague Mr. Baird and other

Members of this Committee. We intend to both mark up and file the bill tomorrow, so it can move swiftly through the House. The bill can be passed and perhaps even enacted before Congress finally manages to adjourn for the year. Senator Jeffords has already reported his companion bill out of his Committee in the other body, and we are working closely with him.

The bill would be an important first step in ensuring that we have the R&D our nation needs to combat threats to our nation's water and sewage systems.

Page 23 PREV PAGE TOP OF DOC

And those threats are real. As in other areas of terrorism, official statements have generated some confusion. My gut feeling is that, prior to September 11th, officials tended publicly to overplay the threats to our water supply, and since September 11th—now that the threat is less abstract—officials have tended to downplay the threat. I hope our witnesses can give us some clear guidance on what our concerns truly are.

And I also hope our witnesses will be able to lay out a research agenda, so we can get a better sense of how we need to move forward with the program that will be created by H.R. 3178.

I look forward to hearing from our panel.

Mr. **BAIRD.** Thank you, Mr. Chairman. I want to thank you for your leadership and initiative on this important piece of legislation, and I also want to thank Ranking Member Hall and Barcia and the Committee staff for their good work. I think you have said it eloquently. We have spent a lot of time since September 11 focused on many other aspects of homeland security, but there is nothing more basic than the promise that when you turn on your drinking water each morning, or in the evening, and your family needs water, it will be secure and safe.

And the legislation you have introduced, and I am proud to be a cosponsor of, would provide additional research to assess vulnerability, to assess real-time monitoring, to develop security and other techniques. I think it is actually long overdue and I am proud to be a part of helping develop this. I look forward to the testimony of the witnesses and I thank them for joining us today.

Page 24 PREV PAGE TOP OF DOC

[The prepared statement of Mr. Baird follows:]

PREPARED STATEMENT OF THE HONORABLE BRIAN BAIRD

In the aftermath of September 11, our citizens have been more diligent than ever trying to protect themselves and their neighbors. The Federal Government has also increased its watchfulness, increasing our police presence in many locations including our airports. It is a fundamental duty of our government to ensure that the water we drink is safe and that is why Chairman Boehlert and I have introduced this bill.

Chairman Boehlert, I appreciate that the Committee has moved so quickly on this bill. It demonstrates the

dedication of all of us to protecting one of the most essential components to our daily life, clean drinking water. Access to reliable and clean drinking water will be one of the largest challenges in the century, and our government must do more to protect this basic right. The bill that Chairman Boehlert and I introduced will provide more protection to our water supply from terrorist threats and will also benefit the public by providing much needed research on the various other aspects to water protection, such as endocrine disrupters and arsenic standards.

After September 11, we all realized how much more should have been done to bolster airport security, fortunately we are given a chance to protect our water supply before it is seriously threatened.

Chairman **BOEHLERT.** Thank you so much, Mr. Baird. And thank you for your hard work and cooperation in this endeavor. Is there anyone else that seeks recognition for an opening statement? And we are trying to make the opening statements very brief.

Page 25 PREV PAGE TOP OF DOC

Mr. **LAMPSON.** May I, Mr. Chairman——

Chairman **BOEHLERT.** Mr. Lampson.

Mr. **LAMPSON** [continuing]. A short statement?

Chairman **BOEHLERT.** Yes, sir.

Mr. **LAMPSON.** Thank you. Just to first compliment all of you on this bill and to say that I look forward to joining you as a cosponsor and to thank you for your work. What I am most proud of is the fact that this Committee is one of the few places that seems to be stopping, taking a couple of deep breaths, backing up, and saying, let us look at what we need to be doing as a country and reach the point where we know how to respond to these before something happens. So, in that regard, thank you, and thank the Panel. I look forward to continuing to work on this matter.

Chairman **BOEHLERT.** Thank you very much. The Chair recognizes Mr. Calvert.

Mr. **CALVERT** Thank you, Mr. Chairman. And I want to thank you for having this hearing. Having the privilege to chair the Water Committee of the House, this is something that is especially interesting to me. And I was able to pass the bill and it was signed by the President this week on dam security and water security throughout the United States to help repay communities who add additional security to their various facilities throughout the country in order to assure—or to help assure that our water supply is secure. But, you are absolutely correct, we need research and development. I look forward to working with you on this bill and hopefully being able to cosponsor this legislation with you.

Page 26 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** The Chair is pleased to recognize the distinguished Vice Chair of the Full

Committee, Mr. Gutknecht.

Mr. **GUTKNECHT.** Thank you, Mr. Chair. I will be very brief. I have been talking to Mr. Ehlers and I have talked to you, Mr. Chairman. I would hope that some time perhaps around the White House Christmas party we could have another hearing on technology and talk about some of the technologies that both big firms and small firms here in the United States are developing. Because I ultimately believe that in the war against terrorism—we are seeing it played out now on the battlefields, but I think we will see even more of that here in the States—that technology is going to play a very important role. And I have met with a number of firms—and I can think of three of them from my general area where I come from—that have developed some amazing technologies.

And I think—I would hope that we could have a hearing, either of the Full Committee or, perhaps, the Technology Subcommittee, some time around the White House Christmas party when members will be here anyway, and do something to bring some of these folks in and at least make us and, perhaps, the general public aware of some of the exciting technologies that are coming online. I yield back.

Chairman **BOEHLERT.** Thank you very much for an excellent suggestion.

Mr. **SMITH.** Mr. Chairman, just a——

Page 27 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** Yes. Mr. Smith.

Mr. **SMITH.** Just that I hope we can expand our inquiry into possible contamination of aquifers themselves and I hope that we all can submit an opening statement for the record.

Chairman **BOEHLERT.** Thank you so much. Without objection, so ordered.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CONGRESSMAN NICK SMITH

I want to thank the Committee Chairman, Mr. Boehlert for holding this hearing and bringing forward this legislation to bolster the security of our water utilities infrastructure and to address concerns about research gaps and the need for new and improved technologies and practices.

As we struggle to respond properly to the horrific events of September 11, we must begin to make our nation more secure by identifying and correcting areas where we are most vulnerable. However, we must also take extra care to safeguard this information from those who mean to do harm to our Nation. The terrorist who attacked us on September 11 managed to inflict incredible harm with no more than a few months of training and some box cutters. It seems that terrorist are quite capable of using our vulnerabilities against us. Which is why I am very concerned by reports that I have read regarding world wide web publication of sensitive information and "worst-case scenarios" at U.S. industrial sites that could amount to handing terrorists a blue print for effective attack.

I understand how important it is for researchers to share information and for public water supplies to share experience. However, too much information too easily available makes us that much more vulnerable.

This panel has a wealth of experience and expertise about out vulnerabilities and the appropriate ways in which to discreetly address them. I thank the panel for taking the time to speak to us today and I look forward to getting their advice about the proper exchange of information and the proper controls to keep that information out of the hands of terrorists.

[The prepared statement of Representative Constance A. Morella follows:]

PREPARED STATEMENT OF REPRESENTATIVE CONSTANCE A. MORELLA

Mr. Chairman, thank you for calling this important hearing. In the wake of the dreadful attacks of Sept. 11th, we must seriously consider future threats toward our critical infrastructures. Nowhere is this more apparent than in our water supply.

We need to rethink the safety and security of our water supply, treatment, and distribution systems. We need to identify the probable threats and establish emergency response procedures. Specific agents of terror, whether chemical or biological, need to be identified and studied. Redundancies and interconnections need to be built into the system to insure uninterrupted service in the event of a point failure or local attack. Our aging infrastructures need to be upgraded with new technologies to protect them from intentional, malevolent acts.

All of these steps will take time and we need to proceed precipitously. Additional research and further study is necessary to fully understand the threat and what our policy response should be. That is why I have joined Chairman Boehlert in co-sponsoring H.R. 3178. I believe this bill is a necessary first step in addressing the safety concerns surrounding our nation's water supply and I applaud the Chairman for his expeditious treatment of this piece of legislation. I also want to thank the panelists for agreeing to appear before us today to discuss this issue. I look forward to their testimony and hope they will offer their opinions on this bill as well as any suggestions they have to improve it.

[The prepared statement of Representative Jerry F. Costello follows:]

PREPARED STATEMENT OF THE HONORABLE JERRY F. COSTELLO

Good morning, I would like to thank all of the witnesses for appearing before our committee to discuss anti-terrorism tools for water infrastructure. As you are aware, keeping our water supply safe is an important issue for homeland security and hopefully this hearing will allow us to gauge our preparedness.

The House Science Committee, in conjunction with Congress, has shown great support for the

development of new technologies for improving security of our water infrastructures. I recently supported legislation, which would provide significant funding for security purposes at critical water infrastructure facilities, because I believe it is in the best interest of everyone to support initiatives that will provide the American people with a sense of safety and preparedness. In my district, my constituents have many concerns about the safety and security of the Mel Price Lock and Dam in Madison County, Illinois and the Illinois American Water Company in Belleville and Alton, Illinois. I am particularly interested in learning about the vulnerabilities of our water systems and the cost of providing resources to address deficiencies in security.

Page 30 PREV PAGE TOP OF DOC

I thank all the witnesses for being with us today and providing testimony to our Committee.

[The prepared statement of Representative Sheila Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Thank you, Mr. Chairman and Ranking Member Hall, for holding this important hearing on "H.R. 3178, Water Infrastructure Security and Research Development Act" and the Development of Anti-Terrorism Tools for Water Infrastructure. We are fortunate to have a distinguished panel of witnesses who have given their time to speak about this very important issue.

The nation's water supply and water quality infrastructure have long been recognized as being potentially vulnerable to terrorist attacks of various types,. including physical disruption, bioterrorism/chemical contamination, and cyber attack. Interest in such problems has increased since the September 11, 2001 attacks on the World Trade Center and the Pentagon. Damage or destruction to these systems by terrorist attack could disrupt the delivery of vital human services, threatening public health and the environment, or possibly causing loss of life.

Water infrastructure systems include surface and ground water sources of untreated water for municipal, industrial, agricultural, and consumer needs; dams, reservoirs, aqueducts, and pipes that contain and transport raw water; treatment facilities that remove contaminants; finished water reservoirs; systems that distribute water to users; and wastewater collection and treatment facilities. Across the country, these systems comprise more than 75,000 dams and reservoirs, thousands of miles of pipes and aqueducts, 168,000 public drinking water facilities, and about 16,000 publicly owned wastewater treatment facilities. Ownership and management are both public and private; the federal government has responsibility for hundreds of dams and diversion structures, but the vast majority of the nation's water infrastructure is either privately owned or, owned by non-federal units of government.

Page 31 PREV PAGE TOP OF DOC

The federal government has built hundreds of water projects over the years, primarily dams and reservoirs for irrigation development and flood control, with municipal and industrial water use as an incidental, self-

financed, project purpose. Because of the size and scope of many of these facilities, they are critically entwined with the nation's overall water supply, transportation, and electricity infrastructure. Threats resulting in physical destruction to any of these systems could include disruption of operating or distribution system components, power or telecommunications systems, electronic control systems, and actual damage to reservoirs and pimping stations. A loss of flow and pressure would cause problems for water customers and also would drastically hinder firefighting efforts. Bioterrorism or chemical threats could deliver massive contamination by small amounts of microbiological agents or toxic chemicals and could endanger the public health of thousands.

Water supply was one of eight critical infrastructure systems identified in President Clinton's 1998 Presidential Decision Directive is part of a coordinated national effort to achieve the capability to protect the nation's critical infrastructure from intentional acts that would diminish them.

Since September 11, the nation's drinking water utilities have been on a heightened state of alert to protect against the potential disruption of water service and biological and chemical contamination of drinking water supplies. Fortunately, before September 11, the water supply community was already at work with the U.S. Environmental Protection Agency, the Federal Bureau of Investigations and other federal agencies to develop methods and tools to protect water system facilities and consumers. Several drinking water organizations and EPA are currently sponsoring various research and development projects addressing water system security issues. These projects include tools for assessing vulnerabilities, preparations for response and recovery in the event of an attack, understanding the impact of potential biological and chemical agents, and training of water system personnel on security issues.

Page 32 PREV PAGE TOP OF DOC

Let me join my colleagues in support of H.R. 3178, "Water Infrastructure Security and Research Development Act". This bill is critical in protecting one of our nation's most precious resources—the water supply. As indicated, protecting our water supply is important to the future of this nation and ensuring that our children are protected from any terrorist act. H.R. 3178, I believe, has the greatest potential to ensure the safety of our water systems.

I look forward to your comments.

[The prepared statement of Representative J. Randy Forbes follows:]

PREPARED STATEMENT OF CONGRESSMAN J. RANDY FORBES

Thank you, Mr. Chairman and Ranking Member, Mr. Hall, for responding so quickly to what has become one of the greatest public concerns as we pursue the war against terrorism—the safety of our water supplies.

There is not a person in this nation who is not affected by the Water Infrastructure Security and Research Development Act. We all rely upon the cleanliness and purity of our water supplies and upon the appropriate treatment of our sewage. Since September 11th, each of us has become acutely aware of the many routine aspects to our lives that we now take for granted, but that could easily be perverted by terrorists to do us harm. Our water supplies, simply because they reach every one of us, have to be at the top

of that list.

Page 33 PREV PAGE TOP OF DOC

Last month, I held two town hall meetings in my district, and the first question at each one revealed the serious concerns of my constituents about the safety of their water. Simply put, they wanted to know what we are doing to protect their water from being used to deliver chemical or biological weapons.

In response, I was pleased to become an original cosponsor of Chairman Boehlert's bill to provide the necessary funding to do research and development on ways to protect our water infrastructure. This legislation will allow us to identify the threats, improve our ability to respond to those threats, and provide us with the knowledge we need to ensure the long-term safety of our water.

This is clearly an important part of homeland security, and I appreciate the Chairman for addressing this matter with this legislation. I would also like to thank our learned witnesses for joining us today and sharing their thoughts on this urgent issue.

Chairman **BOEHLERT.** And there are no limitations on what our vision will be as it develops and we certainly will look into that area. Thank you very much. With—let us go right to our Panel. I am getting 14 inputs here. I will introduce three members of the Panel, and, for the fourth member, I will give that privilege to the distinguished lady from New Mexico, who is one of the lead cosponsors of our bill and a very hardworking member of this Congress.

We are privileged to have Mr. James Kallstrom, Director, Office of Public Security for the State of New York; Dr. Richard Luthy, Silas H. Palmer Professor of Engineering at Stanford University. He is Chair of the National Research Council's Water, Science, and Technology Board. Dr. Luthy. And Mr. Jerry Johnson, General Manager, District of Columbia's Water and Sewer Authority. He is testifying on behalf of the Association of Metropolitan Water Agencies and the American Water Works Association Research Foundation. And to introduce our fourth member, the Chair recognizes Ms. Wilson.

Page 34 PREV PAGE TOP OF DOC

Ms. **WILSON.** Thank you, Mr. Chairman. And I appreciate the opportunity to sit in today. You have done some very good work on research and development. And I am very pleased to be a cosponsor of your bill, and I hope we can move it quickly to the Floor of the House to address some of the research and development needs for security of our Nation's water systems.

Jeff Danneels is the lead—leads the water project at Sandia National Laboratories. Sandia is a multi-program Department of Energy laboratory in New Mexico that has been working on these issues for a long time. It deals with energy and infrastructure issues, as well as the nuclear weapons work. And a lot of the technologies that were developed for one purpose can also be transferred over into other great national problems.

He began this work on water with the EPA and the American Water Works Association over a year ago,

and it follows on from some work that was done with the Federal dams and the Corps of Engineers on Federal water system security. That work has been accelerated since the attacks on the 11th of September in order to give information to water utilities, to provide training to people operating those utilities, and to really focus on what can technology bring to the equation.

It is very possible that within the next three to five years, we will be able to have real-time monitoring of contamination for chemical and biological agents at a marginal cost which is small enough for small community water systems to be able to afford. And that is what we want. We want the confidence that the water that comes out of the tap, in small communities across this country, is safe. And we want to be able to do that at a cost that won't increase people's bills.

Page 35 PREV PAGE TOP OF DOC

The technologies and the programs at Sandia National Laboratories are some of the best in the Nation. And we are very glad that Jeff is here with us today, a civil engineer by training, who has been leading this program for 2 years, but has been working at Sandia National Laboratories for 17 years. And we are very, very glad and honored to have you here with us today.

Chairman **BOEHLERT.** Thank you very much. And now, we will go to our Panel. And we would ask each of the Panel to try to summarize their opening statement. Your full statement will appear in the record in its entirety, but we try to limit the opening statements so that we have ample opportunity for a good exchange, good dialogue. And I want to thank all of you for serving as very valuable resources for this Committee as we go about our very important work.

With that, let me recognize the Director of the Office of Public Security for the State of New York—I might add the great State of New York—maybe a little bias creeping in there—Mr. James Kallstrom.

STATEMENT OF JAMES K. KALLSTROM, DIRECTOR, OFFICE OF PUBLIC SECURITY, STATE OF NEW YORK

Mr. **KALLSTROM.** Mr. Chairman, members of the Committee, thank you for providing me this opportunity to share with you the State of New York's perspective on the protection of water infrastructure from the threat of terrorist attacks. In particular, I want to emphasize the state's strong support for H.R. 3178. If enacted, this legislation will contribute greatly to the state's long-term plans to protect our valuable drinking water supplies and clean water infrastructure.

Page 36 PREV PAGE TOP OF DOC

Mr. Chairman, as the world knows, the State and City of New York felt the brunt of the devastating terrorist attacks which stunned our Nation on September 11. While Governor Pataki already had initiated a widespread effort to assess our vulnerability to terrorist attacks, an effort which began after the Oklahoma City bombing, the horrific actions of September 11 heightened the state's sense of vulnerability and the need to ensure that its citizens, structures, and natural resources are protected effectively from any future attacks.

In response to these attacks, Governor Pataki created the Office of Public Security and I have been honored to be named as its first Director.

Governor Pataki has charged me with developing a comprehensive statewide strategy to secure New York State from acts of terrorism or terrorist threats. The Office of Public Security will tie together all state efforts to detect, identify, address, respond to, and prevent terrorist attacks from occurring within the state. My office coordinates its activities with the Federal Office of Homeland Security—I might say I just came from a meeting with Governor Ridge to this hearing—and with counties throughout the state. The efforts which the Office of Public Security is willing to take include both short-term actions, those protective steps that we can undertake immediately, and long-term efforts to lessen our vulnerability to attacks and to ensure that the events of September 11 never happen again.

At the forefront of state and local efforts to protect our citizens are actions to protect critical infrastructure, including drinking water and wastewater facilities. The risk to New York's drinking water supplies or wastewater treatment facilities is small, but real. For that reason, this Act can play an integral role in our efforts to protect the state's water supplies.

Page 37 PREV PAGE TOP OF DOC

The research funds which H.R. 3178 would authorize are compatible with New York's long-standing tradition of academic innovation at the more than 300 public and private research universities and institutions of higher learning in New York State. Long recognized as the birthplace of technology and innovation, New York ranks among the world's most sophisticated and prestigious locations for technology-driven research; the type of research which we envision would be undertaken through H.R. 3178.

The research which EPA could fund through this bill can help us find new means to protect the drinking water supplies at more than 4,000 community water systems which serve approximately 17 million New Yorkers on a daily basis. The City of New York is the single largest water supplier in the country, serving approximately eight million city residents and a million upstate residents, as well as the millions of visitors to the city.

