

Recommendations for Management of Domestic Water Supply Well Records in the State of Connecticut

Private Well Workgroup

Sub-group to State Water Plan Implementation Workgroup

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Summary

Approximately 322,000 private water supply wells have been installed in Connecticut, providing drinking water to nearly one quarter of the state's population. Well drillers, who are licensed and regulated by the Connecticut Department of Consumer Protection (CT DCP), fill out a well completion report for each well and paper or scanned copies of many well completion reports are currently managed by CT DCP. These well completion reports contained a lot of useful information, such as depth of well, static depth to water, depth to bedrock, and well yield. Paper or scanned reports are available by town and year; however this format does not allow for private wells to be located on a map, and the data from the various fields in the form can't be analyzed on a local or statewide basis. If these data were retrievable, they could be used to aid in identifying potential public health threats from PFAS, road salt, and other contaminant releases. Other benefits include geo-referenced data on overburden and bedrock geology, and administrative efficiencies.

Most states in the region have upgraded to an electronic database format. Data from the well completion reports are entered into a database, which allows for geographic referencing of well locations and retrieval and analysis of the information. Recently, CT DCP has developed a database for entry of the data from new well completion reports, which will be submitted by well drillers on a digital form. CT DCP will manage the database into the future. The estimated timeline for the implementation of this new system is late summer 2020. Although this is a significant step for managing well completion report data moving forward, CT DCP has no resources available to enter existing data into the database.

This sub-workgroup of the State Water Plan Implementation Workgroup is recommending that Connecticut allocate resources to enter information from existing well completion reports into the new database. A multitude of agencies in the state will benefit from this effort. Overall, it is the conclusion of this sub-group that the benefits of the proposed format far outweigh the associated costs.

Introduction

One of the most critical resources we have in Connecticut's water is high quality drinking water. The state's 3.5 million people obtain their water through both public water supply systems and individual water supply wells. Community systems are proactively, heavily regulated with oversight from the CT Department of Public Health (CT CPH). Regulation includes design and treatment standards, regular water quality testing, and planning for adequacy of supply. Data on the location and quality of public water supplies are readily available to the water system regulators who can share the information as needed and appropriate.

In contrast, approximately 820,000 people rely on private water supply wells for their water in Connecticut, as do many small commercial properties in rural areas. Well owners are responsible for testing the quality of their own drinking water and maintaining their own wells. While private wells are tested for basic parameters when a well is first constructed, there are no testing requirements subsequent to installation. Additionally, there is no available mapping of the location of private wells in the state, and the information on well construction can be difficult to locate. This information is often needed when contamination occurs.

The State Water Plan identifies a number of issues concerning water supply wells, including our ability to respond to water quality issues, and manage and plan for economic growth. A topical sub-work group was formed by the State Water Plan Implementation Work Group to consider and evaluate how well information is managed and to make recommendations to the Water Planning Council on this topic. A list of members of the sub-work group can be found in Appendix A.

Nearly 322,000 private residential wells exist in the state of Connecticut, serving about 23% of the state's population (Table 1). The number of private wells serving a residential population in Connecticut is an estimate that is derived from census information and the population supplied by public water systems.

Current Population:	3,572,665	Data source: https://www.census.gov/quickfacts/fact/table/ct,US/PST045218
Number of people per household	2.55	Data source: https://www.census.gov/quickfacts/fact/table/ct,US/PST045218
Percent of population served by community systems	77%	Number of people served by community systems/Total CT population

Percent of population served by private wells	23%	1 - (% of population served by community systems)
Number of people served by community public water systems	2,752,875	Data source: DWS Public Water Systems Lists webpage: https://portal.ct.gov/DPH/Drinking-Water/DWS/Public-Water-System-Lists
Number of people served by private wells	819,790	Total Population * Percent served by private wells
Estimated number of private wells	321,486	Number of people served by private wells / average number of people per household in CT

The above table assumes one well per residential premises; however there are situations where more than one well is needed to supply the household water use needs. These situations usually occur in areas of the state where the bedrock geology does not support adequate yields and often results in very deep wells with yields less than 1 gallon per minute. Additionally, the above estimate of the number of private wells only accounts for wells supplying water for domestic use to residential premises. It does not account for the number of irrigation wells, geothermal wells, or wells used for commercial or industrial purposes.

In Connecticut, water supply wells must be installed by a licensed well driller. When a well is installed, a well completion report is generated by the driller. The well completion report contains data which, if accessible, could provide valuable information to state agencies, health directors, and regional and local planning entities, in addition to the residents that rely on these wells.

