Delaware Valley Early Warning System (EWS)
Project Summary

EWS Background

The Delaware Valley Early Warning System (EWS) is an integrated monitoring, notification, and communication system designed to provide advance warning of surface water contamination events in the Schuylkill and Lower Delaware River watersheds. The EWS was developed in 2002 with funding provided by the Pennsylvania Department of Environmental Protection (PADEP) and the United States Environmental Protection Agency (USEPA) and was deployed as a fully functional system in 2004. The Philadelphia Water Department (PWD) initiated the development of the EWS after identifying the need for such a system while collaborating with upstream treatment plant operators for the completion of the Source Water Assessments for the Schuylkill and Lower Delaware Rivers between 1998 and 2000. The Delaware Valley EWS covers the entire length of the Schuylkill River as well as the Delaware River from Wilmington, DE, to the Delaware Water Gap, near Dingman's Ferry, PA.

Components of the EWS

The EWS is comprised of four principal components; the EWS Partnership, the notification system, the monitoring network, and the web-based database and portal. The EWS Partnership is comprised of stakeholders in the EWS and includes representatives from both public and private drinking water treatment plants in the coverage area, industries who withdraw water from the Schuylkill and Delaware Rivers for daily operations, and representatives of government agencies and emergency response personnel from both PA and NJ. The notification system includes both automated telephone notification and web-based notification capabilities. The monitoring network is comprised of on-line water quality and flow monitoring stations located at USGS sites and water treatment plant intakes throughout both watersheds. The website and database portal are the backbone of the EWS and are fully integrated with the notification system and monitoring network.

Water Quality Notification System

The notification system is the means by which water suppliers and industries are made aware of a contamination event. This system, which was developed to support existing notification protocols, relies upon an emergency responder, water supplier, discharger, or other like party, to initiate an alert by reporting an event to the system using the telephone or website reporting features.

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Telephone Reporting System

The telephone notification system enables the reporting party to automatically send telephone and/or e-mail notifications to downstream emergency responders, treatment plant operators, and other utility personnel through a single phone call. When the reporting party calls the toll-free EWS telephone notification system, the user is prompted to enter the time and location of the event using the touch-tone key pad. Once this basic information is provided, the user is prompted to leave a detailed voicemail providing whatever additional event information is available, such as the name and organizational affiliation of the reporter, type and extent of the event, response actions being taken, and contact information for obtaining additional information. When the call is completed, the automated system initiates telephone and/or e-mail notifications to all downstream EWS users. Users entering events through the telephone system are prompted to send redundant notifications for high risk events when users will receive a telephone call using CodeRed communication technology *and* e-mail notification. Users will receive notifications via e-mail *only* if the event is determined to be of low risk by the reporting party. High risk event phone calls to downstream users provide the user with the time and location of the event and play the associated event voice message. When a notification is made by e-mail, recipients of the notification will see the time and location of the event in the body of the e-mail and will be provided with a link to the EWS's website for downloading and listening to the associated voice message.

Website Reporting System

The website notification system allows an emergency responder, water supplier, or discharger to generate an immediate notification to downstream water suppliers and industrial users by utilizing the EWS's website reporting and mapping functionality. On the home page of the website, the user is given the option of entering a new event. When this option is selected, an on-line report is generated and the reporting party is prompted to provide detailed information on the date, time, location, nature, and extent of the event. An interactive mapping tool allows the user to identify and select the location of the event and save the location coordinates into the event report. When the on-line report is completed and saved into the system, an e-mail notification is immediately generated to downstream users and a time of travel model is produced estimating the time at which the event will impact all downstream intakes based on real-time flow data and historical high and low flow values. The time of travel tool provides drinking water and industrial intakes with an estimated time frame in which to modifying their operations to address the anticipated threat.

The notification system supports existing notification protocols by allowing a reporting party to notify many organizations and individuals with a single phone call or by populating and saving a single on-line report. Single call or on-line notifications will initiate alerts to all subscribing downstream water suppliers and industries, including those users far enough downstream that current protocols do not require they be contacted. Thus, this system increases the reach of the reporting party. The system also initiates calls and e-mails to multiple people within a given organization, and provides redundant calls if the initial call is not received or acknowledged. These functions increase the likelihood of successful notifications and reduce the likelihood that a notification will not be received due to the intended recipient being on vacation or away from their desk. Multiple notifications within organizations and redundant notifications to individual recipients are especially important for notifications that occur outside of normal business hours, when some intended recipients may not be reachable.

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Monitoring Network and Website

The monitoring network and website together provide EWS users with information and tools needed to respond to water quality events. The monitoring network collects and sends near real-time data to the EWS database which then populates the EWS website. The website provides a secure location for the storage of water quality data and event information and provides the users with tools for entering new events, updating existing events, determining the time at which an event will impact a given intake, monitoring the effect of an event on water quality as it moves downstream, and for monitoring real-time water quality and flow data to guide daily operations. Additionally, the time of travel model can be run in simulation mode to assist with emergency preparedness planning. In 2014, a tidal spill model was incorporated into the EWS to better forecast the movement of contamination in the tidal Delaware River. The tidal spill model produces an animation for water quality events reported in the tidal Delaware that can be viewed via the EWS website. The tidal spill model is updated every 6 hours for 48 hours after the initial report to incorporate the changing conditions of the river.

EWS Partnership

The EWS Partnership includes public and private drinking water treatment plants in the coverage area, industries who withdraw water from the Schuylkill and Delaware Rivers for daily operations, emergency response personnel, and representatives of regional, state, and county government agencies. Through the EWS Steering Committee, these parties guide the development of the EWS and determine the future role and functionality of the system. The EWS Steering Committee meets biannually during which recent system developments and enhancements are discussed, future development activities are explained and prioritized, and user comments are shared and incorporated into the EWS development plan.

Conclusion

The Delaware Valley EWS has become an international model for water quality early warning systems through its sophisticated integration of monitoring, notification, and website technologies, its usefulness for daily plant operations, and through the strength of its partner network. Although the EWS was deployed as a fully functional system in 2004, ongoing upgrades and enhancements continue to be made to ensure the most effective and robust technology is utilized and the system continues to meet the needs of the expanding EWS user network. These ongoing activities include website redesign, the development of new Internet tools and system functionality, the improvement of system performance and website navigation, the addition of new water quality monitoring stations, the incorporation of new monitoring technologies and water quality parameters, and the training and support of new and existing users. The goal of these activities is to ensure that the Delaware Valley EWS continues as the most advanced, robust, and sophisticated system possible for preventing the contamination of the drinking water supplies which serve over 3 million people in the Schuylkill and Lower Delaware River watersheds.

For more information on the EWS project, please contact:
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