We recognize that the public water supply systems for New York City and around the state may be vulnerable to sabotage. For example, physical destruction of a drinking water or wastewater system could deprive a population of its essential water supply, as well as cause serious secondary effects, such as the inability to ensure sanitation or to provide fire protection to the affected population. Manufacturers and other businesses similarly could be deprived of water resulting in serious consequences for local economies. While there are some barriers to biochemical threats, such as dilution and treatment, we take such potential threats seriously.

All water systems in New York State are on alert and are well-prepared to avoid a catastrophic terrorist attack. Looking toward the future, however, we envision a need to improve analytical testing methodologies, to identify possible biochemical threats, and enable a rapid response to them.

Page 38 PREV PAGE TOP OF DOC

The renowned Wadsworth Center for Laboratories and Research at the New York State Department of Health, and others, have begun to research new methodologies that may provide for the rapid identification of a contaminant introduced into a water supply. This bill could assist these efforts by providing new avenues for high-quality research on the means to protect ourselves from threats to drinking water and wastewater systems.

Mr. Chairman, while the State of New York obviously cannot publicly discuss in detail the potential vulnerabilities of our drinking water and wastewater systems, I want to make it clear that New York is taking those steps which are necessary in the short term to protect these systems and other critical infrastructure. For the longer term, we recognize that targeted research will help us craft new and sophisticated means to ensure that our public remains safe.

Governor Pataki is dedicated to protecting not just the investment that the state has made in its infrastructure, its economy, and its bountiful national resources, but also in its most important asset, our diverse and irreplaceable citizens.

While the state mourns the loss of those who died on September 11, we recognize the urgency of moving ahead to ensure that such a heinous act never occurs again. This bill fits well within the state's long-term plans for the protection of its water infrastructure and population, and I urge you to move this legislation quickly. Thank you, Mr. Chairman.

[The prepared statement of Mr. Kallstrom follows:]

Page 39 PREV PAGE TOP OF DOC

PREPARED STATEMENT OF JAMES K. KALLSTROM

Chairman Boehlert, thank you for providing me with this opportunity to share with you the State of New York's perspective on the protection of water infrastructure from the threat of terrorist attacks. In particular, I want to emphasize the State's strong support for H.R. 3178. If enacted, this legislation will contribute greatly to the State's long-term plans to protect our valuable drinking water supplies and clean water infrastructure. We also are watching the progress of S. 1593, a virtually identical bill introduced by Senator Jeffords, which was approved by the Senate Environment and Public Works Committee on November 8th.

Mr. Chairman, as the world knows, the State and City of New York felt the brunt of the devastating terrorist attacks which stunned our Nation on September 11th. While Governor Pataki already had initiated a wise effort to assess our vulnerability to terrorist attacks—an effort which began after the Oklahoma City bombing—the horrific actions of September 11th heightened the State's sense of vulnerability and the need to ensure that its citizens, structures, and natural resources are protected effectively from any further attacks. In response to these attacks, Governor Pataki created the Office of Public Security (OPS). I have been honored to be named as its first Director.

Governor Pataki has charged me with developing a comprehensive statewide strategy to secure New York State from acts of terrorism or terrorist threats. OPS will tie together all State efforts to detect, identify, address, respond to and prevent terrorist acts from occurring within the State. My Office coordinates its

activities with the federal Office of Homeland Security and with counties throughout the State. The efforts which OPS will undertake include both short-term actions—those protective steps that we can undertake immediately—and long-term efforts to lessen our vulnerability to attacks and to ensure that the events of September 11th never happen again.

Page 40 PREV PAGE TOP OF DOC

At the forefront of State and local efforts to protect our citizens are actions to protect critical infrastructure, including drinking water and wastewater facilities. The risk to New York's drinking water supplies or wastewater treatment facilities is small, but real. For that reason, H.R. 3178, the Water Infrastructure Security and Research Development Act, can play an integral role in our efforts to protect the State's water supplies.

The research funds which H.R. 3178 would authorize are compatible with New York's long-standing tradition of academic innovation at the more than 300 public and private research universities and institutions of higher learning in New York State. Long recognized as the birthplace of technology and innovation, New York ranks among the world's most sophisticated and prestigious locations for technology-driven research—the type of research which we envision would be undertaken through H.R. 3178. New York State has a network of outstanding public and private research universities, a workforce tailor-made for making advances in technology, and a "brain trust" of more than 360,000 scientists and engineers. New York also has nearly 10 percent of the nation's Ph.D.s, 199 members of the National Academy of Sciences, more than 10 percent of the entire membership of the National Institute of Medicine and nearly 170 members of the National Academy of Engineering.

The research which EPA could fund through H.R. 3178 can help us to find new means to protect the drinking water supplies at more than 4,000 community water systems which serve approximately 17 million New Yorkers on a daily basis. The City of New York is the single largest water supplier in the country, serving approximately eight million City residents and a million upstate residents, as well as the millions of visitors to the City.

Page 41 PREV PAGE TOP OF DOC

We recognize that the public water supply systems for New York City and around the State may be vulnerable to sabotage. For example, physical destruction of a drinking water or wastewater system could deprive a population of its essential water supply, as well as causing serious secondary effects such as the inability to ensure sanitation, or to provide fire protection to the affected population. Manufacturers and other businesses similarly could be deprived of water, resulting in serious consequences for local economies. While there are some barriers to bio-chemical threats, such as dilution and treatment, we take such potential threats seriously.

All water systems in New York State are on alert and are well-prepared to avoid a catastrophic terrorist attack. Looking toward the future, however, we envision a need to improve analytical testing methodologies to identify possible bio-chemical threats and enable a rapid response to them. The renowned Wadsworth Center for Laboratories and Research at the New York State Department of Health and others have begun to

research new methodologies that may provide for the rapid identification of a contaminant introduced into a water supply. H.R. 3178 could assist these efforts, by providing new avenues for high-quality research on means to protect ourselves from threats to drinking water and wastewater systems.

Chairman Boehlert, while the State of New York obviously cannot publicly discuss in detail the potential vulnerabilities of our drinking water and wastewater treatment systems, I want to make it clear that New York is taking those steps which are necessary in the short-term to protect these systems and other critical infrastructure. For the longer term, we recognize that targeted research will help us to craft new and sophisticated means to ensure that our public remains safe.

Page 42 PREV PAGE TOP OF DOC

Governor Pataki is dedicated to protecting not just the investment that the State has made in its infrastructure, its economy, and its bountiful natural resources, but also in its most important asset—our diverse and irreplaceable citizenry. While the State mourns the loss of those who died on September 11th, we recognize the urgency of moving ahead to ensure that such a heinous act never occurs again. H.R. 3178 fits well within the State's long-term plans for the protection of its water infrastructure and populace, and I urge you to move this legislation quickly.

Chairman **BOEHLERT.** Thank you very much. Just a couple of observations. One, the majority of the water that those eight million people in New York City drink comes from my district. And I am highly——

Mr. **KALLSTROM.** That is right.

Chairman **BOEHLERT** [continuing]. Interested in——

Mr. **KALLSTROM.** That is right.

Chairman **BOEHLERT** [continuing]. Protecting that system for a whole lot of very valid reasons. Secondly, I want to compliment you and Governor Pataki, particularly, for having the vision prior to September 11 to create your office. And I want to congratulate him for having someone of your caliber in that office. And I would like to recognize Mr. Israel because he has the privilege of representing you here in Washington, D.C. Mr. Israel.

Mr. **ISRAEL.** Well, thank you, Mr. Chairman. Actually, I have the privilege of representing a portion of Long Island, and I would just say that I came to know Mr. Kallstrom when he, in a very calming and soothing way, helped lead the investigation of the crash of TWA Flight 800 on Long Island. He is so highly regarded by all Long Island public officials, Republicans and Democrats alike. Governor Pataki really did our state a wonderful service by appointing him as the Director of Public Security. And so I wanted to personally welcome him and thank him for all the work he has done on Long Island. And, Mr. Chairman, if I may, I would like to sign on to your bill as a cosponsor.

Page 43 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** Thank you so much.

Mr. **KALLSTROM.** Thank you.

Chairman **BOEHLERT.** Duly noted. Dr. Luthy.

STATEMENT OF DR. RICHARD G. LUTHY, PH.D., P.E., SILAS H. PALMER PROFESSOR OF CIVIL AND ENVIRONMENTAL ENGINEERING, STANFORD UNIVERSITY; CHAIR, NATIONAL RESEARCH COUNCIL'S WATER, SCIENCE, AND TECHNOLOGY BOARD

Dr. **LUTHY.** Here I am. Thank you for the invitation to discuss the security of our Nation's water systems. I applaud your consideration of H.R. 3178 and the development of anti-terrorism tools to protect the Nation's water.

This is an important first step, but the funding level needs to be at least 50 million to start to address these problems. Top priority should be given to protection of physical structures for water storage and transmission that serve large populations and that would be very difficult to replace, and also, to maintaining water quality through better monitoring, new treatments, and incorporating the concept of multiple barriers.

I caution you to question very carefully comments that I hear from officials that refer to truckload quantities of chemicals being necessary to cause harm because of dilution from the large volumes of water being handled. This simply isn't true, and all the more so if the goal is fear, anxiety, and disruption.

Page 44 PREV PAGE TOP OF DOC

Since the sad events of September 11, we now question the vulnerability of our water systems to deliberate attack or sabotage. But another reality is that many components of our water systems are aging and need repairs. As most systems are 50 to 100 years old, and while driven by a sense of urgency because of recent events, we need to consider carefully what can be done with new approaches that ensure both the security of our water systems while, at the same time, using such investments to enhance the reliability and capability of such systems.

Issues that need to be better understood include the following: First, what elements of the water system are most vulnerable to physical damage and how can we protect our water systems? Dams and aqueducts and pumping stations that capture and convey water over long distances to large populations are especially vulnerable. And while steps have been taken, like fencing and covering reservoirs, more is needed. In-place systems for natural disaster monitoring and response could serve as platforms to incorporate intrusion sensors and quick response to intentional damage.

Second, what chemicals or biological agents, and in what amounts, may do the most harm? This matter needs thoughtful analysis. Small quantities of toxic chemicals may cause panic and great economic disruption. The infective dose for certain spores or protozoan oocysts is such that these agents, in concentrated form, may contaminate very large volumes of unfiltered water. I caution also that something added to water does not have to be toxic. Merely introducing taste or odor or color would be very disruptive if the goal is fear and anxiety.

Third, how can we achieve early detection of chemical or biological agents in time to take corrective action? As the recent anthrax cases show, early detection is the key to thwarting an attack. Problems arising from intentional acts may not be detected until chemical or biological agents are at the treatment plant, or worse, in the distribution system. Cities like San Francisco, including Stanford, and New York City, have no treatment other than disinfection. Most analytical equipment is highly automated and could be more autonomous with new technologies.

Page 45 PREV PAGE TOP OF DOC

The chemical industry, and as we will hear, some national laboratories, are developing chemical analysis-on-a-chip and canary-on-a-chip for detection of hazardous compounds in the workplace. With modifications, such systems may be useful in routine monitoring of water supplies for a spectrum of compounds.

Fourth, how can operations be reconfigured to provide greater interconnectedness among source supplies and among water distribution systems? Interconnecting water supply and distribution systems means that one locality may help another under emergency conditions. Mutual aid pacts could include water supply, laboratory resources, operating assistance, and repair response. Our Nation has experienced sabotage of local water supplies in the past with alternative supplies being brought in while the affected system was flushed or repaired.

In the arid west, where I live, separate water supply systems are in place for agricultural and domestic use. With so much more water used in agriculture, interconnecting the agricultural water supply or groundwater systems could augment the domestic supply.

Fifth, how may multiple barriers be incorporated in treatment plant operations and in the distribution system to ensure greater safety? We should think of new ways to treat water. New technologies and augmented conventional technologies are needed, including stand-by treatment systems. Fortunately, advances in membrane, sorptive, and oxidative technologies can be brought to bear on this problem. We need to extend the multiple barrier design concept to create a series of hurdles and traps that can cope with chemical and biological agents. Multiple barriers comprising storage capacity, enhanced treatment, and mutual aid, provide the means and the time to address a problem.

Page 46 PREV PAGE TOP OF DOC

Lastly, are our water supply systems vulnerable to cyber attack? Essentially, every component of the water supply system is highly automated and dependent on electric power. Electronic security, emergency control backup, and emergency power capabilities of the water supply system need careful analysis and possible re-engineering.

In summary, H.R. 3178 has great potential to help assure the future safety of our Nation's water. A $50 million program would be the minimum for engineering analysis and problem-solving scientific developments and evaluation of water policies for the breadth of issues confronting the safety of our

Nation's water.

It will be critical that any new research program be organized and administered with great rigor, including independent peer-review process, to ensure that the best research is pursued and the best results are obtained. The needs are too great to do otherwise. Again, thank you for the opportunity to discuss the safety of our Nation's water.

[The prepared statement of Dr. Luthy follows:]

PREPARED STATEMENT OF RICHARD G. LUTHY

Safety of Our Nation's Water

Good morning, Chairman Boehlert and members of the committee. Thank you for the invitation to discuss the security of our nation's water systems. I am Richard G. Luthy, a professor of environmental engineering at Stanford University and chair of the National Research Council's (NRC) Water Science and Technology Board. The National Research Council is the operating arm of the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, chartered by Congress in 1863 to advise the government on matters of science and technology. The focus of our board's work is water resources, science, technology, and policy. Our results have been presented to this committee before. I have prepared remarks relevant to the current high interest in safe water supplies. These remarks are based on my knowledge and experience and the knowledge and experience of several of my colleagues, some of them also from the Water Science and Technology Board. The following comments explain the water system, how it may be vulnerable to intentional acts, and what actions should be taken and research done to better protect and improve the water system infrastructure. I hope this information is useful to your Committee as you consider the important business of refining and implementing H.R. 3178 and the development of anti-terrorism tools for the nation's water infrastructure.

Page 47 PREV PAGE TOP OF DOC

Water is essential to life and it is obvious that an adequate supply of clean potable water is essential not only for personal health but also for maintaining our nation's economic wellbeing. One of our greatest engineering accomplishments of the twentieth century was the development of our nation's water systems. These water systems comprise a number of integrated components: 1) *the water supply system,* including dams, reservoirs, rivers, and aquifer systems and water wells that are the source of our water, and the associated conveyance devices for delivering water where it is needed for domestic, commercial, and agricultural uses; 2) *the water treatment system,* including water treatment plants that remove impurities and harmful agents and which makes water suitable for domestic consumption and other uses; and 3) *the water distribution system,* comprising networks of pipes, pumps, and storage tanks that deliver clean water on demand to homes, commercial establishments, and industries.

Beginning about 100 years ago and continuing throughout the twentieth century, cities and states and the federal government made enormous investments in water systems to provide adequate supplies of water for use in the home, industry, and agriculture. Enormous gains in public health were realized by protecting our source waters and installing water treatment plants to provide chemically and microbiologically safe water.

These successes are evident by the virtual elimination of the most deadly water-borne diseases including typhoid and cholera. Today, because of our water supply, treatment, and distribution systems, we enjoy the best drinking water quality of anywhere in the world. This was achieved by unparalleled accomplishments in integrating and developing the components of the nation's water systems.

Since the sad events of September 11, we now question the vulnerability of our water systems to deliberate attack or sabotage. Although recognized in the past, the vulnerability of our water systems to deliberate acts has not received sufficient attention. The reasons include the fact that simply developing and maintaining our existing water systems received primary attention. Aside from concerns about the vulnerability of our water systems to intentional acts, another reality is that many components of our water systems are aging and need repairs, replacements, or upgrades. This state of affairs is not new. We have heard repeated concerns about our aging infrastructure. But now in the context of September 11 we are looking at the infrastructure of our water systems in a new light and thinking about things that must be done to protect our water systems from intentional acts. While driven by a sense of urgency because of recent events, we should not act precipitously. We need to consider carefully what is possible and what can be done with new approaches that ensure both the security of our water systems while at the same time using such investments to enhance the reliability and capability of such systems. After all, the fundamental mission of such water systems is to protect human health and insure economic wellbeing, and we should be asking ourselves whether there are better ways to do that.

Page 48 PREV PAGE TOP OF DOC

Some issues that need to be better understood to protect our water supply systems from intentional acts include the following. The answers to these questions require engineering analysis and problem solving, scientific advances, and evaluation of institutional arrangements and water policies.

What elements of the water system are most vulnerable to physical damage? How do concerns for physical damage vary depending on the source of water? How can we protect water systems from physical damage? Dams and aqueducts and pumping stations that capture and convey water over long distances are especially vulnerable to physical damage. But even water supplies taken from rivers or lakes may suffer if intakes are damaged. Similarly, groundwater withdrawn from wells relies on pumps and infrastructure delivery. The control of human access to critical water supply system components is an important issue and responses are likely to be much different for water supply systems located in parks and public places versus remote areas. While steps have been taken in the last twenty years, like fencing and covering reservoirs, more is needed to prevent intentional acts. Some aqueducts are hundreds of miles long; protecting these systems is especially challenging. Water supply systems are designed to withstand natural disasters. In-place systems for natural disaster monitoring and response could serve as platforms to incorporate intrusion sensors and quick response to intentional damage. The distribution system is more difficult to secure; though potentially affecting a smaller population, mass exposure is not needed if the goal is fear and anxiety.

What chemicals, biological agents or toxins may do the most harm to human health and disrupt the beneficial uses of water? What points in the water supply, water treatment, and water distribution system are most vulnerable to release of such agents? What amount of such agents would harm humans or disrupt service? It is believed for many toxic chemicals that truck-load quantities are needed to cause harm to the

water supply system because of the very large volumes of water being handled. But this matter needs thoughtful analysis. Small quantities of toxic chemicals, even if not directly harmful, may cause panic and great economic disruption. Who would want ,lo consume water with intentional addition of low levels of lead or cyanide? Biological agents and especially their toxins may be harmful at very low levels. The infective dose for certain spores or protozoan oocysts may be fewer than ten, and thus small volumes of these agents in concentrated form may contaminate very large volumes of unfiltered water. These issues are relevant to both surface water systems and those relying on groundwater as their source, especially those using water from carbonate or other aquifers in which the water residence times are relatively short. Elevated portions of distribution systems are a concern, being more vulnerable to entry of chemical or biological agent than pressurized conduits. Something added to water does not have to be toxic; merely introducing taste or odor would be very disruptive if the goal is fear and anxiety.

Page 49 PREV PAGE TOP OF DOC

How can we achieve early detection of chemical or biological agents in the water supply system in time to take corrective action before water gets to a water treatment plant or into the distribution system? We need better monitoring for early warning of the intentional addition of chemical or biological agent to the water supply. Water supplies are monitored routinely for a small number of contaminants and much less frequently for a large number of contaminants. Conventional laboratory methods are time consuming and require skilled analysts. Together, this means that problems arising from intentional acts may not be detected until chemical or biological agents are at the treatment plant, or worse, in the distribution system (some large U.S. systems, notably that of San Francisco and New York City have no treatment, other than disinfection). However, much can be done to improve this situation. Most analytical equipment is highly automated and could very likely be made more autonomous with new technologies. The chemical industry and some of our national laboratories are developing 'chemical analysis on a chip' for hand-held, portable, chemical analysis systems, and 'canary on a chip' for detection of hazardous compounds in the work place. With modification, such systems may be useful in routine monitoring of water supplies for a broad spectrum of compounds, both known and unknown. Innovations in immunoassays and nanotechnologies hold promise for rapid screening of chemical and biological agents. We shouldn't overlook time-tested methods like increased chlorine demand, taste and odor, turbidity, and other measures as useful surrogate indicators in conjunction with new procedures.

