

Water Infrastructure Risk Assessment

Increasing Security and Reliability by Design

Background

National and international security challenges shifted with the end of the cold war. Scarcity of arable land, water, and other basic resources are now recognized as critical components of regional stability in many areas around the world. Water resources and the associated supply, treatment, and distribution infrastructures are important elements of national security that face a spectrum of threats. According to the President's Commission on Critical Infrastructure Protection, the nation is so dependent on our infrastructures that we must view them through a national security lens. Infrastructures are also essential to the nation's economic health and social well-being. Recent threats and isolated attacks on the water distribution system suggest a trend that could put our water infrastructures at risk. Foreign governments, disgruntled employees, terrorist groups, transnational crime syndicates, and vandals all pose potential threats to our nation's water systems. Recent events include:

- A pesticide intentionally injected into a water main.
- A cult culturing salmonella in its own laboratory.
- The discovery of U.S. water utility information in Afghanistan.

To counter the current threat situation, the U.S. water infrastructure urgently requires:

- A systematic analysis of existing and emerging threats.
- Security enhancements based on the vulnerability assessments completed by water utilities.
- Early warning and response systems to detect and contain contaminants.

Approach

The Security Systems and Technology Center of Sandia National Laboratories has the experience and resources to address the needs of the water infrastructure. From nuclear weapons to large federal dams, Sandia has been the lead laboratory for the U.S. Department of Energy providing security solutions for our nation's most critical assets. Systematic and performance-based risk assessment methodologies developed and refined over the last 25 years have been adapted for use on the water infrastructure.

In partnership with the Environmental Protection Agency, water industry associations, and water utilities, Sandia is developing a comprehensive program for protecting the water infrastructure. Activities completed or currently underway include:

- Development of Version 1 and Version 2 of the security Risk Assessment Methodology for Water Utilities – RAM-WSM.
- Development of the RAM-WSM *Case Study for Small and Medium Water Utilities*.
- Training and train-the-trainer programs in security risk assessment tools and technologies.



***Improving the Safety, Security,
and Reliability of Our Water
Infrastructure***



Entry Control Systems

- Completed lessons learned workshops involving water utility owners and water industry consultants and RAM-WSM trainers.
- Assessment and characterization of several large municipal water utilities by Sandia's physical and cyber security experts.
- Creation of new standards with intrinsic security for the water and wastewater infrastructures.

Research and Existing Projects

Research into real-time active management systems for water quality monitoring, an important component of total system security, is underway. Examples of Sandia's efforts include:

Active Management Systems

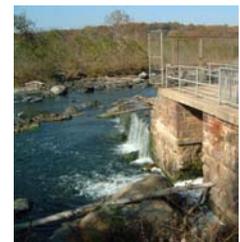
- Research is underway to allow continuous monitoring of several Environmental Protection Agency-regulated contaminants.
- Adapting proven microsystems techniques to detect chemical/biological agents in water.
- Developing on integrated methodology for assessing critical infrastructure by leveraging existing assessment methods used for physical and cyber analysis.



Microsystems for Continuous Monitoring of Water Quality

Water Infrastructure

- Delivered a fully documented methodology for assessing security risks at water utilities. RAM-WSM has been used to assess security risks at thousands of water utilities across the United States.
- Developed and presented workshops to train water utility managers and water consultants on systematic risk assessment methodologies (now turned over to private industry).
- Integrated cyber and physical security assessment processes.
- Completed security risk assessments of 7 large municipal systems.
- Delivered a Case Study to demonstrate a streamlined version of RAM-WSM for application to small and medium-sized water utilities.
- Ongoing research and development of methods that quickly determine contaminant introduction locations.



Water Utility Assessments

Related Sandia Water Activities

This is one component of Sandia's Water Safety, Security, and Sustainability Initiative.

Other areas include: Water Quality, Water Quantity, Water Use Management, and International Water.

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