A well completion report provides information on where the well is located, the depth, yield and geology, as well as details on the well construction. When a well completion report is generated by a well driller, copies are sent to the property owner, local health director, Connecticut Department of Consumer Protection (CT DCP), and the Connecticut Department of Energy and Environmental Protection (CT DEEP). The CT DCP has been working to scan well completion reports and make them available online. Unfortunately, the scans are multi-page pictures of all the completion reports for a given town in a given year drilled, and the information on them is not searchable in the current form. In addition, well completion reports have been required since the 1950s, but reports available online range from the 1970s to 2016. CT DEEP is currently considering scanning the reports from the 1950s to 1970s and providing them to DCP in pdf-a form.

Challenge or problem definition

Unlike most other states, currently there is no statewide program that monitors or tracks domestic water supply well information in Connecticut. Drillers are required by State law to file well completion reports (boring logs), which are maintained by individual towns, local Health Districts, and by State Agencies in hard copy or as a scanned image. Water quality reports are generated when new homes are purchased or built, and these reports are maintained locally by towns and local Health Districts, again, mostly in hard copy form.

Often, the locations where wells were drilled is difficult to discern given that wells were drilled prior to identifying the home address (well drillers identify lot number) and well drillers are not required by the State to include latitude and longitude. This is particularly concerning if there is a contamination issue to be addressed or when evaluating adequacy and sustainability of the resource for new developments.

Well completion reports and water quality reports may be difficult to access for homeowners, health officials (local and state level), emergency responders (spill situation), and environmental consultants (clean-up setting or siting of hazards) given the existing system for storing well completion reports and water quality reports. No local agency uses the same technique for storing files which adds complexity to creating a detailed database of well log information and up-to-date water quality information. For example, some town halls keep well completion reports and associated water quality reports on record for each home by the address. Although useful, the homeowner is not necessarily required to provide the most recent water quality test results to the town. Smaller towns often are part of a regional health district and the data are more difficult to associate with an address. At the State level, well logs are organized by town and year of installation and many lack the address of the home due to reports being filed immediately after the well is drilled. Currently the State does not collect water quality reports as it is the responsibility of the homeowner to ensure clean/safe drinking water.

CT DCP has constructed an online database for entry of data from new well completion reports, and have stated that they will manage the database into the future. The database contains every field that is currently included on the well completion report form. DCP will be adding longitude and latitude of the well location as a required field to the well completion report entry form, which will allow for geospatial referencing and mapping of well locations. The estimated timeline for the implementation of this new system is late summer 2020. Although this is a significant step for managing data moving forward, CT DCP has no resources available to enter data from existing well completion reports into the database.

What are the benefits of a complete domestic water supply well database?

Multiple agencies, including the Connecticut Department of Energy and Environmental Protection (CT DEEP), the Connecticut Department of Public Health (CT DPH), Connecticut

Department of Transportation (CT DOT), and regional and local planning, emergency, conservation, and municipal agencies, have a strong interest in having a searchable database of our state's water supply wells. A comprehensive database would allow for local or statewide geographic information system (GIS) analysis using various data contained in the well completion form. Once in a GIS format, many different analyses of groundwater (e.g. groundwater flow direction) and geological features (e.g., areas with elevated levels of naturally occurring contaminants like uranium) be performed (see Metcalf & Robbins, 2013; Metcalf et al., 2014).

The ability to quickly identify nearby private water supply wells in the event of contamination (e.g. surface spill, release from underground storage tank) currently does not exist; a database would allow for rapid determination of domestic wells that would be at risk of contamination.

PFAS

Per and polyfluoroalkyl substances (PFAS), widely used in non-stick cookware production, stain resistant fabrics, and fire-fighting foams, have been receiving heightened attention in Connecticut with the creation of the PFAS Task Force. Public water system operators have recently been required to identify potential sources of PFAS in their watershed protection areas, and have started testing for the substances in drinking water. However, no such efforts have been undertaken for private domestic wells. A database with geospatially located private domestic wells would be a critical first step to identify areas where residents could be potentially consuming contaminated well water near hotspots of PFAS contamination such as landfills. Testing of private wells for PFAS is a recommendation in the PFAS Task Force Action Plan.

Road salt

Road salt is not a new contaminant, but recent research has highlighted the widespread ecological impacts that this common winter deicing chemical is having on ecosystems in cold weather regions. Once in the dissolved form, chloride travels readily through the unsaturated zone and into shallow groundwater aquifers, where it moves slowly towards surface water bodies and deep bedrock aquifers. Although sodium tends to be held more strongly in soils adjacent to salt sources, it can also cause mobilization of lead, manganese and radionuclides such as radium (McNaboe et al., 2017). In Connecticut, the Connecticut Department of Transportation (CT DOT), CT DPH, and CT DEEP have been dealing with issues related to road salt contamination of private wells and public water systems. Many homeowners are not aware that their drinking water is high in sodium or chloride until the water tastes salty, or plumbing systems start to corrode. Just like with PFAS, having a geospatially-referenced private well database would assist all three agencies identified above in identifying hotspots of road salt contamination. Road deicing policies could potentially be adjusted in areas where numerous private wells have been contaminated, but without a geospatial database, it would be extremely difficult to identify those affected.