How can water supply system operations be reconfigured to provide greater interconnectedness among source water supplies and among potable water distribution systems? What might be the potential for groundwater or irrigation water resources shoring up contaminated surface supplies on an emergency basis? Interconnectedness means that in-place conduits allow the transfer from one water supply system to another. Interconnecting water supply systems offers greater assurance that if one component of the water supply system is lost then other water supplies may be put online to transfer water through stand-by conduits. Similarly, water distribution systems could be interconnected so that one locality may help another under emergency conditions. Mutual aid pacts could include water supply, laboratory resources, operating assistance, and repair response. Aside from the technical issues, how this systems approach, often called "regionalization," would work in practice requires cooperation on a regional (often watershed) basis. Historically, because of the fragmented nature of the water supply industry, there has not been as much attention to design for interconnectedness unless prompted after the fact by a chemical spill or natural

disaster. Our nation has experienced sabotage of local water supply systems with alternative water supply being brought in while the system was flushed or repaired. Greater interconnectedness results in inherently greater stability and flexibility, as systems comprising standby networks are more resilient to upset than monolithic entities. In the arid west, separate water supply systems are in place for agriculture and domestic use. Since so much more water is used in agriculture than by municipalities, conceivably interconnecting the agricultural water supply or groundwater systems could augment the domestic supply in an emergency. Again, there are many questions, both technical and institutional, on how this would work.

Page 50 PREV PAGE TOP OF DOC

What changes in system operations and what new technologies may provide a safeguard against chemical or biological agents? How may multiple barriers be incorporated in treatment plant operations and in the distribution system to ensure greater safety in our domestic water supply? As mentioned above, we should think of new ways of supplying and treating water. Examples include the installation of robust, stand-by systems that could deal with chemical or biological threats. New technologies and augmented conventional technologies are needed. Fortunately, advances in membrane, sorptive, and oxidative technologies can be brought to bear on this problem. In water reuse, a fundamental design paradigm is to install multiple barriers that provide adequate safeguards in converting wastewater to potable water. Such systems are not dependent on one process but several in a train that provide backup protection. Similarly, we need to extend the multiple barrier concept to create a series of hurdles that guarantee greater assurance that we can cope with chemical and biological agents. These barriers may extend from the water treatment plant to include the distribution system and point of use. Multiple barriers comprising storage capacity, enhanced treatment systems, and mutual aid provide the means and time to address a problem.

Are our water supply systems vulnerable to cyber attack and what can be done to safeguard against such threats? Historically most of the concerns for the safety of the water supply system have focused on natural phenomenon. Not to be overlooked, however, is the realization that essentially every component of the water supply system is highly automated. This includes electronic control of water pumping and storing, water treatment operations, and water transmission. Although these operations are backed up by manual controls, great damage could be done if the control of these systems were lost for a period of time due to cyber attack. Electronic security and emergency control backup capabilities of the water supply system need careful analysis and possible re-engineering. This concern could be just as real as chemical or biological threats.

Page 51 PREV PAGE TOP OF DOC

Among the items listed, top priority should be given to protect physical structures for water storage that serve large populations and that would be very difficult to replace, and to maintaining water quality through better monitoring and new treatments and incorporating the concept of multiple barriers.

In closing, the issues discussed above are crosscutting among disciplines and institutions. Answers to these questions and designing effective solutions to key problems will require broad-based studies comprising university and governmental research establishments, professional organizations, practitioners,

and operators, as well as advice from groups like the National Research Council. The challenges are great but so are the resources to make our water safer than ever before. H.R. 3178 appears to have great potential to help assure the future safety of our nation's water. While an important step in this direction, the appropriation request of $12 million is inadequate given the enormity, complexity, and diversity of issues outlined above. A $50 million program would seem to be the minimum for engineering analysis and problem solving, scientific developments, and evaluation of water policies for the breadth of issues confronting the safety of our nation's water supply, treatment, and distribution systems. It will be critical that any new research program be organized and administered with great rigor, including an independent peer review process, to assure that the best research is pursued and the best results are obtained. The needs are too great to do otherwise.

Again, thank you for the opportunity to discuss the safety of our nation's water systems. I will be happy to answer any questions you may have.

BIOGRAPHY FOR RICHARD G. LUTHY

Page 52 PREV PAGE TOP OF DOC

RICHARD G. LUTHY is the Silas H. Palmer Professor of Civil and Environmental Engineering at Stanford University and Chair of the National Research Council's Water Science and Technology Board. He received his B.S. in chemical engineering and M.S. and Ph.D. in environmental engineering from the University of California at Berkeley. Dr. Luthy was previously on the faculty at Carnegie Mellon University and former head of the Department of Civil and Environmental Engineering. His area of teaching and research is physicochemical processes and water quality. His research includes interdisciplinary approaches to understand phase partitioning and availability of organic contaminants and the application to water quality engineering and environmental quality criteria. He has served on several NRC committees on hazardous materials. Dr. Luthy is a member of the National Academy of Engineering.

76415t.eps

Chairman **BOEHLERT.** Thank you so much, Dr. Luthy. Mr. Danneels.

STATEMENT OF JEFFREY J. DANNEELS, DEPARTMENT MANAGER, SECURITY SYSTEMS AND TECHNOLOGY CENTER, SANDIA NATIONAL LABORATORIES

Mr. **DANNEELS.** Chairman Boehlert, and, distinguished members of the Committee, thank you for inviting me here today to testify on developing anti-terrorism tools for water infrastructure. In this testimony, I present a phased approach to improving the security of the water infrastructure. The immediate steps already undertaken to improve security, such as adding guards and additional water-testing protocols, are neither sustainable, nor do they provide a balanced approach for improving security in all parts of the water infrastructure.

Page 53 PREV PAGE TOP OF DOC

In parallel with this immediate response, research should begin immediately on intermediate and long-term solutions that will significantly reduce risk to America's water infrastructure. I would like to summarize the recommendations that I have included in my written testimony.

The work suggested by H.R. 3178 must be integrated with testing and other efforts underway to understand which contaminants are the greatest risk to the water infrastructure. H.R. 3178 should support the following efforts: The security risk assessment methodology for water systems, new security technologies, real-time monitoring, SCADA, or Supervisory Control and Data Acquisition system research, and advanced treatment techniques.

The security risk assessment methodology being developed by Sandia will require significant improvement in the coming years to both reduce the cost of performing the assessments and to incorporate new features into the methodology. Some of the tools used in the methodology can be automated. The methodology must be flexible to incorporate new threat information as it becomes available and generic to cover a wide range of systems. This methodology is being developed for medium and large size cities; a parallel effort must be started to determine the best approach for small systems as well.

New security technologies are being developed for specific infrastructure threats, such as explosives detection for airports. Security technologies that may be required for water utilities might include on-line radiation monitors to detect radiation contamination in large flows and possibly, active access delay systems for remotely controlled facilities.

Page 54 PREV PAGE TOP OF DOC

A significant effort will be required to design, integrate, miniaturize, and cost-effectively produce a knowledge-based, real-time monitoring system. Many of the biological contaminants of concern are difficult to detect and require several days to complete the existing identification testing protocols utilizing expensive instrumentation.

Much of the basic research on new identification schemes is scattered at numerous institutions around the country. A new model of cooperation may be required to develop integrated sensors into a real-time water quality monitoring capability. A systems integrator agency or organization should be responsible from the start for the effort to integrate, miniaturize, and produce a viable, cost-effective system.

The existing SCADA systems have many vulnerabilities, yet these computerized controls will play an increasingly important role as automation is employed to reduce operating costs. Both legacy systems and the new systems are vulnerable to hackers. Standards, security and operation protocols, and secure platforms all require research and development to protect the control system.

Research into advanced treatment techniques to remove a broad range of potential contaminants, both for protection from intentional acts, and to meet new drinking water standards, is necessary. This research will support the analysis to determine if fundamental changes are needed in the way America's potable water is supplied. A parallel effort to understand the most cost-effective manner to supply reliably safe, secure water should be a top priority. This effort will provide the long-term solutions.

H.R. 3178 should provide flexibility in approaches and funding to support this type of effort. Current water programs, such as the Safe Drinking Water Act, to protect potable water, may need to be extended or altered to meet the new enhanced security requirements. Integrating security while solving the other needs of the water infrastructure is the right approach.

Page 55 PREV PAGE TOP OF DOC

Finally, H.R. 3178 provides accountability, focus, and structure for a security program within the water infrastructure.

Now, I will see if I can challenge your AV system this morning. See if this—okay—it is on a couple—it is challenged. It is on a couple of the monitors. Okay. We talked a little bit about real-time monitoring, and I just wanted to show you some of the things that Sandia has been working on. These are hand-held chemistry laboratories.

The one that you see is an early prototype. It actually looks a little different today. But that is a gas analysis system. And the one on the bottom is a liquid analysis system. And so, basically, what we are trying to do is to take something that is a bench top or fairly large, expensive instrument and turn them into real-time monitors. These are not just a dream. These things actually exist. And these are some results you will see from liquid chem lab on actual testing on agents—biotoxins that we are concerned that somebody might put in the water supply. It takes about four minutes presently. Now, these are in prototype stage. These are not—you know, I don't have any to sell today. We are not at that point. But somebody—it is getting close that somebody could commercialize these type of things.

This is the gas phase Microchemlab. This has been tested on live agents. This is export controled data, so I had to take off the agents that it has been tested on. But it will do these things in about 90 seconds. So these things exist today.

Right there inside the pea pod are the working parts of the gas phase Microchemlab. For those of you that have a chemistry background, that is a gas chromatograph, a pre-concentrator and a SAW device. And those are basically the working parts.

Page 56 PREV PAGE TOP OF DOC

The point of these things is once they are developed and turned into an engineering type model, they can be manufactured for very little cost. Now, the first one might cost you a whole lot of money, but the second one won't. And I will—the video clip I will get rid of—it didn't work. But I just wanted to show you these things as a kind of a follow-on to the testimony. These things exist and are working. Thank you.

[The prepared statement of Mr. Danneels follows:]

PREPARED STATEMENT OF JEFFREY J. DANNEELS

INTRODUCTION

Chairman Boehlert and distinguished members of the committee, thank you for inviting me here today to testify on the topic of developing anti-terrorism tools for the water infrastructure. My name is Jeffrey J. Danneels and I lead the effort at Sandia National Laboratories (Sandia) to improve water infrastructure security. Sandia National Laboratories is managed and operated for the U.S. Department of Energy (DOE) by Sandia Corporation, a subsidiary of the Lockheed Martin Corporation.

Sandia is a multiprogram laboratory of DOE and one of the three National Nuclear Security Administration laboratories with research and development responsibilities in nuclear weapons and associated programs in nonproliferation and arms control. As a multiprogram national laboratory, Sandia also supports security programs in energy, critical infrastructures, and emerging threats, as well as work for the DOE, the Department of Defense, and other federal agencies.

Page 57 PREV PAGE TOP OF DOC

As the lead laboratory for physical security research and development for DOE's Office of Safeguards and Security, Sandia has a rich history providing security solutions for high-consequence facilities. Over the past 25 years, DOE has invested over $500 million in Sandia's security programs. The results of this investment include unique sensor-testing facilities, advanced security systems, a wealth of system-testing experience and capabilities, and a large, multidisciplinary technical base. Sandia's extensive security experience is complemented by a wide range of in-house science and engineering expertise, including water resources management and use, advanced water treatment techniques, cooperative water agreement monitoring programs, and contaminant fate and transport, as well as dynamic simulation modeling. This expertise in related water areas complements and provides technical support to Sandia's work in water infrastructure security. Sandia also has many years of experience in the information security arena. Beginning with command and control for nuclear weapons, Sandia's expertise has expanded to include network security, cryptography, secure Supervisory Control and Data Acquisition (SCADA) for critical infrastructures, and information system security assessments.

This testimony presents a phased approach to improving the security of the water infrastructure. The immediate steps already undertaken to improve security, such as adding guards and additional water-testing protocols, are neither sustainable, nor do they provide a balanced approach for improving security in all parts of the water infrastructure. In parallel with the immediate response, research should begin on intermediate and long-term solutions that will significantly reduce the security risk to America's water infrastructure. As an example, real-time monitoring for chemical and biological contamination could become a reality in the next three to five years. In the long term, systems studies for understanding the most effective methods to meet new drinking water quality standards while providing enhanced security may point to fundamental water system changes. Recommendations for a focused and effective research program to address these issues will be presented in the conclusion of this statement.

Page 58 PREV PAGE TOP OF DOC

As the responsible public agency for the protection of the water infrastructure, the Environmental

Protection Agency (EPA) joined with the American Water Works Association Research Foundation (AwwaRF) and Sandia to address the security issues surrounding our national water infrastructure. Sandia is presently developing a security risk assessment methodology for the water infrastructure. This methodology addresses security from a systems perspective by considering both physical and cyber security and their interdependencies with other critical infrastructures.

BACKGROUND

To improve the security of our nation's water infrastructure, the present conditions of the water infrastructure and needs for the future must first be understood. A snapshot of the current national water infrastructure can be drawn from the publications of the EPA, the American Water Works Association (AWWA), the AwwaRF, the National Research Council, the Water Infrastructure Network (WIN), and other water utility specialists. While many of the identified water infrastructure requirements do not directly relate to security, meeting these requirements provides ample opportunity to enhance security as improvements are implemented. Now is the time to ascertain whether fundamental changes in the way the water industry supplies drinking water can result in cost-effective improvements across the spectrum of current water infrastructure concerns.

Water Infrastructure

The EPA (1999) has explored the size and number of the water utilities that comprise our national water infrastructure. Approximately 170,000 public water systems provide water for more than 250 million Americans. Public water systems axe "water systems that provide drinking water to at least 25 people or 15 service connections for at least 60 days per year." The EPA recognizes two primary types of public water systems:

Page 59 PREV PAGE TOP OF DOC

Community Water Systems, which provide drinking water to the same people year-round. Approximately 54,000 community water systems currently serve America's homes. Of these community water systems, about 350 are large enough to serve more than 100,000 customers.

Non-Community Water Systems, which serve customers on less than a year-round basis. These systems can be further subdivided into two categories:

1) Non-community water systems that serve 25 or more people for more than six but less than 12 months, such as schools or factories with their own water sources. America has more than 20,000 of these systems.

2) Non-community water sources that provide water to sites where people are transient, such as gas stations or campgrounds. More than 96,000 systems fit this category (EPA, 1999).

Literature searches that cover the past 100 years reveal very few malevolent attacks on the water infrastructure in the United States. The information that is available is of limited use to predict the types of attacks that might be perpetrated in the coming years.

Outdated and Resource-Limited Infrastructure

There were more than 270 million water-consuming Americans at the turn of the new century, which included an increase of about nine percent during the 1990s for a total increase of 120 million (80 percent increase) since 1950. The U.S. Census Bureau's middle estimate projects another 120 million people added by 2050. "The implications of this forecast, even if not fully realized, are manifold and complex: the nation will essentially have to replicate all the housing and infrastructure built since World War II, in addition to repairing and replacing what already exists" (according to the National Research Council, 2001). The anticipated additional burdens upon the aging water infrastructure are a significant consideration. To meet the water needs of 390 million Americans in 2050, a clear strategy must be developed now. According to an AWWA report that analyzed 20 utilities, "expenditures on the order of $250 billion over 30 years might be required nationwide for the replacement of worn-out drinking water pipes and associated structures (valves, fittings, etc.). This figure does not include wastewater infrastructure or the cost of new drinking water standards" (AWWA, 2001).

Page 60 PREV PAGE TOP OF DOC

The typical high-volume, urban domestic water utility was designed to deliver water for firefighting as well as for public consumption. In many cases, less than one percent of the treated water flowing from an urban water utility is consumed (drinking and cooking). In Milwaukee, for example, 41 billion gallons per year of treated water is pumped into the distribution pipeline. This amounts to over 125 gallons per user per day. Yet only about one-half gallon, or less than one-half percent of this volume, is consumed by the user each day. Similarly, Albuquerque pumped 38.6 billion gallons of well water to serve approximately 450,000 residents in 1999, which is over 235 gallons per user per day (City of Albuquerque, 2000). Less than one-quarter of one percent of the treated volume was consumed. Why is 100 percent of the water supply being protected at the same level as the one percent that poses the greatest health threat?

Natural outbreaks, such as *Cryptosporidium*, have already shown the risks in the current system for the immunity-compromised, the very young, and the aged populations. A survey of the literature documents only one death in the United States from intentionally contaminated water in the past 100 years (Tucker and Sands, 1999). However, doctors from Harvard and the Medical College of Wisconsin estimated that as many as 10,700 or more rectal and bladder cancers may be caused each year by trihalomethanes and other water disinfection byproducts (Morris et al., 1992). The Journal of Epidemiology also reports that these chemicals are associated with pancreatic cancer (Geldreich et al., undated) and may be associated with major birth defects (Bove et al., 1992). Historically, chemicals intentionally introduced into the water system for disinfection or other treatment processes posed more of a threat to the health of the general public than poisons emplaced by criminals or terrorists.

Page 61 PREV PAGE TOP OF DOC

In April 2000 WIN released its first report, documenting the need for significant improvements in water quality and public health. These proposed improvements, although not universally accepted, were associated with America's investments in the water and wastewater infrastructures. This report also projected the financial costs of maintaining such a level of improvement. Between now and 2020, a $23 billion per year

increased investment will be required to meet national environmental and public health priorities and to repair and replace the crumbling water infrastructure. WIN, representing professional, technical, academic, environmental, labor, and government organizations involved in water infrastructure, declared that new investments are needed in the amount of nearly a trillion dollars in critical water and wastewater improvements over the next two decades. "Not meeting the investment needs of the next 20 years risks reversing the public health, environmental, and economic gains of the last three decades" (WIN, 2001).

Although violations of the Safe Drinking Water Act regulations are on the decline, significant numbers of systems affecting tens of millions of customers are out of compliance for one or more of the, EPA-regulated contaminants. In fact, the EPA has concluded that the number of monitoring and reporting violations is greatly underestimated:

Over the past year, EPA has been evaluating the quality of the data used to assess the effectiveness of the drinking water program. . .. This analysis concluded that about 90 percent of monitoring and reporting violations which should have been reported were reported incorrectly or not at all (EPA, 1999).

Solutions are needed that address all these concerns. Enhanced security features for water utilities should become an important feature of all new designs and retrofits. In addition to the oft mentioned chemical and biological contamination threats, water utility targets could include physical and cyber disruption of facilities resulting in long-term shortages or loss of public confidence.

Page 62 PREV PAGE TOP OF DOC

WATER INFRASTRUCTURE SECURITY PROGRAM—PHASED APPROACH

The events of September 11, 2001, caused the nation to consider the vulnerability of many of our critical infrastructures. The water infrastructure was not built to withstand terrorism and is vulnerable to four broad classes of attacks:

Chemical contamination,

Biological contamination,

Physical disruption, and

Disruption of the computerized control network known as the SCADA system.

Improving security system effectiveness or reducing the consequences of an attack are the two most important ways to reduce water infrastructure risk. The ultimate goal of a water infrastructure security program is to make the water infrastructure an unattractive target for terrorism. The purpose of this testimony is to help identify an effective, phased approach for achieving this goal. The many forces driving change in the reliability and safety of the water infrastructure provide ample opportunities to improve security in parallel with other required modifications.

