

American Water Resources Association
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1:30 PM – 3:00 PM

SESSION 39: Drinking Water Supply

Source Water Protection Analysis Based on the DWMA - William Cooter, RTI International, Durham, NC
(co-authors: A. Roger Anzzolin, James I. Rineer, Brandon Bergenroth, David Chrest)

To enhance the U.S. EPA's capabilities to identify major contaminant risks to public drinking water supplies, the Office of Ground Water and Drinking Water created the Drinking Water Mapping Application (DWMA). The DWMA provides a secure application EPA staff can use to obtain reports and maps that help manage programs under the Safe Drinking Water Act. The DWMA makes extensive use of the enhanced National Hydrography Dataset (the NHDPlus) to locate drinking water surface intake locations within the NHD network and to define source water areas relative to the intake facilities. Source protection areas are also provided for buffer areas around wellheads. GIS layers used for the DWMA allow a wide range of cross-program analyses to identify risks in proximity to drinking water facilities or source water protection areas. In addition to information from the EPA, the DWMA makes extensive use of data from the USGS and the USDA. Information from the National Land Cover Dataset for 2001 is applied to provide percent impervious cover indicators for all surface water and groundwater source protection areas. The DWMA also provides information on the locations of FEMA floodplain areas or areas along coasts vulnerable to impacts from storm surges or sea level rise based on analyses applying the National Elevation Dataset. This information is valuable in planning for responses to natural disasters (e.g., major inland floods or tropical storms along our coasts) as well as the evaluation of adaptation strategies related to potential climate change impacts. Examples are provided of the extensive set of sensitive areas and potential contaminant risks available with the DWMA. Approaches are illustrated that can help make information related to sensitive drinking water information available to a wider audience. These approaches can involve displaying non-sensitive information that is in proximity to drinking water facilities. Approaches are also illustrated that use suitable large polygons such as the HUC12 subwatersheds in the Watershed Boundary Dataset to provide indicators for the underlying sensitive drinking water information that can then be readily shared with other agencies and the general public.

Mitigation of Uncertainty in Spatial Analyses: A Case Study of Siting a Water Supply Wellfield in an Urban Environment - Francis Henderson, Broward County Water & Wastewater Services, Pompano Beach, FL

Siting new water supply wells in an urban environment requires the characterization and analysis of a multitude of sub-surface and land cover/use factors along with groundwater modeling results; and regulatory, operations and infrastructure considerations. In this study, multi-variant, spatial analyses using GIS were used to assist in the decision-making process of where to site a new wellfield in urban Southeast Florida. Spatial Analyses in GIS require consideration for data uncertainty or accuracy beyond those normally considered in making a map. While GIS gains much of its power from being able to collate and cross-reference many types of data by location, unfortunately, every time a new dataset is imported, the GIS also inherits its errors. In this presentation, several possible approaches to mitigating unacceptable data uncertainty are discussed. These approaches range from simply acknowledgment of the level uncertainty to formal accuracy assessments that results in the diagnoses and error reduction in the spatial data to acceptable levels to meet the needs of the underlying decision making of where to locate new water supply well sites.

Where Will We Fail Next? V Integrating GIS and Failure Forecasting to Identify Your At Risk Assets - Seth Garrison, CDM, Cambridge, MA (co-author: James Carolan)

Proactive water system utility managers have been developing aggressive pipe rehabilitation and replacement (R&R) programs that target the most obviously faulty or degraded assets for many years. After decades conducting these R&R programs, the number of failures and the frequency of water quality complaints have

declined. Given that decline and the increasingly tight funding utilities are now asking themselves, "What do we do now?" With many of the serious infrastructure problems out of the way, it is much harder to choose candidate pipes for R&R. In order to accurately "weight" the factors that affect the degradation and the ultimate risk to infrastructure and health, utilities are increasingly required to leverage existing applications such as hydraulic models, geographic information system (GIS) data and risk identification to develop specialized Asset Management (AM) practices that rank assets more effectively. The analysis often starts with an assessment of failure probabilities by pipe characteristics (age, material, diameter, etc.) using historical data. One of the most advanced tools for failure forecasting is LEYP, developed by the CEMAGREF, France. This presentation will review a number of the key criteria that are pertinent to identifying the risky assets during your R&R decision making process; how several types of statistical models are used in collaboration with GIS and hydraulic modeling to make decisions; and demonstrate creative examples of how values for the criteria have been derived using a wide array of sources including: GIS software and the GIS asset inventory; Work orders, capital planning documents, complaint records, etc.; Identification of sensitive customers and critical infrastructure; Hydraulic models; Information emanating from other public agencies and utilities. In addition, options for using and managing the results of the analysis will be discussed including the use of GIS and other applications to track, view and manage the resulting multi-year R&R plan.

Leveraging GIS and Database Technologies for Facilities Siting Analysis - The St. John's River/Taylor Creek Reservoir Alternative Water Supply Project Case Study - Prasad Chittaluru, EPIC Engineering & Consulting Group, LLC, Orlando, FL (co-authors: John Watson, George Schlutermann, Lynn Wile)

Three Florida Water Management Districts (WMDs) jointly concluded that groundwater resources in central Florida are insufficient to meet future demands and identified the need to implement alternative water supply (AWS) projects. Several strategies have been proposed to develop sustainable water solutions by reducing water use, increasing water supplies, and reusing treated wastewater. In addition to such strategies, there is a need for temporarily storing water during times of abundance for later use during dry periods. Opportunity exists to divert water from St. Johns River into a reservoir or using aquifer storage and recovery (ASR) to increase the reliability of water supply. Six water suppliers and two WMDs signed a Memorandum of Agreement to work together to plan and prepare a preliminary design for this AWS project titled St. Johns River/Taylor Creek Reservoir (SJR/TCR) Water Supply Project. A consultant team was selected to evaluate the technical, economic and environmental feasibility of this project and identify feasible sites for locating facilities such as river water intakes, surface water treatment facilities, storage reservoirs, ASR and direct recharge wells, and transmission systems. The consultant team developed a methodology including environmental constraints, natural resources, regulatory criteria, infrastructure and economic factors to identify preferred locations for planned facilities. Various criteria were developed to enforce the constraints. Weighting factors and utility curves were developed for each criterion to reflect influence on the facilities site selection. Optimal facilities siting required simultaneous iterative analysis of multiple criteria across large geospatial and tabular datasets. The project area spanned four counties and the information varied greatly due to multiple sources. The power of GIS and database technologies was successfully leveraged to perform sophisticated and iterative data analyses resulting in consistent and quantifiable ranking for each site. Top ranking sites for each facility type were identified and provided for subsequent modeling exercises. This paper summarizes the methodologies developed for this siting analysis and describes how GIS and database technologies were used to solve a complex problem.