



## **Enhancing Resilience and Emergency Preparedness of Water Utilities through Improved Mapping**

### **A Critical Infrastructure GIS Mapping Initiative**

#### **Project Background**

Throughout the Commonwealth, maps are utilized by Public Water Systems (PWSs) and Publicly Owned Treatment Works (POTWs) for operational purposes and to meet federal and state regulatory requirements. Maps are also used during emergency response efforts and for non-emergency scenarios, such as MassDEP permitting, inspection and review of regulated facilities, troubleshooting water utility issues, watershed/resource protection, and climate change resilience planning. Available maps can vary from hand drawings and old blueprints, to fully engineered Geographic Information Systems (GIS) or Computer-Aided Design (CAD) maps based on the available resources of any given water utility.

The Water Utility Resilience Program's project "Enhancing Resilience and Emergency Preparedness of Water Utilities through Improved Mapping" is designed to assist water utilities with enhancing their ability to better manage infrastructure assets, respond to emergencies, and meet regulatory mapping requirements as necessary. In addition, the data developed from this project is providing MassDEP with the tools necessary to evaluate, prioritize and assist water utilities with critical infrastructure resilience planning and climate change adaptation, as well as improve MassDEP's ability to more efficiently respond to water utility emergencies. Datasets depicting generalized information, including service area boundary maps, are published and made available via MassGIS.

#### **2016 Project Work**

In 2016, a collaborative effort was initiated between MassDEP's Water Utility Resilience Program (WURP) and MassDEP's GIS program to develop a uniform approach in tracking map availability, improve internal accessibility to water utility critical infrastructure, and develop a consistently formatted, statewide water utility infrastructure map for state agency use. The initiative resulted in a preliminary statewide inventory of available community (COM) PWSs and POTWs mapping information, and included a comprehensive review of historical mapping projects, available online information, and internal MassDEP files. The inventory allowed MassDEP to identify water utilities that may potentially be in need of GIS mapping technical assistance.

#### **2017 Project Work**

In 2017, state grant funding through MassDEP's Water Management Act (WMA) program secured \$300,000 to assist in jumpstarting GIS mapping for water utilities that were initially

identified through the 2016 inventory as potentially in need of GIS assistance, and lacked the resources for such work. In January 2017, MassDEP issued a Request for Quotes (RFQ) seeking bids from pre-qualified firms on the ITS53ProjServGIS statewide contract in order to select a Contractor for this work. The work included confirming information contained within MassDEP's mapping inventory, updating PWS interconnection information, and providing GIS mapping services for up to 50 water utilities.

In March 2017, MassDEP contracted with Tighe & Bond, Inc. to provide these GIS services. As a result, a total of 32 communities, prioritized as 34 PWSs and 15 POTWs, received GIS mapping services free of charge. The 49 water utilities were prioritized based upon factors that included system size, need(s), interest in participation, and MassDEP regional program staff input.

Data developed from the 2017 project resulted in MassDEP and each PWS and/or POTW receiving a hard copy paper map of their respective drinking water distribution or sewer collection system, along with a thumb drive that contained a pdf image of the map, the GIS data for their system, and a GIS metadata description report.

Proposed costs for additional services to continue building upon work initiated under this project including assessment of GIS technical assistance for an additional 86 water systems that have indicated interest.

## **2018 Project Work**

During fiscal year 2018 (FY18), \$500,000 was made available to further the project. MassDEP issued a Request for Interest (RFI) on November 7, 2017, to solicit interest from additional PWSs and POTWs to receive free technical assistance in developing GIS maps of their respective distribution and/or collection systems from a private consulting firm. The RFI was posted to the MassDEP website with additional direct email messages sent out through MassDEP's drinking water and wastewater/Department of Public Works (DPW) listserv.

On February 20, 2018, MassDEP issued an RFQ seeking bids from pre-qualified firms on ITS53ProjServGIS contract to hire a consultant to provide the mapping services. MassDEP contracted with Tighe & Bond to complete tasks outlined in the RFQ.

The FY18 project resulted in a total of 44 water utilities, designated as 28 PWSs and 16 POTWs, receiving GIS mapping services free of charge. The project's work in FY18 included development of a [GIS Field Use Information Report](#). The report offers water utilities basic information about GIS data and the variety of ways it can be used for operations, planning and event response. It includes summaries of how GIS data can be used by water utilities, and provides comparisons of existing GIS software commonly used throughout the state by water utilities. This report should not be considered an endorsement by MassDEP of any particular GIS product or services.