The water infrastructure is subject to a large number of additional needs and financial stresses beyond

terrorist attack and other malevolent human threats:

Page 63 PREV PAGE TOP OF DOC

Monitoring and reporting requirements have increased significantly.

There is a continuing need for investment in new facilities to keep pace with expected population growth.

A large maintenance and upgrade investment is necessary to replace aging infrastructure.

Additional financial investments will be required to address the large number of contaminants under consideration for regulation by the EPA as well as those contaminants yet to be studied or even identified.

Many of the standards for regulated water contaminants are expected to become more stringent in the near future.

Water system managers are under enormous pressure to improve the security of the water supply in the coming weeks or months. Unfortunately, the realities of the existing infrastructure—unprotected reservoirs, systems with no water treatment capabilities, large and aging treatment facilities, open and broadly dispersed distribution systems, minimal real-time monitoring capabilities, under-protected information and SCADA systems, and the lack of ties between water delivery systems—render it extremely difficult to protect. There is no quick or cheap fix.

Phased Approach

Page 64 PREV PAGE TOP OF DOC

A phased approach to improve water infrastructure security will yield the best results. The phases to reduce identified risks to the water supply infrastructure include the near term, which will yield results in the next one to three years; the intermediate term, which is three to five years from now; and the long term, from five to ten years in the future. Actions on all phases should begin immediately.

Near Term

There are four areas of security that should be addressed in the near-term phase: threat definition, information protection, short-term risk reduction, and training.

Threat definition: The range of threats that a water utility should be prepared to address must be better defined. Some government agencies have drafted what they believe is their credible threat spectrum or description into a classified document. These agencies want their protection systems for critical facilities to have a reasonable likelihood of stopping specific defined threats. Until the water industry understands and defines the probable threats to its systems, there can be no consistency across the infrastructure.

Engaging the Federal Bureau of Investigation, the Centers for Disease Control, and other information and intelligence agencies to help define the threat is an important near-term step. Defining the threat or threats

against which the water infrastructure should be protected is the necessary first step in improving security. This threat can be graded based upon the severity of the consequences that threat-caused disruptions have on a specific water system; but without this consistent threat definition, the security requirements, preparedness, and capabilities of the water infrastructure and its individual systems cannot be assessed or compared.

Page 65 PREV PAGE TOP OF DOC

Information protection: Because many drinking water utilities are operated or administered by local governments, they are subject to state disclosure laws, often referred to as sunshine laws. These state laws are not pre-empted by federal laws. Appropriate methods to protect security information and the results of vulnerability assessments at drinking water utilities must be implemented in the near term.

For example, the Association of Metropolitan Water Agencies received a grant from the EPA to create an Information Sharing and Analysis Center (ISAC). This badly needed tool will help disseminate security information and knowledge among drinking water utilities, but the ISAC information itself may be subject to sunshine law disclosure requirements once the information is accessed or used by a utility. Obviously, existing sunshine laws would severely limit the desirability of participating with ISAC or sharing the type of information that the ISAC could provide to other utilities. The Critical Infrastructure Protection Advisory Group, made up of water industry associations, government agencies, and several water utilities that represent the water sector, should address this issue and provide guidance to Congress for possible legislative changes.

Short-term risk reduction: A security risk assessment methodology for the water infrastructure is being developed and field-tested and will require several months to complete. Having a standard methodology for assessing the security risks in the water infrastructure will help ensure the completion of comprehensive and comparable risk assessments. Sandia is also performing security risk assessments of specific water utility systems in parallel with the methodology development. This effort will identify a spectrum of short-term improvements that can be quickly implemented either to increase protection system effectiveness or to reduce consequences or potentially do both. However, this first-round effort cannot be as thorough as desired due to the lack of knowledge about potential chemical and biological contaminants as well as other credible threats.

Page 66 PREV PAGE TOP OF DOC

Short-term security improvements include upgrades to physical and cyber security systems, developing security processes and procedures, implementing operational changes, increasing water quality testing protocols, and completing background checks on employees. Instrumentation presently in use to measure pH, chlorine residual, total organic carbon, conductivity, and other parameters may also be employed to detect impacts on water quality from malevolent acts.

Training: Developing and refining the security risk assessment methodology for water utilities and training the utility personnel and their consultants on the methodology are important near-term steps. AwwaRF and

the EPA are partnering with Sandia to develop and present a three-day course on performing risk assessments for water systems in December of 2001. Although the methodology is not expected to be completely verified and validated by that time, the urgency of the need for this tool is immediate.

This course will include classroom training as well as a practical application that will enable the trainees to begin a risk assessment of their own facilities. EPA is also partnering with Sandia to develop a "Train the Assessor" course to train consultants to perform water system risk assessments and to evaluate the potential risk reduction from proposed operational and security upgrades. This training will provide hands-on experience with many physical protection technologies so that participants can understand their uses and limitations.

Awareness training can also improve water security. Industry associations are supplying awareness videos to their memberships, their websites are full of helpful information, and awareness courses are being planned. The goals of the awareness program are to educate water utility owners and operators on the importance of protecting the water infrastructure and to initiate steps to implement and accomplish this protection.

Page 67 PREV PAGE TOP OF DOC

Intermediate Term

In the three-to-five-year range, water utilities should take a more balanced approach to the security of their systems. Installing real-time monitoring equipment, improving redundancy, adding back-up systems, enhancing SCADA security, and employing security technologies should be accomplished over the intermediate term. A balanced approach is necessary to ensure that the security of the entire system is enhanced; otherwise, weak links can be exploited by an adversary. All parts of the water infrastructure, including the supply, treatment, and distribution components, require improvements to achieve a consistent level of protection throughout the system.

Real-time monitoring: New monitoring capabilities to detect water-borne chemical and biological contaminants are needed throughout the water infrastructure, from source water monitoring to continuous monitoring at multiple locations throughout the distribution system. Monitoring the source water will provide an early warning detection capability that allows water utilities to close water intakes in response to a drop in water quality. Monitoring the distribution pipelines and storage reservoirs will provide continuous feedback on water quality to detect malevolent contamination, allowing parts of the distribution system to be isolated in the event of an attack. More research is required to identify the potential biological and chemical contaminants that pose the greatest or most likely risk to the water infrastructure. A prioritized list of contaminants should be developed to drive the development of real-time sensing capabilities for those contaminants that present the greatest security risk. In the intermediate term, existing instrumentation can be integrated with new microanalytical systems to provide real-time monitoring for many contaminants.

Page 68 PREV PAGE TOP OF DOC

Sandia and the DOE Chemical/Biological Nonproliferation Program have invested more than $11 million to design and prototype hand-held chemistry laboratories. This work draws upon Sandia's expertise in microsystem technology to miniaturize laboratory chemical analysis. This effort has resulted in the development of two hand-portable systems capable of rapid and sensitive analysis of chemical constituents and impurities—one for gases and the other for liquids. The focus to date of the liquid analysis system has been biowarfare agents (biotoxins). Experiments with the prototype liquid analysis system demonstrated complete analysis of toxins in less than 4 minutes. With an investment in research and development, real-time sensing systems to monitor water quality could be made widely available. Not all contaminants can be detected in the intermediate-term, but the ability to detect many potentially deadly agents could significantly reduce the risk to the water consumer.

Redundancy: Risk can be reduced significantly by increasing the redundancy in the water infrastructure. These improvements reduce consequences rather than enhance security. The security risk assessment methodology can be used to identify components within the water utility that can leave the system vulnerable to "single points of failure," an engineering term used to identify weaknesses that can cause the entire system to fail. Adding pipelines, storage tanks, or alternate energy sources may eliminate these vulnerabilities and improve operational capabilities as well.

Back-up systems and spares: The water infrastructure is highly dependent on the electrical power grid to pump and treat water. However, loss of power does not result in an immediate loss of water supply for most water utilities because the amount of water stored in large reservoirs can be used for temporary supply. As with redundancy, additional back-up capabilities will reduce consequences. Back-up generators that are designed and installed, or working with the local power supplier to provide equipment during an extended power outage, can reduce risk by reducing consequences.

Page 69 PREV PAGE TOP OF DOC

Many of the existing pumps, valves, and other mechanical equipment are old, and replacement parts are no longer available. Manufacturing spares of some critical components and storing them away from the facilities could reduce consequences of a physical attack as well as the consequences of an equipment failure.

SCADA improvements: Many of the legacy SCADA systems were designed with little or no protection. Standards are being developed to include enhanced security measures. Both legacy systems and new systems should include these updated features.

Security technologies: Once the threat or threats are better defined, appropriate application of security technologies should be part of the intermediate-term security improvement program. Detection, assessment, and delay elements can be incorporated around critical assets to help defeat an adversary. The security elements employed should become part of an independent protection system, rather than a part of the SCADA system and thus a collateral responsibility for facility operators. Also, a single point of failure vulnerability is created by routing the security system through the SCADA system.

Long Term

Over the long term, the changes to our water infrastructure are likely to be profound. Solutions to the

security risks inherent in our water system can best be addressed through fundamental changes that require a re-evaluation of the functions, capabilities, and limitations of the water infrastructure. The need for revitalizing our deteriorating water infrastructure, the growing demand from increasing populations, and the anticipated more stringent water quality regulations combine with the emerging requirements for improved security to drive system owners and operators to consider fundamentally changing the way water is provided to users. Water sources will be difficult, if not impossible, to protect from intentional contamination. Huge water treatment plants covering acres of often-vulnerable real estate are too big to cost-effectively protect against intrusion. Water distribution pipelines have hundreds of thousands of access points. Traditional security measures such as increased physical security (e.g., guards and fences) can help, but these measures constitute neither a complete nor a very cost-effective solution. Fundamental changes in our approach to potable water supply, treatment, and delivery may be required to provide the most efficient and economical approach to water supply safety, security, and reliability. Researching alternative solutions, looking for ways to reduce the consequences of an attack or accident, developing advanced treatment technologies, moving toward distributed treatment, crafting new drinking water safety and security standards, understanding how to protect critical assets, and providing water system security education are long-term solutions to the problems faced by the water infrastructure.

Page 70 PREV PAGE TOP OF DOC

Alternative solutions: A range of solutions can be considered. The solution alternatives that should be investigated for applicability and feasibility include use of bottled water, point-of-use or point-of-entry treatment, distributed treatment, and dedicated potable water distribution. On one end of the spectrum are the high-end advanced membrane filtration systems (reverse osmosis) coupled with granular activated carbon that might be employed at the water treatment facility to provide bottled water for an entire community. The expense of producing the water is almost insignificant compared to the costs of bottling and distributing the treated water, but the final cost is likely to be much lower than today's bottled water. On the other end of the spectrum would be small point-of-use treatment applications. Such systems as under-the-sink faucet filters, employing advanced membranes or other technologies, could be used to reduce biological as well as many of the chemical hazards. Filtration processes and some treatment activities at the water treatment facility would continue, but final drinking water quality treatment would be at the point-of-use or point-of-entry.

Reducing consequences: End-users want to be guaranteed that the water they are consuming is safe. Zero risk cannot be achieved, but new or retrofitted facilities and operations may provide a much greater probability of delivering safe water through our taps. The security risk assessment methodology applied to the water infrastructure elevates the importance of consumed (drinking and cooking) water because an attack affecting consumed water would have the highest likelihood of impacting large populations and hence have the greatest consequences. While more study is required to identify the toxicity of biological contamination through cutaneous contact with water, inhalation and ingestion routes of human exposure are now of highest concern.

Advanced treatment technologies: If the option is considered to protect the one percent of water that is consumed for drinking and cooking, the question then becomes how that goal is best achieved. Biological contamination has been singled out as a concern, both as a malevolent and a natural threat. Existing

technologies of sand/anthracite filtration, micro- and ultra-filtration, and treatments with ozone, ultraviolet, and chlorine significantly reduce biological threats. Nanofiltration and reverse osmosis systems can filter out biological contaminants in the range of 0.001 microns and greater (Osmonics, Inc., 1996). Pathogenic biological organisms that fall into this size category include *Cryptosporidium, Giardia,* viruses, fecal coliforms, and various bioagents such as anthrax spores. Many of the chemical contaminants that might be used to contaminate water supplies can also be removed using these advanced treatment technologies. These same technologies, particularly the advanced membranes, can be used to more effectively treat saline water as well. Treating only one percent of the water would allow us to use these sophisticated treatment technologies that are prohibitively expensive for use on all the water. Further research is needed to improve both the effectiveness of removing contaminants as well as the cost effectiveness of these methods.

Page 71 PREV PAGE TOP OF DOC

Distributed treatment: The middle of the spectrum that ranges from point-of-use approaches to whole-system treatment solutions includes localized or community-based systems that provide the final drinking water quality treatment. These systems could serve hundreds of customers or individual buildings. The treatment systems would be very small if dedicated potable water distribution were included in this approach. Distributed systems would make it very difficult to attack a large population. This option seems to offer an attractive economy of scale compared to filtration units in every home or building a new delivery system for bottled water. Over the past five years, the EPA's Environmental Technology Verification (ETV) Program (EPA, 2001), in cooperation with the National Sanitation Foundation, has been verifying the performance of a variety of innovative (ultraviolet, filtration, ozonation) drinking water package treatment plants that could potentially be candidate regional/neighborhood treatment systems.

New drinking water safety and security standards: Solutions are needed that reduce risk to the public and offer the ability to meet the anticipated more stringent drinking water standards. The proposed arsenic standard is an example of a new regulation that will require significant investments in the water infrastructure, a treatment that is unnecessary for 99 percent of the water processed. Point-of-use, bottling water at the treatment facility, and neighborhood-finished treatment systems may offer a more economical solution to meeting new standards. Performing security risk assessments on the water infrastructure on a periodic schedule will help ensure that needed operation4l and security improvements are reducing risk.

Critical assets: With a fundamental change to the distribution system, it becomes much easier to determine the critical assets in the water infrastructure, such as pipelines and pumps. Many pipelines are deeply buried and thus are an unlikely target. However, main lines that are exposed may need increased security. If physical security measures can be employed to protect the existing pumps and new designs developed to separate and protect future pumps, the risk of physical disruption of the water supply can be significantly reduced. Another method to reduce water supply risk would be to tie major metropolitan water systems together. Most large metropolitan areas have the ability to treat and provide more water than is typically demanded by their customers. By constructing pipelines among the utilities and adding additional pumping capacity, the utilities would become more distributed, thus reducing the consequences of an outage.

Page 72 PREV PAGE TOP OF DOC

Education: Finally, once a course of action is determined, future water system designers must be educated and trained in these methods. Security measures and features designed and constructed at the onset of a project will cost significantly less than trying to add these features later. The water community will need to reach out to the American Society of Civil Engineers (ASCE), the AWWA, colleges, and other institutions to educate future designers on the new requirements identified for water utilities. The ASCE and the AWWA already work together to set standards for drinking water utilities, a partnership that can be used to implement needed security upgrades.

CONCLUSIONS

Efforts underway, such as the development of the security risk assessment methodology for water utilities, will require investments in the water infrastructure to provide a solid foundation for improving security. Refining and automating the methodology are clearly necessary efforts. This methodology will require significant development as more information is gained about potential contaminants and other credible threats to the water infrastructure. A clear understanding of potential threats and agreement at the national level about their credibility is important. The water utility risk assessment is a snapshot in time and should be repeated on a periodic basis.

Throughout the water infrastructure, but especially in the source water and distribution systems, early warning monitoring capabilities must be developed and installed. "There is a critical need for rapid online and field methods for detecting and quantifying both infectious agents and biotoxins in water and in other environmental samples" (Burrows and Renner, 1999). "The need for and scope of an early warning monitoring system should be guided by an assessment and prioritization of site-specific risks that includes a vulnerability analysis of the entire water supply system, including the watershed and distribution system" (ILSI, 1999). We must know what is in the water and have time to react before it is consumed.

Page 73 PREV PAGE TOP OF DOC

The current method by which water is treated and delivered should be re-evaluated. Distributed treatment systems, bottled water facilities at the water treatment plant, point-of-use filtration, or a combination of these measures will improve the security of consumed water. "The delegates to the American Assembly recommend utilities: Explore a new water deliver approach whereby water is treated to adequately protect against acute health risks. This approach could include additional polishing to protect against chronic risks for only that water used for actual human consumption" (Means, undated). More research is needed into methods to reduce the cost and improve the efficiency of treating saline water, which often relies on the same advanced technologies that new approaches to water delivery would employ. Treating 100 percent of the water to drinking quality while consuming less than one percent may no longer make sense. The socioeconomic consequences of all alternatives must be studied and understood.

A thorough study of the various alternatives and a cost/benefit analysis must be performed and a range of options developed for utilities to choose how best to improve their systems. The proposed alternatives all have advantages and disadvantages. Bottling water at the plant allows the equipment to be well maintained, uses the existing infrastructure, and employs economies of scale. Limitations include the challenges of developing a system to effectively deliver the water and gaining customer acceptance. Point-of-use systems

provide the greatest security, but have many drawbacks. The sheer numbers of devices required, maintenance issues, and the amount of water passing through some systems and then sent into the wastewater system would need to be addressed. Public education and transferal of public health responsibility to the consumer might not be acceptable.

Education and training are critical to the overall success of this program. Future designers of water supply systems need to be educated to consider security at the beginning of the design process. Water supply system operators and their vendors need to understand and assess the potential security risks in their systems and develop ways to manage, mitigate, or otherwise reduce those risks. The public needs to be educated to help protect their water supply and to understand why water delivery methods may need to change. Our collective goal is to make the water infrastructure an unattractive target for terrorism.

Page 74 PREV PAGE TOP OF DOC

RECOMMENDATIONS ON H.R. 3178

A research and development (R&D) program should be initiated immediately to study intermediate and long-term approaches to significantly reduce risk in the water infrastructure. Many of the efforts described in H.R. 3178 are the cornerstones of an effective R&D program. The work suggested by H.R. 3178 must be integrated with testing and other efforts underway to understand which contaminants axe of the greatest risk to the water infrastructure.

H.R. 3178 should support the following efforts: the security risk assessment methodology for water systems, new security technologies, real-time monitoring, SCADA protection, and advanced treatment techniques.

The security risk assessment methodology will require significant improvement in the coming years both to reduce the cost of performing the assessments and to incorporate new features into the methodology. Some of the tools used in the methodology can be automated. The methodology must be flexible to incorporate new threat information as it becomes available and generic to cover a wide range of systems. The methodology as developed is designed for medium and large cities; a parallel effort is required to determine the best approach for small systems.

New security technologies are being developed for specific infrastructure threats, such as the explosives detection portal for airports. Security technologies that may be required for water utilities might include on-line radiation monitors to detect radiation contamination in large flows of water, active access delay systems for remotely controlled facilities, and remote response platforms.

Page 75 PREV PAGE TOP OF DOC

A significant effort will be required to design, integrate, miniaturize, and cost-effectively produce a knowledge-based, real-time monitoring system. Many of the biological contaminants of concern are difficult to detect and require several days to complete the existing identification testing protocols utilizing expensive

instrumentation. Much of the basic research on new identification schemes is scattered at numerous institutions around the country. A new model of cooperation may be required to develop integrated sensors into a real-time water quality monitoring capability. A systems integrator agency or organization should be responsible from the start for the effort to integrate, miniaturize, and produce a viable, cost-effective system.

The existing SCADA systems have many vulnerabilities, yet these computerized controls will play an increasingly important role as automation is employed to reduce operating costs. Both legacy systems and new systems are vulnerable to hackers. Standards, security and operational protocols, and secure platforms all require research and development to protect the control system.

Research into advanced treatment techniques to remove a broad range of potential contaminants both for protection from intentional acts and to meet new drinking water standards is necessary. This research will support the analysis to determine whether fundamental changes are needed in the way America's potable water is supplied. A parallel effort to understand the most cost-effective manner to supply reliably safe, secure water should be a top priority. This effort will provide the long-term solutions.

H.R. 3178 should provide flexibility in approaches and funding to support this type of effort. Current water programs to protect potable water may need to be extended or altered to meet the new enhanced security requirements. Integrating security while solving the other needs of the water infrastructure is the right approach.

Page 76 PREV PAGE TOP OF DOC

Finally, H.R. 3178 provides accountability, focus, and structure for a security program within the water infrastructure.

REFERENCES

AWWA, 2001. *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure,* AWWA Water Industry Technical Action Fund study, American Water Works Association, Denver, CO, May 2001.

Bove, F.J., et al., 1992. *Public Drinking Water Contamination and Birthweight, Fetal Deaths, and Birth Defects and Public Drinking Water Contamination and Birthweight and Selected Birth Defects,* U.S. Public Health Service and the New Jersey Department of Health, 1992.

Burrows, W. Dickinson and Renner, Sara E., 1999. *Biological Warfare Agents as Threats to Potable Water* in Environmental Health Perspectives, v. 107, no. 12, pp. 975–984, National Institutes of Health, Washington, DC, December 1999.

City of Albuquerque, 2000. *Water Quality Report,* Water Quality Program, Public Works Department, Albuquerque, NM, July 2000.

EPA, 2001. See the EPA's Environmental Technology Verification (ETV) Program home page at: *www.epa.gov/etv*

EPA, 1999. *25 Years of the Safe Drinking Water Act: History and Trends,* United States Environmental Protection Agency, Office of Water (4606), EPA 816–R–99–007, Washington, DC, December 1999.

Page 77 PREV PAGE TOP OF DOC

Geldreich, E., et al., undated. *Summary Report: Investigation of the Cabool, Missouri Outbreak For a Water Supply Connection,* U.S. Environmental Protection Agency, Washington, DC.

ILSI, 1999. *Early Warning Monitoring to Detect Hazardous Events in Water Supplies* (An ILSI Risk Science Institute Workshop Report), Thomas M. Brosnan (ed.), ILSI Press, Washington, DC, December 1999.

Means III, Edward G., et al., undated. *How to Best Position Your Utility for the Future,* available through the American Water Works Association Research Foundation, 6666 W. Quincy Ave., Denver, CO.

Morris, R.D., et al. 1992. *Chlorination, Chlorination By-Products, and Cancer: A Meta-Analyses* in American Journal of Public Health, v. 82, no. 7, pp. 955–963, 1992.

National Research Council, 2001. *Envisioning the Agenda for Water Resources Research in the Twenty-first Century,* Water Science and Technology Board/Division on Earth and Life Studies, National Research Council, Washington, DC, National Academy Press, 2001.

Osmonics, Inc. 1996. *The Filtration Spectrum,* copyrighted chart, Osmonics, Inc., Minnetonka, MN, 1996.

Tucker, Jonathon B. and Sands, Amy, 1999. *An Unlikely Threat* in Bulletin of the Atomic Scientists, v. 55, no. 4, July/August 1999.

Page 78 PREV PAGE TOP OF DOC

WIN, 2001. *Recommendations for Clean and Safe Water in the 21st Century,* Water Infrastructure Network, Water Infrastructure Network, 1816 Jefferson Place, NW, Washington, DC 20036–2505.

76415q.eps

76415r.eps

76415s.eps

BIOGRAPHY FOR JEFFREY J. DANNEELS

Jeffrey J. Danneels is a Department Manager within the Security Systems and Technology Center at Sandia National Laboratories, a post he has held since June 1999. He is responsible for Civilian Surety programs, which include Security of large federal dams, Architectural Surety• for buildings, security of high-voltage transmission systems, and water security. Mr. Danneels was program director for the international *Innovative Technologies for Disaster Mitigation* conference (Oct '99) in Washington, DC. This three-day

Architectural Surety• conference provided a forum for experts from around the world to exchange information on mitigating the consequences of natural and man-made disasters.

Prior to this position, Mr. Danneels was the Las Vegas Operations Manager for the Yucca Mountain Project site characterization activities, which include the design and installation of experiments, numerical modeling, analyses of data, and formal reporting. His responsibilities included thermal testing, thermal-mechanical testing, convergence monitoring, and rock properties testing.

Page 79 PREV PAGE TOP OF DOC

From 1994 to 1997, Mr. Danneels served as department manager for Sandia's Energy and Environment Sector Office Team. Responsibilities included developing and monitoring business metrics as well as representing Sandia's Energy and Environment business unit to sponsors and various other entities, including congressional staff, universities, and other national laboratories and institutions.

From 1989 to 1994, Mr. Danneels served as Sandia's department manager for the Facilities Accelerated System Team, which was responsible for developing and deploying a process to rapidly install complex equipment in ultra-clean-room environments. He was the responsible manager for construction projects that include Sandia's Explosives Components Facility, Strategic Defenses Facility, and Technology Development Center. In this capacity, Mr. Danneels pioneered innovative performance-based contracts to greatly shorten the Architectural/Engineering firm selection process for line-item projects.

Mr. Danneels joined Sandia in 1985. He holds a Masters of Management from the University of New Mexico, a Masters of Science in Civil Engineering from Louisiana State University, and a Bachelor of Science in Civil Engineering from Michigan State University.

Mr. Danneels has received several significant honors for his work at Sandia, including three Sandia President's Quality Awards and, most notably, an Employee Recognition Award in 1998 for the early completion of the installation phase of the Drift Scale Test on the Yucca Mountain Project, the largest in-situ rock thermal test in the world. The success of this project was noted by the chairman of the Nuclear Regulatory Commission in a letter to the United States Congress.

Page 80 PREV PAGE TOP OF DOC

WITNESS DISCLOSURE INFORMATION

Witness name: Jeffrey J. Danneels

Capacity in which appearing: Representative of a non-government entity

Name of entity being represented: Sandia National Laboratories (GOCO)

Position held: Manager, Civilian Surety Programs Department

Parent organization (managing contractor): Lockheed Martin Corporation

Federal contract: Management and operating contract between Sandia Corporation and U.S. Department of Energy, DE–AC04–94AL85000. FY2002 estimated cost: $1,580,187,000; negotiated fee: $16,300,000.

Chairman **BOEHLERT.** Thank you. Thank you very much. Mr. Johnson, first of all, I want to congratulate you for the fine job you are doing out there. You are protecting us every single day and working with us every single day to guarantee that the District's water and sewer system works as it should work. I should note that we are drinking bottled water here. Don't be offended by that. We love the District's water, but we have done this for security reasons. The fact of the matter is, what we found—we had these big pitchers of water here, invariably they would get knocked over and everything else. So now we have a more secure bottled water. But that is not meant, in any way, shape, or manner, to reflect on the fine water you provide. Mr. Johnson, you are recognized.

Page 81 PREV PAGE TOP OF DOC

STATEMENT OF JERRY N. JOHNSON, GENERAL MANAGER, DISTRICT OF COLUMBIA'S WATER AND SEWER AUTHORITY; TESTIFYING ON BEHALF OF THE ASSOCIATION OF METROPOLITAN WATER AGENCIES AND THE AMERICAN WATER WORKS ASSOCIATION RESEARCH FOUNDATION

Mr. **JOHNSON.** Thank you, Mr. Chairman. And good morning to you and members of the Committee. I want to thank you for holding this very important hearing today. I am Jerry Johnson, General Manager of the District of Columbia Water and Sewer Authority, and I appear before you today as a member and also representing the Association of Metropolitan Water Agencies or AMWA.

AMWA represents the Nation's largest publicly owned water agencies, and these large systems provide drinking water for over 110 million citizens in the United States.

I am also representing the American Water Works Association Research Foundation or AWWARF, which is a nonprofit research arm of the water utilities in North America with approximately 950 water suppliers contributing funds to a centralized research program.

The D.C. Water and Sewer Authority, as you are aware, provides retail water services to residents, businesses, as well as the Federal Government in the District of Columbia and parts of northern Virginia. WASA also provides wastewater treatment services to the District, Montgomery and Prince George's Counties in Maryland, Fairfax and Loudon Counties in Virginia, as well as the town of Vienna, and operates Blue Plains Wastewater Treatment Plant in southwest Washington, which is the largest advanced wastewater treatment plant in the world.

Page 82 PREV PAGE TOP OF DOC

I would first like to thank the Chairman and the cosponsors of H.R. 3178, the Water Infrastructure Security and Research Development Act. And I want to assure you that the drinking water community

supports this bill and similar bills—and a similar bill in the Senate because the legislation provides for the improved security of our drinking water facilities.

In my testimony today, I would like to discuss the need for more research and development in the area of water infrastructure security. In response to the September 11 terrorist attacks, water systems are actively upgrading facilities across the country to address security concerns never before imagined. However, a more substantial investment is needed for water infrastructure security research to develop new technologies and practices to address potential vulnerabilities in our Nation's water systems.

Since September the 11th, the Nation's drinking water utilities have been on a heightened state of alert to protect against potential disruption of water service and biological and chemical contamination of the drinking water supplies. Fortunately, before September 11, the water supply community was already at work with the U.S. Environmental Protection Agency and the Federal Bureau of Investigation and other Federal agencies to develop new methods and tools to protect water systems and facilities, as well as our consumers.

The water security research bill before the House and the companion bill before the Senate, provide up to $12 million a year for five years that would substantially improve the investment in water infrastructure and security and research and development. The continuity and viability of providing drinking water and wastewater treatment is fundamental to the health and the economy, as well as the prosperity of this entire Nation.

Page 83 PREV PAGE TOP OF DOC

EPA and the water industry are currently engaged in a handful of water research projects, but much more needs to be done for the water supplies. And we want to ensure that EPA places anti-terrorism research among its top research goals. Under its current leadership, EPA has been extremely helpful to water systems, but this legislation is needed if EPA is to make terrorism prevention and response a high priority into the future. EPA must have the specific authority, for at least this duration of this bill, to conduct the type of research, because we cannot have this strategic research lost in the mix of a number of other programs, especially in today's world as we look at this research field.

Work is progressing for a number of—has been progressing for a number of years, but more knowledge must be gained and disseminated—must be gained and disseminated—I repeat, gained and disseminated—on the characteristics of possible biological and chemical toxins and other inline probes that detect contaminants, and remedial prevention as well as facilities to neutralize these contaminants.

Over the last two years, AWWARF and EPA and other water organizations have sponsored a number of research and development projects addressing water system security issues.

On the local level, water systems are currently stretching very limited resources in conducting activities for safeguarding the delivery of water to the consumer and the various communities they serve and for developing contingency plans to deal with emergency and catastrophic events that may interrupt or otherwise threaten the water supply. However, rapid development of additional tools, technologies, and processes is needed to help the water systems in addressing security concerns.

As a result of advances in information technology and the necessity for improved efficiency, water systems have become increasingly automated. These advances will create efficiencies, but also create vulnerabilities to cyber attacks. Attacks on the Nation's infrastructure and information system may be capable of disrupting the water systems and operations on a broad scale.

My written testimony provides specific examples of potential research projects, the development, and for this—to address the critical needs of our system. We urge your support of the legislation. And with that, members of the Committee, I will be prepared to answer any questions you might have.

[The prepared statement of Mr. Johnson follows:]

PREPARED STATEMENT OF JERRY N. JOHNSON

Good morning, Chairman Boehlert and members of the committee. Thank you for hosting this important hearing.

My name is Jerry Johnson, the General Manager of the District of Columbia Water & Sewer Authority and member of the Association of Metropolitan Water Agencies (AMWA). AMWA is a nonprofit organization representing the nations largest publicly owned water agencies that serve more than 100,000 people. These large systems provide drinking water to approximately 110 million people.

WASA is also a subscriber to the American Water Works Association Research Foundation (A**WWA**RF). A**WWA**RF is the nonprofit research arm of the water utilities in North America with approximately 950 water suppliers contributing funds to a centralized research program. In the past 10 years A**WWA**RF, in cooperation with EPA and other national and international partners, has invested more than $225 million in over 650 research projects directed at all aspects of water utility operation and technology advancements, including the development of security tools.

DC Water and Sewer Authority provides retail water services to residents and businesses in the District of Columbia and parts of Virginia. WASA also provides wastewater treatment for the District of Columbia, portions of Montgomery and Prince George's counties in Maryland and Fairfax and Loudon counties in Virginia as well as the town of Vienna, Virginia. WASA's Blue Plains Wastewater Treatment Plant, located in South West Washington, is the largest advanced wastewater treatment facility in the world.

I would first like to thank Chairman Boehlert and the other co-sponsors of the bill H.R. 3178, the Water Infrastructure Security and Research Development Act. The drinking water community supports this bill and a similar bill in the Senate because the legislation provides for security of drinking water facilities.

In my testimony today, I would like to discuss the need for more research and development in the area of water infrastructure security. In response to the September 11 terrorist attacks, water systems are actively upgrading their facilities to address security concerns. However, a substantial investment is needed for water

infrastructure security research to develop new technologies and practices to address potential vulnerabilities at our nation's water systems.

Page 86 PREV PAGE TOP OF DOC

National Importance and Need for Research

Since September 11, the nation's drinking water utilities have been on a heightened state of alert to protect against the potential disruption of water service and biological and chemical contamination of drinking water supplies. Fortunately, before September 11, the water supply community was already at work with the U.S. Environmental Protection Agency (EPA), the Federal Bureau of Investigation (FBI) and other federal agencies to develop new methods and tools to protect water system facilities and consumers. This unique partnership was established in response to Presidential Decision Directive (PDD) 63 where EPA was identified as the lead federal agency for water supply and AMWA subsequently appointed as the water sector's liaison on infrastructure security.

To coordinate efforts among the various national associations, AMWA established a Critical Infrastructure Protection (CIP) Advisory Group. Other drinking water organizations, including A**WWA**RF, are represented on the advisory group. The EPA, FBI and the Department of Energy provide liaisons to the Advisory Group to ensure that we coordinate our efforts with the appropriate federal entities as well. In part, this advisory group serves to identify gaps in tools and technologies needed in addressing security concerns at water systems.

The water security research bill before the House and the companion bill before the Senate that provide up to $12 million a year for five years would provide a substantial investment in water infrastructure security R&D to address potential vulnerabilities at our nation's water supply systems. The continuity and viability of providing drinking water and wastewater treatment is fundamental to the health and economic prosperity of communities across the nation.

Page 87 PREV PAGE TOP OF DOC

EPA and the water industry are currently engaged in a handful of water security research projects, but much more is needed and water suppliers want to ensure EPA places anti-terrorism research among its top research goals. Under its current leadership, EPA has been extremely helpful to water systems, but this legislation is needed if we expect EPA to make terrorism prevention and response a high priority into the future. EPA must have the specific authority, for at least the duration of the bill, to conduct water research, because we cannot have this strategic research lost in the mix with other programs, especially when so much research is needed.

Work has been progressing for a number of years, but more knowledge must be gained and disseminated on the characteristics of possible biological and chemical toxins, instantaneous and on-line probes to detect those contaminants, and remedial/preventive actions to neutralize those contaminants. Useful and practical techniques for evaluating and upgrading the security of water systems and new approaches for the design

and operation of these systems, especially the drinking water distribution systems, are also critical needs. Understanding of the current threats and the development of tools and techniques to effectively evaluate the evolution of those threats must also be developed. Techniques for hardening water systems from cyber attack must be developed and installed. In short, practical research is absolutely essential to anticipate potential terrorist scenarios.

Current Research and Development Activities and Other Security Projects

Over the last two years, A**WWA**RF, EPA and other water organizations have sponsored a number of research and development projects addressing water system security issues. These projects include tools for assessing vulnerabilities, preparations for response and recovery in the event of an attack, understanding the impact of potential biological and chemical agents, and training of water system personnel on security issues. But more work is needed.

Page 88 PREV PAGE TOP OF DOC

Specific security projects include the following:

AMWA received a grant in late September 2001 from EPA to develop a Water Information Sharing and Analysis Center (ISAC). The Water ISAC will be a web-based tool providing threat alerts and potential vulnerabilities to water and wastewater systems. The system will also provide a mechanism for systems to report incidents for analysis. Providing specific threat information to water systems in a secure manner is critical for preparing water systems in advance of potential threats of contamination, physical disruption, and cyber attack. At this time, an analysis is being conducted of possible design criteria for the Water ISAC.

A**WWA**RF is in the last stages of developing a vulnerability assessment tool for water systems. This tool will allow water systems to conduct a risk-based, self-assessment of the physical vulnerabilities to water facilities including source water and intake, treatment plants, and the distribution system. The final project will be published in November 2001. A**WWA**RF is also preparing a training workshop to train water systems on how to use the tool.

A**WWA**RF, in association with EPA, is funding a study to prepare a comprehensive list of security events and hoaxes at water utilities for the past ten years. These security events will also be analyzed relative to trends and common features, if any. Law enforcement or other agencies have not commonly tracked this information, and understanding of these events is critical information in properly understanding the design basis threat, related security upgrades, and possible prudent response and recovery operations for the utility.

EPA has begun a project to evaluate water systems emergency operation plans for the purpose of developing a guide for water systems. This guide would identify important elements, common areas, and possible best practices and provide template or boilerplate suggestions. The guide would specifically address response and recovery actions to be taken by water systems during intentional acts of sabotage including terrorist acts at water systems.

Page 89 PREV PAGE TOP OF DOC

EPA is also sponsoring a project to develop two contaminant transport models. One mode looks at the transportation of contaminants in rivers and streams (RiverSpill) and the second model addresses transport within water treatment plants and distribution systems (PipelineNet). These models can be used during accidental chemical spills as well as intentional acts of contamination including potential terrorist acts.

EPA has also started a project to develop a cyber vulnerability assessment component of the A**WWA**RF's vulnerability assessment tool. This module of the tool would allow water systems to conduct a risk-based, self-assessment of cyber vulnerabilities at water facilities including process controls, SCADA, and vulnerabilities through Internet access.

In addition, EPA is compiling from available sources, potential chemical agents that could be used to intentionally contaminate water systems. The report is intended to help water systems understand the nature and impacts of chemical contaminants.

The Center for Disease Control and Prevention (CDC) is developing a list of potential biological agents that could potentially be used to contaminate water systems. The report will address information on the nature of the biological agent, impacts on water systems, and human health effects.

The American Water Works Association (AWWA) is also developing training for water systems managers to provide an overview of water systems security issues. The course will be conducted at a number of locations around the U.S.

Page 90 PREV PAGE TOP OF DOC

Local Security Related Activities

On the local level, water systems are currently conducting activities for safeguarding the delivery of water to customer communities and for developing contingency plans to deal with emergency and catastrophic events that may interrupt or otherwise threaten the water supply. However, additional tools, technologies and processes are needed to help water systems in addressing security concerns.

Water systems perform daily water testing and physical measurements before and after treatment. On a daily basis, water system operators constantly watch water chemistry on computer screens linked to real-time testing devices. Alarms are set to notify operators when certain parameters move outside of specified ranges. All treatment chemicals are tested for purity before delivery. Many water systems use chlorine to disinfect the drinking water. Chlorine is an effective tool against a range of bacteria, viruses and chemicals, and water systems can quickly change the chlorine dose if needed.

The events of September 11 have caused water systems to review their emergency preparedness plans, step up discussions with state and federal agencies, and communicate with their customers. Many things have been discussed at the congressional level that would enhance protections of watersheds and water supply.