In addition, the FY18 project included a generalized service area mapping task for community PWSs and POTWs statewide. The task depended upon system response from 522 PWSs and 211 wastewater systems for confirmation of draft service area maps, and requests for information to develop service area data. The task resulted in a statewide service area data layer for approximately 47% of PWSs and 23% of wastewater systems and MassDEP currently anticipates that this information will be made

publicly available in 2019 to the extent permitted by federal and/or state law concerning security requirements for critical infrastructure information, as described below.

## **2019/2020 Project Work**

Project funding of \$500,000 allowed for continued work for fiscal year 2019/COVID year 2020 (FY19/CY20). In anticipation of the FY19 funding, MassDEP again issued an RFI in October 2018 to solicit interest from additional PWSs and POTWs for free technical assistance in developing GIS maps of their respective infrastructure. On April 5, 2019, MassDEP issued a RFQ seeking bids from pre-qualified firms on the ITS53ProjServGIS contract to hire a consultant to provide mapping services and subsequently executed the Statement of Work (SOW) contract in June 2019 with Tighe & Bond.

The FY19/CY20 project provided GIS mapping for 38 water utilities in 23 municipalities across the state, produced water utility flood hazard maps for 120 systems that have participated in the project since its FY17 beginning, and provided training to water utilities on options and procedures for the uncomplicated use and editing of their GIS data both in the office and in the field. The FY19/CY20 project round also built upon the statewide service area mapping to advance the development of publicly accessible water utility service area maps statewide. This continued work saw increased confirmation of service areas for 376 out of 524 community drinking water service areas and 168 out of 263 confirmed sewer service areas: 72% and 64% respectively.

As FY19/CY20 project deliverables were being finalized, MassDEP WURP performed additional targeted outreach to PWSs and POTWs to further define systems interested in project participation and obtain specific information on mapping needs.

## **2021/2022 Project Work**

A combined \$703,000 was made available for project tasks in fiscal year 2021 (FY21) and fiscal year 2022 (FY22) project years to continue work under an amended SOW with Tighe & Bond. During FY21 and FY22, GIS mapping service was provided to 15 and 9 water utilities for each project year, respectively, in 21 municipalities across the state. During the FY21 and FY22 project years, WURP and their contractor built upon the statewide service area mapping to advance the development of publicly accessible water utility service area maps statewide. This continued work saw increased confirmation of service areas for 516 out of 602 community drinking water service areas and 179 out of 261 confirmed sewer service areas: 83% and 69% respectively. As part of these project years, WURP mapped non-transient non-community (NTNC) PWSs and facilities with groundwater discharge (GWD) permits as part of its work in service area mapping. WURP also developed a data dashboard, which allows MassDEP staff to view the data via maps and summary statistics alongside other datasets of importance (e.g. Environmental Justice communities, location of PWS interconnections, etc).

## **2023 Project Work**

During fiscal year 2023 (FY23), MassDEP staff took extensive efforts to review drinking water and sewer service area data developed by the consultant. During this verification process, WURP staff developed standardized processes to ensure the service area boundary dataset incorporated data available from existing drinking water and sewer databases, revised boundaries to ensure polygons aligned with updated municipal boundaries, updated data schema, developed new data categories to improve data use and visualization, developed data maintenance schedules, and identified methods for evaluating and correcting data anomalies.

## **2024 Project Work**

WURP focused on preparing for the publication of the drinking water service area boundaries dataset in fiscal year 2024 (FY24). During this time, additional work was completed to organize data and add fields to enhance the dataset for various data uses. Program staff also worked closely with wastewater programs to gather feedback on ways to enhance dashboards designed to assist staff in their work.

WURP received \$250,000 to continue statewide mapping work. The Program contracted with the United States Geological Society USGS through a Joint Federal Agreement (JFA) to continue mapping and confirming service areas for COM and NTNC PWSs, NPDES entities, and GWD permit holders. USGS also continued work on the interconnections project, incorporated user feedback to an internal dashboard available to MassDEP staff, and developed measures for estimating the population and parcels served by publicly-owned utilities.

## **2025 Project Work**

In September 2024, WURP published the [drinking water service area dataset to MassGIS](#). Data delineating the areas served by public water systems (PWSs) is available for the first time through [MassMapper](#) and the MassGIS's [ArcGIS Online Data Hub](#). The full dataset including description, metadata, and upcoming options to download the data or use it in ArcGIS Online are available through the [MassGIS's dataset landing page](#).