Examples of Potential Research and Development Projects

Research on water infrastructure security is needed in a number of areas. Water systems need to determine their potential vulnerabilities through assessment tools. The first generation of tools is emerging but advances in assessment methodologies are important. Water systems are also interested in new and innovative technologies and processes for protecting physical assets. Systems are concerned about preventing both contamination and disruption of water supplies.

Page 91 PREV PAGE TOP OF DOC

As a result of advances in information technology and the necessity of improved efficiency, water systems have become increasingly automated. These advances have created vulnerabilities to cyber attacks. In addition, our economy is becoming increasingly reliant upon interdependent and cyber-supported infrastructures. Attacks on the nation's infrastructure and information systems may be capable of disrupting water systems operations.

Water systems are also looking at the need for real-time monitoring and detection systems. Early detection systems may be essential in alerting water systems about potential biological, chemical, and radiological contamination. Another area identified as critical to water systems preparation is the need for appropriate response and recovery plans. All large systems, and many smaller systems, have emergency response plans in place. However, these plans were developed to address mainly accidental spills and natural disasters such as floods, hurricanes, and earthquakes. Water systems need improved guidance and tools for updating these plans to address intentional acts including terrorist attacks.

Specific examples of the potential research and development projects that may be critical to water systems include:

Agents for Purposeful Contamination of Drinking Water—Comprehensive understanding of credible contaminants that could be used to purposefully contaminate water is a critical area of need in which extensive research is needed, as had been identified by the President's Commission on Critical Infrastructure Protection and in other studies. At this time water utilities across the country are individually developing lists of contaminants they consider could be used against their system. The EPA, CDC, Department of Defense and other federal agencies began a process last week to develop a baseline set of information on these agents from which a report is expected by the end of the year. However, there is no plan to address the extensive knowledge gaps that are being identified relative to these agents. Even if only the highest priority agents are addressed, research will likely consist of a range of projects on a number of different agents. Some of the topics that could constitute needed areas of research on just one agent include:

Page 92 PREV PAGE TOP OF DOC

— The amount of the agent needed and commonly available to produce effects in humans.

— The amount of this agent is commonly available or how easily can this agent be created.

— How the agent reacts to typical conditions in surface water and ground water.

— How the agent behaves relative to water filtration and other common water utility treatment operations.

— How the agent behaves relative to point-of-use treatment that might be employed given the threat or knowledge of a successful attack.

— What existing or new treatment operations might be developed to address this agent.

— How the agent behaves relative to water disinfection processes, especially in relation to the use of chlorine and ozone.

— How the agent behaves in a water distribution system.

— How the distribution system and other parts of the water utility can be returned to safe use if the agent has contaminated the distribution system.

— How water and other samples are collected for analysis of the agent.

Page 93 PREV PAGE TOP OF DOC

— How to analyze for the agent in a laboratory setting.

— What laboratories have the relevant equipment, supplies, and expertise to analyze for the agent.

— What real-time, early warning, or indicator systems might be developed for this agent.

— What symptoms might be present in the population if this agent has been unknowingly present in the water.

— What analyses are needed to analyze for this agent or its effects in a clinical setting.

Miniature Liquid Chem Lab—A prototype portable analysis unit for the analysis of biotoxins likely to be used by terrorists that mimics the capability of a large laboratory instrument in a low-cost, hand-held package has been developed. By further reducing the size of the unit it could be made applicable as part of an early warning monitoring system in municipal water supply systems. Expansion of the analytical capabilities of the instrument beyond biotoxins to other toxins such as arsenic, heavy metals and pesticides could also be accomplished.

Gas Chromatograph on a Silicon Chip—A prototype miniature gas chromatograph and detector on a silicon chip has been developed. The unit is presently configured for gaseous chemical agent detection. However its capabilities can be expanded as an analytical instrument for other toxic compounds. By expanding the capabilities of this system it could be used as a low-cost real-time detector for volatile organic compounds as a part of an early warning system in a municipal water distribution system.

Page 94 PREV PAGE TOP OF DOC

Nanoelectrode Analysis System—A chip-based micro-electrode system that can be used for the analysis of various inorganic toxic species in water such as cyanide, arsenic, lead, and chromium that might be encountered in a municipal water supply is being developed. Additional work would concentrate on the development of low-cost, low maintenance electrode analysis systems that could be easily deployed in a large network of interconnected sensors within a water distribution system.

Simple Solid State Sensors—Low-cost sensors such as chemiresistor sensors and surface acoustic wave sensors based on micro-chip technologies that can effectively serve as hydrocarbon or other chemical spill detectors have been developed. Additional research would be used to optimize the performance of these sensors and package them in such a way that they could be included in an early warning system for a municipal water supply system. These sensors could be used in concert with some of the other more sensitive systems such as liquid-chem-lab and gas-chromatograph-on-a-chip as a part of a comprehensive early warning system for water supply systems.

DNA-Chips—Considerable progress has been made in the development of DNA-chips, which have been used to detect specific microbiological pathogens in water using genetic information. Such a capability is desirable since terrorist biological agents in a water supply system would occur alongside other non-hazardous organisms. The ability to differentiate between organism type in real-time would be desirable from an early warning standpoint. A laboratory would work with commercial entities in the private sector to package the DNA chip technology into a low-cost stand-alone system that would be an important component in a water supply early warning system.

Page 95 PREV PAGE TOP OF DOC

Systems Integration—Many different types of sensors have been developed that can detect a chemical or a class of chemicals, but they are not integrated into one, knowledge based system. A system integrator is needed to miniaturize and integrate multiple sensors into one system.

Next Steps

In terms of congressional action to help address system vulnerabilities, we urge the House to support H.R. 3178 and the Senate to support S. 1593, which authorize funding for research and development into understanding threats against water and wastewater systems and methods and technologies to prevent and respond to attacks. A substantial investment is needed for water infrastructure security R&D to address potential vulnerabilities at our nation's water systems.

Members of the committee, thank you for the opportunity to testify today. I would be happy to answer any questions you may have.

BIOGRAPHY FOR JERRY N. JOHNSON

Jerry Johnson currently serves as General Manager of the District of Columbia Water and Sewer Authority. The Authority provides retail and wholesale water and wastewater treatment services to the District of Columbia and parts of Virginia and Maryland with a customer base of approximately 2 million.

The Water and Sewer Authority operates Blue Plains, Wastewater Treatment Plant, which is the largest advanced Wastewater Treatment Plant in the world.

Page 96 PREV PAGE TOP OF DOC

Johnson is nationally known as a turnaround specialist. As the first General Manager of the newly created Authority, he guided it from an unrated agency with a projected $8 million deficit to one with an A+ credit rating and $170 million reserve in two years. He has developed long term capital and financial plans, a comprehensive rate strategy in addition to resolving major regulatory agency actions. Public/private partnerships, infrastructure planning, and organizational development are also among Johnson's areas of expertise.

Prior to joining the Water and Sewer Authority, Johnson served as Deputy City Manager for Operations in the City of Richmond, Virginia. During his tenure in Richmond, he also served as Director of Public Utilities, responsible for four separate utility operations including gas, electric, water and wastewater providing service to the metropolitan Richmond area. He has also been the General Manager for the Metropolitan Richmond Convention and Visitors Bureau, responsible for marketing the metropolitan area for tourism and conventions. Jerry began his service in Richmond as the Director of Community Facilities for the City.

Before moving to Richmond, he was Assistant to the City Manager for the City of Alexandria, Virginia and was a Senior Planner for the City of Charlottesville, Virginia.

He graduated with a Business Degree from Ferrum College; a Degree in Urban Affairs and Economics from Virginia Tech and completed the Program for Senior Executives in State and Local Government at the JFK School of Government, Harvard University.

He serves on a number of boards and commissions, holds leadership positions in several national organizations and has numerous honors and awards resulting from his professional accomplishments and community involvement. He also has a number of publications to his credit.

Page 97 PREV PAGE TOP OF DOC

Discussion

Chairman **BOEHLERT.** Thank you very much, Mr. Johnson. Thank all of you. Now that you have all had an opportunity to hear our expert witnesses, do we have any other willing cosponsors of this outstanding piece of legislation? Mr. Gutknecht, we will add your name to the list. Mr. Gilchrest, Dr. Bartlett, Mr. Larson, Mr. Wu. Mr. Lampson, you are on, I think, but we will make sure. Mr. Etheridge. I think we are in agreement up here, so your testimony has helped immeasurably in gaining the attention and support we need for this important legislation. Yeah. The hearing is now adjourned. No. No.

State of Research and Development

Let me ask—this is sort of a comprehensive question for all of you. How would you characterize the state of research, development, and demonstration technologies to secure drinking water and water infrastructure facilities against terrorist attack? And the next question is obviously, is enough being done under current authorities, and would it help to have the type of targeted program we are envisioning in this bill? Sort of a softball, but I would like to hear from all of you. And we will go in reverse order. Mr. Johnson.

Mr. **JOHNSON.** I am going to make an effort to try to remember all parts of your question, sir.

Chairman **BOEHLERT.** Well, first of all, the state of research and development. Is the information there that you need?

Page 98 PREV PAGE TOP OF DOC

Mr. **JOHNSON.** I think that we have made some steps and some strides with regard to research. But no one anticipated the kind of attack that occurred on September the 11th. So what we need to do now is refocus and refocus on some of the things that prior to September the 11th were pretty much unthinkable. We need to look at some different areas. We need to look and advance the technology R&D at a much more rapid pace than we had.

We were looking at things that had to do with the purity and safety of the drinking water that we were producing, but not at things that dealt with so much the introduction of agents into that system. And I think that that is where attention currently needs to be focused and focused very rapidly.

Chairman **BOEHLERT.** Mr. Danneels.

Mr. **DANNEELS.** Let me see, your first question, kind of the current state of the R&D—if you look over the last several years in who has been leading research in this area, you will find very small numbers. You know, you will find a few million has been spent to really research these efforts. So I would say the current state is not what we would like it to be.

Chairman **BOEHLERT.** And could you add specifically what you would suggest that we do?

Mr. **DANNEELS.** Well, one of the things that we don't even begin to understand yet are a lot of the different threats that are out there. CDC and others haven't even characterized a lot of these things. We don't know how they react to chlorine. We don't know how long they will stay in the system. And so the problem right now to come up with a credible threat is we don't have the information that we can even begin to understand. And so there are a lot of pieces of this puzzle that don't exist.

Page 99 PREV PAGE TOP OF DOC

And so, that is part of the problem when you go out and do a vulnerability assessment, it is hard to understand and explain to somebody what is and what is not a threat. And until we understand what some of these contaminants can do, what the residence times are, and what their reaction to chlorine is, it is very difficult to figure out how to best protect those systems.

We know some technologies will take biological agents out—reverse osmosis membranes and other things. We know these biological contaminants are fairly large molecules. So, we know how to take a lot of them out. And, as Dr. Luthy talked about, kind of this defense in depth is the right approach. The problem is once you get into the distribution system we don't have defense in depth.

And then the next question—is enough being done. Since 9/11, there is a lot of activity. And, of course, my concern is the immediate response. And I would like to see more long-term work being done, because I think it is going to take quite a concentrated effort to solve this problem.

Chairman **BOEHLERT.** Well, and I really appreciate your focusing on the long-term aspects of that. Every committee of the House and Senate right now is scrambling to come up with some instant solutions to some very real problems. And that is understandable. And we identify with those efforts too. But this Committee prides itself in taking a longer-range view and we understand that research and development takes time. I mean, you can appropriate the money, but you can't guarantee results in two weeks or maybe sometimes even two years. And so we are trying to take the longer-term approach in support of the short-term efforts. So thank you for emphasizing that. Dr. Luthy.

Page 100 PREV PAGE TOP OF DOC

Dr. **LUTHY.** Yes. Thank you. I think the short answer to your question is no. The problems that we face with regard to security and intentional acts is that things could be done to our systems that were not designed for. The systems are designed for dealing with contaminants that occur naturally in the environment or that are associated with wastewater treatment systems, things that have been known and understood for a great period of time. So we really do not have good knowledge about what chemicals and what biological agents could pose some of the greatest threats, nor do we know fully what amount of those chemicals could pose threats.

And, again, I caution that low levels may be a great concern. In drinking water treatment, we design for risks that are below one in a million. All right. Now, that is not the same thing as having a whole population get killed. I am sorry to talk about this sort of thing. But the facts are that when you listen to some public officials, they speak in terms of truckload quantities because they are talking about something deadly added to water that would kill half the population. That is basically how they get those kind of numbers.

But we are not dealing with that in our water supply. Look what happens with anthrax when you have a couple of people get sick. Look at the panic that results from that. And so we have a lot to do here in learning what agents and in what amounts will cause harm—physical harm and psychological harm. We also have a lot to do in terms of developing new technologies, backup treatment systems, and putting in place this concept of multiple barriers.

And the example I use for this is in wastewater treatment—to take wastewater and make it become potable water. And we can do that, and there are cities that do that now. But there is not just one little treatment device that does that. It is a whole series of steps. So that if there is a technical failure at one spot, a contaminant has to get through a lot of hurdles before it will contaminate a system. And I think that is the only way that we are going to be successful here, that is to put in a series of hurdles and traps. So we have a

lot to do there in terms of new treatments and multiple barriers.

Page 101 PREV PAGE TOP OF DOC

And, lastly, I would say, I think we also have to look at the water laws and institutional arrangements. We need to think on a watershed basis, if you haven't done that in the past, and we have to look at the issue of water laws. Like I mentioned earlier, we have a lot of water moving around the western states that is not used for potable water purposes, but probably could be used for that purpose in the case of some disruption. Thank you.

Federal and State Cooperation

Chairman **BOEHLERT.** Thank you. Thank you, Dr. Luthy. Mr. Kallstrom, the other three are engaged in, well, science and the operation of water systems. Your emphasis is on security. How would you characterize the cooperation you are receiving from the Federal Government in your new role and this very important job?

Mr. **KALLSTROM.** In the formative stages, but I think very, very good.

Chairman **BOEHLERT.** Yeah. I think, I mean, it is encouraging to me that you just reported you have come from a meeting with Governor Ridge.

Mr. **KALLSTROM.** Well, I came from a 15-minute meeting that lasted almost an hour and could have lasted many, many, many more hours. But I think very, very good. I think there is a broad understanding that we have to get state and local law enforcement involved in the counter-terrorism business.

Page 102 PREV PAGE TOP OF DOC

I would associate myself with the experts on the Panel when it comes to the use of technology. I did spend a number of years, not as a scientist, but as someone managing technology for the FBI. I think technology is going to play a huge role, not only in protecting the water supply, but in my number one priority the Governor has set for me, and which I certainly agree with, not having another event happen in the United States, not having someone do something to the water supply or put a device in a building or somewhere else. And technology is going to play a huge role there just from the standpoint of identifying who people are.

Biometrics, the cross-border issues with Canada and commerce and pre-approvals and pre-screening—we need to get this type of technology up right away.

Chairman **BOEHLERT.** I will take you around with me to my other committee assignment. I serve on the Intelligence Committee and——

Mr. **KALLSTROM.** Right.

Chairman **BOEHLERT.** So thank you very much for that. My time has expired. The Chair recognizes

Mr. Baird.

Additional Benefits

Mr. **BAIRD.** I thank the Chair. And part of why I am so pleased to have worked on this bill and I commend the Chair is that post-September 11, we all found ourselves saying, why did we not secure those cabin doors? We certainly wouldn't want someone at the end, if there were to be a tragedy, to say, why didn't we do more to investigate the most basic thing that comes into our house—water.

Page 103 PREV PAGE TOP OF DOC

One of the things that I am also pleased about this is, I anticipate there will be benefits to this whether or not we are eventually—and I hope we never are—but whether or not there is a terrorist attack. In other words, new technologies may be developed—the natural contaminants or pollutants—we may learn how to deal with those better. I wonder if you could talk about the sort of spin-off benefits that this research that the bill provides may help us realize. And I will open that up to whomever.

Dr. **LUTHY.** I would like to tackle that briefly. I think it is very important to take the long view here. We should recognize that our treatment plants, on average, are some 50 to 100 years old. So I think you are exactly right there. You want to design for greater security and greater safety, but do it in the context of upgrading in general our water treatment plants. And the fact is that we have to cope with ever more contaminants in our water systems that—or compounds that we don't know much about, like endocrine disrupters as an example. And so the things that we can do to address the security and safety may address those problems as well. I think you are exactly right on that.

Mr. **DANNEELS.** I would like to add to that, if I can. If you look at the recent arsenic standard and the estimates—and it is all over the ball park of trying to figure out exactly what it is going to cost—but the cost to meet that new standard are enormous. And I would hope the spin-off out of this research of looking at how we measure these contaminants, because right now, a rapid arsenic detector does not exist. And so, it would be nice out of this that we could detect those levels and know when to treat water and when water is a problem. So, yeah, I look at Arsenic—and that is just one example of what I think could be several spin-offs out of this bill.

Page 104 PREV PAGE TOP OF DOC

Mr. **BAIRD.** On that regard, I just personally want to be on record when the EPA—I think we are going to pass this and I am pleased that we are—I hope when the EPA begins to look at who will receive these grants, they not just look at the most wildly outlandish terrorist attack, but they also say how will the research we are funding not only help us deal with a possible terrorist threat, but also possibly provide benefits to the broader issue of water contamination domestically, and, frankly, also internationally, because this issue of clean water is possibly the number one health issue internationally today. And I hope we can learn from this. It is—actually it probably merits a great deal more funding and more research than we have done.

Source vs. Consumption Point Measures

Secondly, let me ask you a question about sort of proximal or source point versus distal or consumption point measures and what your thoughts are in terms of how we should balance funding or research or security in those areas. You have—Dr. Luthy talked about redundancy—one being sort of the main plant, where the water is sent out, versus on-the-tap kind of filtration or purification devices. Again, open it to whomever.

Mr. **JOHNSON.** I think, sir, that we are a fair distance from having that kind of technology for examination. But, as you could see, some of the microcircuits and miniaturized technology that Sandia's lab has been working on and others, certainly those things are a vision for the future. In the District of Columbia, as an example, we have some 1,800 miles of water main and some 7,800 water fire hydrants in and around the city.

Page 105 PREV PAGE TOP OF DOC

And trying to protect all of those facilities, as well as 130,000 customers that are being served, becomes an absolute challenge. But I think that if the technology is—technology R&D is appropriately focused, it certainly is something that we could look to the future to do and it is something that certainly should not be overlooked and ignored. Once the water leaves the production facility, there is a long way to travel before it reaches the tap.

Mr. **DANNEELS.** Let me answer that in a couple of different ways. One is, I spoke in the testimony about a balanced approach. And when you back up into the system, physical disruption may be the biggest concern you have. And so if you want to protect these large plants and the pumping facilities, you may be looking at some physical means and also different SCADA systems. You start getting out into the distribution system and now you are talking more of the technology of either a treatment technology that can remove contaminants or some other way to monitor the water that is in there.

And I want to add one thing to your previous question. You were talking about spin-offs. The real-time monitoring capability that we are developing could also be used for—as an early warning system. And so there is a spin-off there for places like the Ohio River and other places that you can monitor for contaminants in real time. Thank you.

Dr. **LUTHY.** Yes. I agree with the idea that better monitoring is the key here, both for systems like we have in California at the Hetch-Hetchy reservoir that deliver water hundreds of miles to San Francisco, but also for the distribution system as well. The monitoring is very important so that corrective action could be taken. If nothing else, the systems could be secured.

Page 106 PREV PAGE TOP OF DOC

Probably the Ohio River system is the only one that has any system like that in place today. And that is just because there are a whole string of communities from upstream at Pittsburgh all the way down to below Cincinnati that draw water from that. And so they have a reporting system in place that provides time for

taking action in the event of a chemical spill or something like that.

Mr. **BAIRD.** My time has expired. Thank you, Mr. Chairman, and thank you for the outstanding information.

Chairman **BOEHLERT.** Thank you very much. Chairman Bartlett.

Distributed Treatment Systems

Mr. **BARTLETT.** Thank you very much. I might note that D.C. residents are drinking recycled sewage and other waste from the Sixth District. Nearly a couple hundred miles of the Potomac River borders the Sixth District. And this introduces us to a problem that many, many communities face.

Mr. Danneels mentioned a water purification technique which will remove almost anything that is in there, and that is reverse osmosis. But this is probably not applicable to very large amounts of water. If you think about it, it is really a little silly to water your lawn, flush your toilet, and fight fires with drinking water. That just doesn't make much sense.

Wouldn't we have more security by having decentralized and distributed onsite recycling where you could use techniques like reverse osmosis? And, by the way, these techniques are now available for in-home use where you are recycling the water. You don't need to flush your toilet with drinking water. Minimal treatment of water will make it quite acceptable for flushing the toilet and you certainly don't need to fight fires and water your lawn with drinking water.

Page 107 PREV PAGE TOP OF DOC

Wouldn't we have more security in our country if we had more of this distributed treatment of the water? And when you do that you can now recycle the water in your home. As a matter of fact, the average home in America wouldn't need a municipal water source at all—a public water source at all because unless you are in California or the desert, more than enough water falls on the roof of your house to take care of all of your water needs if you have in-home cycling. And those systems are now available on the market and being marketed. Why aren't we pushing these more? Wouldn't it provide more security for our country as a whole?

Dr. **LUTHY.** Well, Mr. Bartlett, I think you are asking exactly the right kind of questions here. You are asking the questions that take us away from what we are doing now to approach the problem from a different perspective. And the questions you are asking are appropriate, but to give a short answer right now is, we don't know. It requires a lot of analysis and understanding. But I think that is the right direction.

And I would—I like the idea of smaller, networked systems, because if you knock out a small system, you are not knocking out a whole city. And networks are good. Think of networks like a bunch of city streets. If one street is torn up for repair, well, you can drive around the block. And you could do the same thing with a lot of small systems. So I think you are right on target there. It just requires—it requires careful analysis though.

Mr. **DANNEELS.** In my written testimony, I address the issue that you brought up. And, indeed, you are

right on. Ninety-nine percent of the water that is treated is not consumed. And so we are treating 100 percent of the water to only consume about 1 percent. So there are a lot of solutions that can be looked at.

Page 108 PREV PAGE TOP OF DOC

One of the ends of the spectrum is doing high-end treatment at the facility and bottling water. And so D. C. WASA could be a bottled water facility. That is one way to accomplish it. The other end of the spectrum, as you talked about, the reverse osmosis systems that could be point-of-use applications. And, as Dr. Luthy pointed out, we haven't done the analysis yet to figure out what is the best system, how we should accomplish that. And I think that is part of what this bill ought to be supporting, is the analysis to come up with what are the best ways as we move forward. We clearly know what we are doing today is not sustainable in the long term.

Rethinking Our Water Systems

Mr. **BARTLETT.** Thank you very much. Not only are we concerned about the purity of our water, but we are also concerned about the quantity of our water. In many places in our country, the quantity of water is going to be the restricting element for growth. And to the extent that you can recycle—you know, these things are particularly attractive for rural areas where we have a not very defensible philosophy of out of sight, out of mind. Our rural—when you have a septic system in your home, that is really a disposal system rather than a recycling system. We need to think more of recycling.

And, you know, what you are required to do by the regulations in most jurisdictions is to put the water in the soil under the major root zone, which is really a threat to the aquifers. If you think about that, it is really silly. But the local jurisdictions will not let you introduce the water into the soil at the root zone. They require to introduce it into the water below the major root zone of the plants which would take up many of the contaminants, many of the nutrients in that water. So you now are putting your aquifers at greater risk.

Page 109 PREV PAGE TOP OF DOC

Our water supplies need rethinking all across the board from these enormous municipal systems, public systems, to more distributed personal systems, which can, by the way, produce water with at least the purity of this bottled water here. Thank you very much.

Chairman **BOEHLERT.** Mr. Lampson.

Planning for the Future

Mr. **LAMPSON.** Thank you, Mr. Chairman. As we are talking about all of the effort that is being made, the thoughts that are being put into trying to improve all of our systems, we know that a lot of money is being spent or talked about being spent, and it is going to be soon, upgrading infrastructure throughout the country. Are those cities, areas, or whatever organizations that are contemplating making upgrades and improvements right now, taking all of our conversation, the ideas that you have presented here today, in mind as they make their plans? Any of you?

Mr. **JOHNSON.** Let us see if I can perhaps address that from our perspective, and I think we could call it a microcosm of what occurs in much of the rest of the country given the age of our system and our infrastructure. And to be quite honest with you, many of those things simply have not been taken into consideration. And it is a matter of going in and looking at those 100-year-old pipes and many of the systems that are currently in place for an infrastructure for delivery of the water and focusing more on treatment and meeting the new EPA standards through the treatment process and then making sure that that infrastructure is stabilized so that it can be delivered.

Page 110 PREV PAGE TOP OF DOC

And there are some tremendous costs and expenses that we face as we look at improving that infrastructure. So I would suggest that until the recent occurrence, there had not been a great deal of focus on the kind of research and development that is anti-terrorism oriented except for response plans, as opposed to developing systems that were more proactive in addressing the problem before it occurred.

Information Sharing

Mr. **LAMPSON.** How are we going to best get that information out to those planners immediately so that anyone who is considering a project can have the most up-to-date knowledge?

Mr. **JOHNSON.** Well, that was one of the reasons I tried to put some emphasis on information sharing. I think that the dissemination and sharing of information, which is a critical element of the R&D that has to be done, that gets to integrated computer systems and integrated sharing of information, is going to be one of the critical elements. And then the organizations like AWWARF and AWWA who have been conduits of information for the water systems around the country, I think, are another mechanism for getting it there. But that has end requirements that might come down from this legislation and from EPA standards as another method of getting it there.

Mr. **DANNEELS.** I think if you look in the written literature today, some of these ideas are starting to be talked about more and more. And, in fact, in my written testimony, I reference a couple of documents. The AWWA document, looking at the future, and also the Water Infrastructure Network document, where some of these ideas are starting to be talked about and explored. But that is probably the state of knowledge today.

Page 111 PREV PAGE TOP OF DOC

EPA is taking some steps. This Friday we are going to do a national telecast to talk about some of these new ideas and we are going to try to down-link to a lot of water utilities. We are developing some training courses with the EPA too—and those will come online in December and January—just to begin talking about some of these ideas. So the information is starting to get out, but, as Jerry said, it is going to take a little while.

Partnerships

Mr. **LAMPSON.** Is there a permit process—obviously there are permit processes that cities go through, but will those permitting agencies—and I would imagine EPA is highest among them—put procedures into place to prohibit someone from acting prematurely without taking the best steps forward at this point?

Dr. **LUTHY.** I don't think so, sir. That is because for a city to comply, they are basically testing water to see if it meets the Safe Drinking Water Act which is——

Mr. **LAMPSON.** Uh-huh.

Dr. **LUTHY** [continuing]. A set of analyses. They are not being challenged on procedures if I understand it exactly.

Mr. **LAMPSON.** Then do we need to enact legislation to make that happen?

Page 112 PREV PAGE TOP OF DOC

Dr. **LUTHY.** I am not an expert on that, but I would say anything that would encourage it, I think, is warranted. From my point of view, as someone that works at a university, I think the best way to address these problems is in the context of this research agenda that we are discussing here, is to require that there would be teaming between the research establishments and the user community.

You know, if I worked in Washington, I would want Jerry on a project with me. And so we would have both the people in the field that have that practical knowledge and have to deal with problems on the day-to-day basis, and you say, okay, what are some generalizable questions from that that we can research that will be broadly applicable. And I think that is a really good strategy.

Other Security Considerations

Mr. **LAMPSON.** One more quick question before my time runs out, and it has to do with the bill itself, H. R. 3178. Do we need to give any consideration to security clearances of the researchers? Do we have adequate security measures in place that would give us an adequate background of the people involved? Should there only be U.S. citizens involved in the research or any other thoughts on that matter? Anyone.

Dr. **LUTHY.** Well, speaking as someone that works at a research university, I would say that would probably be counterproductive. I don't know of any instance where a researcher has caused harm. Maybe the results from their research are impractical, say, but I don't know of anything that has caused——

Page 113 PREV PAGE TOP OF DOC

Mr. **LAMPSON.** The bill, in your opinion, is adequate.

Dr. **LUTHY.** Yes.

Mr. **LAMPSON.** Thank you, Mr. Chairman.

Chairman **BOEHLERT.** Thank you, Mr. Lampson.

Mr. **LAMPSON.** Okay.

Chairman **BOEHLERT.** The Chair recognizes Chairman Smith.

Exposing Our Vulnerabilities

Mr. **SMITH.** Thank you, Mr. Chairman. The—we have been informed that the Taliban in Afghanistan has monitored our news media in terms of our actions and sometimes learned information that makes them more effective. It seems important that we try to make sure that we aren't overly generous in informing potential terrorists of our vulnerabilities. And so I am reluctant to ask you where are we most vulnerable.

But it—I would maybe ask you that—on what we do or what language we put in this bill to help assure. Of course, the EPA has been overly generous in some of their dissemination of information of vulnerabilities and some of the users through their websites have gotten wide distribution of those areas that were most vulnerable. So do you have any suggestions of how we approach this problem of giving the information to the people that need it, but not making it so readily available that we expose our vulnerabilities?

Page 114 PREV PAGE TOP OF DOC

Dr. **LUTHY.** Sir, I would like to take a whack at that. Mr. Osama bin Laden was trained as a civil engineer. So I don't think we are telling him something that perhaps he couldn't figure out. The terrorists that crashed the planes, if I understood correctly, were in this country for several years. Heck, they learned to fly airplanes. They could have just as easily gone to a university and become a civil or environmental engineer in that time. And in the course of those studies, they would have come up with some ideas on their own.

So I would caution that open exchange of information is probably the best way to proceed. We want not to give assurances so much as to have candid discussions. Now, that doesn't mean that these people would publish their network and distribution system and stuff like that. Now, that should be confidential, I grant you. But in sort of general discussion and in the way that we conduct research, we have to have openness.

Mr. **SMITH.** Well, let me just—let me just suggest to you that a lot of the terrorist cells that we have identified in the United States aren't that sophisticated in terms of their knowledge and ability. They are looking for ways to be effective in terrorizing, if you will. So I would strongly disagree with you in terms of these individual cells that are looking for ways to do damage have the kind of information that you think they might have. Any other comments from any of the other panelists?

Mr. **JOHNSON.** Yes. Mr. Smith, as an operator of a major facility in a targeted city, I think that we have to be very, very careful about the information that is publicly shared. I think that we have reached a point in this society where we need to go and take a second look at some of the requirements for sunshine laws and the like that relate to certain information that has been readily available.

You will recall the vulnerability analysis that was done just about two years ago by EPA that required every wastewater treatment plant in the country to do certain analysis and it was only because of a Senate action that it was not put on the worldwide web. And there was some terrible information there that simply one would question as to whether there is a public need to know. So I think that it certainly—I don't want to suggest here what should be included or excluded, but I think that there is an opportunity at this point to take a look—a second look at these laws to determine whether they are viable in all circumstances.

Early Detection Technologies

Mr. **SMITH.** And, Mr. Danneels, you were looking, but I want to ask another question too. And that—what kind of technologies do we have now in terms of helping provide early warning detection? Is that an area in which we have some regular monitoring? Is that a policy? I know in our communities in Michigan that often serve less than 3,000 people, that kind of monitoring isn't a policy. Is it in larger systems and what technologies are available?

Mr. **DANNEELS.** There are several things that are required and are dependent on the size of the system. As you get into larger systems, more and more monitoring is required. However, the only real-time monitoring that exists today basically is at the treatment facilities themselves. When you get away from the treatment facilities, those—you know, it is basically done by grab samples that are taken back to the lab.

Some of the instrumentation that exists today could be used. The problem is we don't know what the background numbers look like. And so some of these things would need to be installed. We would need to study the system to see what the background looks like so we would know if something were to change. The problem we have seen from some studies, like Cincinnati, and other places that have done a little bit of this, is the numbers are all over the map and it is difficult to assess, you know, if there is something going on in the system or it is a natural occurrence. So that is a difficult thing to do today.

Openness

Mr. **SMITH.** Any other comments? Mr. Kallstrom.

Mr. **KALLSTROM.** I agree with Mr. Johnson on his comments regarding the information that we share. We did a survey in the State of New York of things that were on the public websites and it was quite telling. I also agree with Dr. Luthy. I understand what he is saying—we need an open dialogue and communications among our scientists. But we need to make sure who those people are that we are sharing the information with. And posting some of the things that we do on the world wide web to me is—you know, goes way beyond the pale of that type of academic liberalism and just does not make good common sense. So I think we need to bring the pendulum back a few clicks on what we do disseminate without question.

Chairman **BOEHLERT.** Thank you very much. The Chair recognizes Vice Chairman Gutknecht.

Local Responsibility

Mr. **GUTKNECHT.** Thank you, Mr. Chairman. Most of the questions I was going to ask have already been asked. So I really don't have a question. But I would like to make a couple of statements just for the benefit of the members of the Committee, as well as our distinguished Panel. And I want to thank you all for coming. I think this has been a very good hearing. One of the comments I want to make—and I hope—and I am going to be very happy to help support this bill. And I don't think $12 million is certainly unreasonable. But I do want to make this point. And I think we have to be careful here as we begin to assume a larger and larger Federal role in rolling a whole lot of things into the whole rubric of national security.

Page 117 PREV PAGE TOP OF DOC

At the end of the day, though, the people who are most responsible for the quality of water that individuals in the United States of America drink, is not the Federal Government. It is going to be local officials. And I think sometimes we have sort of forgotten that here in Congress as we talk about the war on terrorism, at least domestically. The public health administrations in each state and locality are going to be principally responsible for dealing with whatever eventualities they have to deal with.

The second point I want to make, and I really hope that ultimately as we move forward with this research, we can at least be responsible. And let me explain what I mean by that. Several years ago, I had the chance to meet one of the individuals who was involved in the basic research that ultimately led to the spectrometer. He made a very important point. He said, simply because we can measure parts per billion does not mean that they are statistically significant. And I think we have sort of bought into this notion that, you know, if we have three parts per billion of a particular chemical or agent or whatever, I hope that we will use good science as we go down this path. I think it is very important.

But I just want to make those two comments for the record because there is sort of this alarmist mentality out there that if it is three parts per billion, whether it is arsenic or lead or I mean, you can, you know, fill in the blank, that that is necessarily dangerous to human health. If we could somehow, as we go down that path, at least put it into perspective in terms of, you know, how many parts per billion is average strawberry contains of a particular chemical. And I think we would find that the answer to that question is people would be surprised. Some of the foods that they eat every day may contain much higher parts per billion than the drinking water which they drink.

Page 118 PREV PAGE TOP OF DOC

So I just want to throw that out there for your consideration and for the consideration of the Committee. And I—if you would like to comment, you are more than welcome to, but thank you very much.

Chairman **BOEHLERT.** Thank you. The Chair recognizes the distinguished gentlelady from Maryland, Ms. Morella.

Two-tiered Water Delivery System

Ms. **MORELLA.** Thank you. I want to thank the panelists for their wonderful presentations. And thank you, Mr. Chairman, for introducing this measure of which I am proud to be a cosponsor. I probably should have initially said something about Jerry Johnson, since his domain of the Blue Plains Wastewater Treatment Plant also affects parts of Montgomery County, Maryland. And also, as Chair of the D.C. Authorizing Subcommittee, I am very proud that you are here and the incredible reputation you have and the monumental task ahead of you. And all of you have such sterling credentials and we thank you and hope you continue to stay involved.

I was very interested in the question that actually Mr. Bartlett posed, because it occurred to me that also only one percent of our water is the drinking water. And I would like to just kind of follow through on that.

I am wondering, is it not possible to create a two-tiered water delivery system, one which would be for the drinking and cooking, and one for everything else? Could we then to move more cost-effectively secure the one that would be used for personal consumption—give that our greatest emphasis obviously? And I wondered what changes would this imply for the current delivery infrastructure? And would it be possible to phase in such a plan—such a system over a period of time? I mean, you all have indicated that, yeah, we should probably look into it. If you could be more specific about the kinds of questions I have posed? And I would start with any one of you. I thought it might be appropriate to hear from all of you briefly.

Page 119 PREV PAGE TOP OF DOC

Dr. **LUTHY.** Well, perhaps, I can give an academic view on that. A separate water delivery system would be a good idea if we were designing the system from scratch today. But we already have the pipes in place, so it becomes horrendously expensive to correct that. And a good example of this is just storm water management here in the older eastern cities. Look at the problem of having our storm water in our sanitary sewers. Every time we have a major storm, you have to bypass the treatment plant. And correcting that is horrendously expensive.

And—but we are making progress on it. Boston, Chicago, other cities are. So you have the right idea, but how we do that and where the funds would come for that, I am not quite sure. I cautioned against reliance on small systems in homes because I think there we are dependent upon people to maintain such things. And I think that that is just something that probably people in general wouldn't pay attention to.

Mr. **DANNEELS.** I think the alternative you put on the table is an excellent one. And I have read that some communities, new communities, are doing that. However, I don't remember where they are at, so I can't give you an example. But I have read that some new communities are doing that. I think that is one of the alternatives that needs to be looked at as we move forward and drinking water quality standards continue to be set lower and lower. I am not sure that we, with the infrastructure we have today, can meet those new standards.

And so one of the things that I put, again, in the written testimony, is talking about community-based systems, where you might have a finishing—a small finishing facility that may only serve a small number of houses, a hundred or a couple hundred houses. But, as Dr. Luthy points out, in large, existing cities, that is difficult to accomplish. But as we move forward, it makes sense to me that we look at those types of

systems. I wish we had more analysis today. I can't tell you the most cost-effective way to do it, because we don't have those types of numbers today to make recommendations.

Page 120 PREV PAGE TOP OF DOC

Ms. **MORELLA.** That indicates a need for more research. Mr. Johnson, do you want to comment on that?

Mr. **JOHNSON.** Yes. Yes. Thank you, Ms. Morella, and also thank you very much for your very kind comments. I think that it is a practicability issue. In developed urban communities, it is a matter of having to go in and basically open up the streets and the public ways to install these new systems because I don't know of a way that you could currently retrofit what exists in order to make that happen.

And given the level of expense that we are currently encountering for just keeping the current system operable, which I think you would have to do while trying to phase something like that in, I think that it would be a tremendously expensive conversion. But agreeing with the other panelists, I think that if you are looking at something in a smaller community, in a community that is newly developed or in small systems, small-area systems, it may be something that would work. But I would also caution that small-area systems, is the area where EPA and the State Health Department have their most difficulty in regulating and ensuring that certain standards are met, as well. But certainly on the scale, it could be accomplished.

Ms. **MORELLA.** Mr. Kallstrom, did you want to comment briefly or——

Mr. **KALLSTROM.** Ma'am, it is not my area of expertise, but I would just like to take the opportunity to thank you for all your support to law enforcement.

Page 121 PREV PAGE TOP OF DOC

Ms. **MORELLA.** You certainly, indeed, have it. And that poses, if I could, Mr. Chairman, just ask a very small question about——

Chairman **BOEHLERT.** If it is a very small question.

Federal Government's Role

Ms. **MORELLA.** The small question is, what—you know, since water is generally a local or a state issue, do you see a role in the—for the Federal Government in securing the water supply? Do you think that research dollars are enough, or is there a need for the Federal Government to supply operation and maintenance assistance?

Chairman **BOEHLERT.** Mr. Kallstrom, your area of expertise.

Ms. **MORELLA.** Yes. Mr. Kallstrom, that is right up your alley.

Mr. **KALLSTROM.** I think it is largely a local and state issue, but, you know, having the Federal Government develop the widgets and the sensors and the capability is something the local and state

government cannot deal with. So I think it is a great partnership and, you know, this bill is a wonderful idea. I would like to see more money in the bill. But absolutely, the states need funding for these types of things to implement into their systems, without question. So we need the partnership. Thank you.

Dr. **LUTHY.** I have a brief comment on that too.

Page 122 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** Yeah. Dr. Luthy.

Dr. **LUTHY.** Yes. I think there is a role for the Federal Government here to monitor what is happening at the local level. And a very useful thing would be to go and look at all the instances in which there, in the past, has been an attack or threat made on our water systems and to try to understand what was done in terms of coping with that. If something happened, then what was the remediation that was done. And there are examples of this across the country, but it is so anecdotal and it is not collected anywhere. But I think everyone here could probably cite some example. And so developing that, learning from that, I think, would be a good place to start.

Chairman **BOEHLERT.** I would agree. Wouldn't you—the gentlelady's time——

Ms. **MORELLA.** Thank you. Yes. It has expired.

Chairman **BOEHLERT** [continuing]. Has expired. Wouldn't you agree that it is probably more a myth than reality——

Dr. **LUTHY.** More——

Chairman **BOEHLERT** [continuing]. That all the threats that have occurred and attacks on local water systems over the years?

Past Threats

Page 123 PREV PAGE TOP OF DOC

Dr. **LUTHY.** Well, there have been people who have threatened in the past who——

Chairman **BOEHLERT.** Well, sure. I understand that.

Dr. **LUTHY.** Yeah.

Chairman **BOEHLERT.** Yes.

Dr. **LUTHY.** But I could point to Pittsburgh, for example, where a disgruntled employee put chlordane in a water distribution system. Now, that was an intentional act of sabotage. And so learning what the south hills of Pittsburgh had to do to cope with that, that is a good example then——

Chairman **BOEHLERT.** Yeah. Yeah.

Dr. **LUTHY** [continuing]. Of where the City of Pittsburgh said, we are going to put an emergency pipeline in place that they then kept in place to provide that water—the City of Pittsburgh provided water to the south hills while they corrected the chlordane problem. In another city—the problem, in The Dalles in Oregon where there was a group who was going to put salmonella in the water supply? It was unsuccessful, so they put it in restaurants instead.

Chairman **BOEHLERT.** Yeah.

Page 124 PREV PAGE TOP OF DOC

Dr. **LUTHY.** But I think that there are good examples there to learn from. And say, well, how were these people found out? What did they do? And if something did happen, how on earth did we cope with it?

Chairman **BOEHLERT.** Yeah. I would agree that we learn from experience.

Dr. **LUTHY.** But I think there are very few instances really.

Chairman **BOEHLERT.** You know, I would observe that one of the things we can do—and the dual system, the two-tiered system that is being discussed—Mr. Johnson, I think, pinpointed a large part of the problem. I mean, the estimated shortfall right now for water systems in America, drinking water and wastewater, is in the area of $23—$24 billion dollars a year. And the Federal Government is spending about $3 billion and the state and local governments are spending a good share of money. But we are falling far short of the mark, which is one of the reasons why I identify, and a number of members of this Committee identify, with our water infrastructure network.

We have paid a lot of attention to building our highway infrastructure and our aviation infrastructure, but our water infrastructure needs, Mr. Johnson, as you can attest, have been sorely lacking in the funding. So—and the other thing—one of the things we can do, obviously, is stop wasting it. We are conspicuous consumers.

Would you believe that this Congress—well, the preceding two Congresses, spent about two years arguing about a rule that requires low flow toilets. And there were some people that thought this was the heavy hand of government coming in and saying, you know, you have got to restrict the flow each time you flush. And there are some people that built a 2-year press career on demanding that the heavy hand of government be lifted and we be allowed to flush away gallons and gallons each time. And what a waste of a precious resource. But we are more serious about a lot of things since September 11. The Chair recognizes Mr. Udall.

Page 125 PREV PAGE TOP OF DOC

Role for NIST?

Mr. **UDALL.** Thank you, Mr. Chairman. Welcome to the Panel. And I apologize for not being here earlier for your testimony. I was curious or—and wanted to start with a comment. I think many of you are probably familiar with the National Institute of Standards and Technology, known as NIST. And it is our premier standard-setting organization in the United States. And it—I would like to extend the question to you—does it seem appropriate to ensure that NIST might be involved in helping the EPA determine what grants are made to organizations trying to develop standards, especially those concerning computer security? Anybody on the Panel would like to respond?

Mr. **KALLSTROM.** Well, I have had some experience with NIST and I always found them to be a highly capable, highly professional organization. You know, how they would interface as to setting priorities for funding particular grants for development, I think, would have to be—they would have to be part of a larger chain that would better assess the priorities of those from a whole team approach. So they probably would have a role. I wouldn't see them having the predominant role though.

Mr. **UDALL.** Mr. Danneels, do you have a thought on that? I know you are——

Mr. **DANNEELS.** I would——

Mr. **UDALL** [continuing]. Affiliated with the Sandia Laboratories and perhaps——

Page 126 PREV PAGE TOP OF DOC

Mr. **DANNEELS.** I would say that historically I don't believe NIST has played much of a role in the water arena. I believe most of the standards have been set between AWWA, ASCE, and some of those groups. So there would be an awful lot of coming up to speed on how those are done.

Mr. **UDALL.** Thank you. Besides the DOE National Labs, are there any other Federal laboratories that might assist in the research that we have been discussing today? And, if so, do you have any prime candidates that you might identify?

Mr. **DANNEELS.** Yeah. Several of the labs have looked at the type of systems that we have developed here that I had presented earlier, talking about Microchem lab. There is lots of research going on, on the other side of the House, more for the defense side of the House, that could be brought over and applied to the water infrastructure. So, yes, I know Lawrence Livermore has done work. I know Oak Ridge has done work. So, yes, I think this bill affords the opportunity for the national labs to play into this research. Historically, the grants program has specifically excluded the national labs. So you have excluded some of the premier research laboratories from doing some of this work.

Additional Benefits

Mr. **UDALL.** As I mentioned, I missed your earlier testimony. I just want to conclude with one final question. We have been talking quite a bit in the Congress, when it comes to responding to the terrible attacks on the 11th of September, about infrastructure improvements, research improvements that would have additional applications to cite. In other words, we are not just responding to the terrorist attacks.

Page 127 PREV PAGE TOP OF DOC

But if we were, for example, to improve our public health system, we would have additional benefits, I think, accruing to Americans. Do you—in your earlier testimony, did you all identify any areas where in the process of taking more of a look at this situation where we could ensure that our water supplies are cleaner, safer, regardless of whether they are subject to additional—or just to a terrorist attack or to a problem generated of this kind?

Dr. **LUTHY.** Yes. We talked about that briefly. It is important to recognize that our water treatment systems and water delivery systems are typically 50 to 100 years old, and they were designed to cope with other kinds of problems. And as we hear, they are aging and need repair and replacement, but the way that we should do that is to address the new problems as well. And it is not just the terrorist threats. There are also threats from trace pharmaceutical agents and other sorts of things that we use in our daily life. So you are exactly right. You need to take a long-term look at this problem and be deliberate in your actions so that you can both enhance the capability and performance of our water treatment plants, while, at the same time, addressing the security/safety issues.

Mr. **UDALL.** I am pleased to hear that to be the case. And I just want to commend the Chairman for holding this hearing and for identifying that as a real possible outcome in the long run if we do this right. And I yield back my time. Thank you, Mr. Chairman.

Chairman **BOEHLERT.** Thank you very much. Mr. Grucci.

Mr. **GRUCCI.** Thank you, Mr. Chairman. First, let me commend you also on conducting these hearings. Obviously, water is such an important part of life and its protection is so vitally important to everyone. It certainly gives people a sense of comfort knowing that people are watching out for their water supply.

Page 128 PREV PAGE TOP OF DOC

First, let me just comment on Mr. Kallstrom's presence here. I had the unfortunate pleasure of working with Mr. Kallstrom during Flight 800—TWA Flight 800 crash when Mr. Kallstrom was in his other position at the FBI. I was then the Supervisor of the Town of Brookhaven, and along with our County Executive Bob Gaffney, who sends his best wishes to you, sir—muddled through what was a very tragic event in the beginning and watched as people like Mr. Kallstrom took complete control of the situation and guided it through its many, many twists and bends and allegations of all sorts of terrible things that could have happened. I commend you on your work there and I look forward to your service in New York in your new position, and I think the Governor has made a very wise choice in you, sir, and I look forward to working with you in any capacity that I might be of help to you in.

Probability of a Terrorist Attack on an Aquifer

My question goes to Dr. Luthy. Doctor, we have a soil-source aquifer where we come from. Our water, obviously, comes from under the ground and it is controlled by an authority, the Suffolk County Water

Authority. And they have done a very good job of making sure that our water is clean, our water is pure, and our water is in ample supply. But my question comes more in what has been asked of me by my constituency. And that is, can our water supply become the subject of a terrorist attack? My first inkling is, is that it probably is not a very high priority since it is a soil-source aquifer rather than a reservoir type water supply. But if, indeed, terrorist activity could happen, how could it happen and what could we do to prevent it from happening? And that might even be for you or for Mr. Kallstrom, whoever feels more comfortable in responding.

Page 129 PREV PAGE TOP OF DOC

Dr. **LUTHY.** It would seem that it would be very difficult to contaminate an aquifer. These—the problems that we have today with aquifer contamination arose from practices that occurred a long time ago, you know, from fuel spills, that kind of stuff, and agricultural practices. So a deliberate act would seem to be pretty difficult to contaminate an aquifer. Destroying pumps would be another matter. Destroying a power supply to such systems would be another matter. But I think, in general, that aquifers are certainly very much more secure.

Mr. **GRUCCI.** Thank you. I appreciate your answer. Mr. Kallstrom, do you have anything that you would like to add?

Mr. **KALLSTROM.** I would just thank you for your remarks and thank you for all your help and cooperation back during those times. They were interesting times. I would agree with that. I think we are better off. Obviously, we can't let our guard down though, especially from the standpoint of supplying the water. And we are very concerned with that in this state. And working with the police agencies there in Suffolk, we think we have a good plan to deal with that as we speak.

Mr. **GRUCCI.** Great. Thank you. I yield back the remainder of my time, Mr. Chairman, and——

Chairman **BOEHLERT.** Thank you, Mr. Grucci.

Mr. **GRUCCI** [continuing]. Just to say thank you for holding these hearings, and I look forward to the passage of our bill tomorrow.

Page 130 PREV PAGE TOP OF DOC

Chairman **BOEHLERT.** Thank you very much. Ms. Jackson Lee.

Additional Comments

Ms. **JACKSON LEE.** Mr. Chairman, whenever you have a hearing in spite of the markup that we had in the Judiciary Committee, I would like to come and to acknowledge your leadership on these issues and to thank you for holding the hearing, and to emphasize to the witnesses my apologies for not hearing their complete testimony. But having reviewed their statements, I will make a few comments, Mr. Chairman, and reserve my questions.

Simply I want to enunciate the number of municipal sewage plants, treatment works, 16,000 of them servicing 73 percent of the U.S. population. I think with that one sentence, the value and the urgency of this hearing and markup is—I think, is clearly stated. My concern is that this has not been a high priority, and that is the potential for contamination of innocent water systems. They are found everywhere.

And I think that is the point that I would like to make, is that these are benign. They are innocent. They are located in areas where, coming from a local jurisdiction that most of us come from—we represent towns and counties, hamlets, urban areas—and typically these water centers, if you will, are nondescript. They may be in the midst of an urban area. They may be out in a rural area on a particular lakefront. Some of us have groundwater. Some of us have surface water. And most of us have no attention to it, no security to it. So I think the contamination question is a very viable one.

Page 131 PREV PAGE TOP OF DOC

Working with my fellow colleagues on homeland security, that is one of the key issues that we have spoken about, not only the water contamination, but, of course, air contamination. Ventilation was the issue of a hearing just a few weeks ago.

So I am hoping that as we move the legislation forward—and I have reviewed it, but not reviewed it extensively—we will be prepared tomorrow—that we will provide funding sources for research to determine other creative ways of preventing contamination. And as we seek to protect our water sources, I think we can be even that more expert in the kind of dollars or the kind of research that we promote.

I hope this is not the first time we approach this issue, Mr. Chairman, and it will give others of us the opportunity maybe to add additional insight to the legislative process, even after the passage of the bill tomorrow. And I would just thank the witnesses for their testimony. And I yield back.

Chairman **BOEHLERT.** And I thank you and I thank you for your very active participation in the deliberations of this Committee. Part of the problem we experience here is that so many of us are stretched a little bit thin. We have other responsibilities and oftentimes, as in the case of Ms. Jackson Lee, a higher priority is given to something at the moment in the Judiciary Committee requiring her presence there. But let me tell you, she is one of the most active members of this Committee, and also, I might add, one of the most thoughtful members, and I do appreciate it.

And I appreciate the testimony from all of you. Obviously, what we are trying to avoid, as much as possible, is adding one more set of worries to the American people. And we are trying to avoid also providing fodder for the tabloid trash. We want to deal in facts in this Committee.

Page 132 PREV PAGE TOP OF DOC

And so the one message from the Committee, I think, is that—and the witnesses have been very kind in indicating their support for the direction in which we are proceeding—is that we are moving in the right direction to do what needs to be done. We feel comfortable with the—I, as a New Yorker, with the plans that New York has in place with the professional leadership that the Governor has brought to bear on the

subject with Mr. Kallstrom, that our water systems are being monitored very carefully.

We are doing our best to provide the resources, as Ms. Jackson Lee pointed out, that we need for additional research and development, and our university communities are some of the best places to go to get that research going, and we are not going to provide instant solutions. But we think, in this Committee, on long range. And so I think we are doing—we are about business that is very important for the American public and I am proud of the Committee's action in this regard.

And I want to thank all of you for serving as resources. We are going to be moving forward tomorrow with the markup of this bill. There is a time sensitivity. It is not any rush to judgment. We have thought about this subject for some time. This is a bipartisan committee, so we are not trying to score points for partisan advantage on one side or another. Mr. Baird has worked just as hard as I have on this measure. We are the lead cosponsors, but, as you witnessed here, members raised their hands and said, put me on that bill. We have examined it. We think it is a good bill. And your testimony helped convince them that it is. So I thank you very much. And I would announce the Committee is adjourned.

[Whereupon, at 11:58 a.m., the Committee was adjourned.]

Page 133 PREV PAGE TOP OF DOC

Appendix 1:

H.R. 3178

76415b.eps

76415c.eps

76415d.eps

76415e.eps

76415f.eps

76415g.eps

H.R. 3178 WATER INFRASTRUCTURE SECURITY AND RESEARCH DEVELOPMENT ACT

(INTRODUCED 10–30–01, REFERRED TO SCIENCE COMMITTEE)

SUMMARY

Authorizes EPA grants ($12m/yr for 5 years) to public and private nonprofit research organizations for research, development and demonstration projects that increase security of drinking water and wastewater infrastructure.

SECTION 1

Provides short title.

SECTION 2

Defines the terms "Administrator," "research organization," and "water supply system." Research organizations include foundations, national laboratories, and universities. Water supply systems include drinking water and wastewater facilities.

SECTION 3

"Water Supply System Security Research Assistance"

Subsection (a): Directs the EPA, in conjunction with other relevant agencies, to establish a program for the research, development, and demonstration of technologies and related processes to increase the security of water supply systems.

Subsection (b) Projects

Provides that awards may be used to:

(1) conduct research related to or develop technologies and related processes to assess physical and information systems vulnerabilities;

(2) conduct research related to or develop technologies and related processes for protecting physical assets and information systems;

(3) develop programs to disseminate the results of research to increase public awareness of threats to water supply systems, and to help managers of water supply systems respond to threats;

(4) demonstrate and assess upgraded security technologies and related processes, including the operational and cost impacts of enhanced security measures;

(5) develop guidelines, standards, and procedures for physical and information systems security at water supply systems;

(6) conduct research related to or develop real-time monitoring systems related to chemical, physical, and radiological attacks;

(7) conduct research related to or develop technologies for the mitigation, response to, and recovery from

biological, chemical, and radiological contamination; and

(8) carry out other research, development, and demonstration activities EPA considers appropriate for improving water supply system security, including information sharing and analysis.

Subsection (c) Guidelines, Procedures, Criteria

Page 136 PREV PAGE TOP OF DOC

(1) Requires EPA to consult and coordinate with various entities, including water supply agencies, in developing guidelines, procedures, and criteria for applications and the selection of awards.

(2) Requires EPA to transmit to Congress proposed guidelines, procedures, and criteria at least 90 days before finalizing such proposals.

(3) Directs the EPA to ensure, to the maximum extent practicable, that awards are distributed to a wide variety of projects and to geographically diverse recipients.

(4) Requires, as a condition of receiving an award, that research organizations have in place appropriate security measures regarding entities and individuals carrying out activities under the award.

(5) Requires the appropriate dissemination of the results of research, development, and demonstration activities.

Subsection (d) Cost Sharing

(1) Directs EPA to require at least 50% cost sharing from non-Federal sources on all demonstration projects, except that EPA may reduce this requirement under specified circumstances.

(2) Provides that the non-federal cost share may include in-kind contributions such as personnel, services, equipment, and other resources.

Page 137 PREV PAGE TOP OF DOC

SECTION 4 "Authorization of Appropriations"

Authorizes $12 million for each of fiscal years 2002 through 2006 for EPA to carry out the Act and requires that such funds remain available until expended.

Appendix 2:

Additional Material for the Record

76415h.eps

76415i.eps

76415j.eps

76415k.eps

76415l.eps

76415m.eps

76415n.eps

76415o.eps

Page 138 PREV PAGE TOP OF DOC

76415p.eps

(Footnote 1 return)

Critical Infrastructure Assurance Office, Report of the President of the U.S. on the Status of Federal Critical Infrastructure Protection Activities; see *http://www.ciao.gov/CIAO Document Library/final.pdf* and summarized in Copeland and Cody, "Terrorism and Security Issues Facing the Water Infrastructure Sector," Congressional Research Service report: RS21026 (September 27, 2001), pp. 4–5.

CONTENTS SPEAKERS INSERTS

WATER AND SEWER AUTHORITY;
TESTIFYING ON BEHALF OF THE ASSOCIATION OF METROPOLITAN WATER AGENCIES AND THE AMERICAN WATER
WORKS ASSOCIATION RESEARCH FOUNDATION

PAGE 81

INSERTS SPEAKERS CONTENTS
NO INSERTS IN THIS HEARING