Naturally occurring contaminants

A variety of contaminants such as arsenic, uranium, manganese, iron and radionuclides occur naturally in bedrock formations in the state. Having access to private well locations would allow for a geographic information system (GIS) overlay of private well locations with areas of concern for these contaminants in drinking water. Currently, the basic potability test does not include arsenic, uranium, radium or radon.

Emergency response

In addition to known contaminant sources like PFAS and road salt, a geospatial database would greatly enhance response to releases/spills of other contaminants. A faster response to such spills would better protect public health in these emergency situations.

Bedrock groundwater resource

In addition to the primary concerns related to human health, little is known about the bedrock water supply in Connecticut. Ellis (1909) presented a comprehensive report on the state of knowledge of the hydrogeologic conditions of the fractured rock in the State of Connecticut. A more recent study (Starn and Stone, 2005) provided an update on the state of knowledge of the fractured rock conditions. Comparing the two studies indicates that we have gained very little understanding of this resource over the last century. The types of information that can be gleaned from these reports and their potential uses are listed in Table 2.

Table 2. Parameter and associated uses for well completion reports.

Parameter	Associated Uses
Static Depth to Water	Evaluating flow direction and sources of recharge and discharge, determining bedrock watersheds
Bedrock Elevation	Define bedrock watershed boundaries, geologic structure, well construction planning
Depth to Rock	Define thickness of the overburden, estimate sand and gravel resource potential, well construction planning
Specific Capacity	Well productivity, optimizing the location of wells
Well Depth	Define fracture location and orientation, well construction planning
Well Yield	Define fracture properties, well productivity
Water Elevation	Groundwater flow directions, sources of recharge and discharge, determining sources of contamination and risk associated with contamination

The hundreds of thousands of well records that are available offer the opportunity to develop and advance our knowledge of the hydrogeology of the fractured rock. A searchable, geographically referenced private well database would allow users to do the following:

- Identify areas where water use may significantly affect the resource, or where water may be overused.

- Identify parts of the State where the groundwater resource is limited, and where it appears to be more plentiful/available (determine areas with high and low yields)
- Provide enhanced understanding of the thickness and texture of the surficial geology throughout the State. For instance, this information would enhance a major project proposed by the State geologists of the New England states to make a seamless map layer with detailed contours of the top of the bedrock surface.
- Identify areas of the State that may be suitable for groundwater withdrawal for future planning.
- Identify geologic information needed to define the extent and pathways of contamination
- Plan for future development including identifying areas with shallow bedrock that may not be suitable for onsite wastewater (septic) systems.
- Provide information for better definition of aquifer boundaries in groundwater modeling studies to determine source areas to wells, or identify new areas for public groundwater supply development, and model remediation of contaminated sites.
- Identify depth and texture information useful to civil and geotechnical engineers, when designing or replacing bridges, designing stormwater drainage systems, and foundations.

Other potential benefits

An up-to-date, comprehensive water supply well database could also help to increase the efficiency of regulatory programs such as the Property Transfer Program, Significant Environmental Hazards Program, and Potable Water Program. Having a database will greatly reduce the time spent locating and submitting documentation of private water supply wells, and make it easier for regulators to fact check accuracy of data.

How have adjacent states managed private well records?

In Massachusetts, the MA Department of Environmental Protection (MA DEP) Drinking Water Program oversees the well database. The database is accessible online and searchable. An Oracle database was developed in-house in 2010 for about \$60,000. The database includes drinking water wells, monitoring wells and irrigation wells. The information in the database is similar to that on Connecticut well completion reports. The well drillers currently log into a portal and enter the data. MA DEP staff QA/QC the data before pushing it up to the database. Historic data (well logs back to the 1960s, over 10,000 logs) were entered in by MA DEP staff. Common data issues revolve around browser incompatibilities, lat/long specifications, multiple ways of entering street addresses, and identifying rock types. MA DEP offers trainings on how to identify various rock types and how to input and use the data. They have 3.5 FTEs dedicated to the

program, which includes licensing and regulatory compliance for well drillers. They also have a technical advisory committee, although it meets infrequently.

Vermont has an online, searchable database. In both New Hampshire and Maine, the state Geological Surveys created geospatial databases; they enter the well completion report information into the database, and maintain the databases.

Recommendations

The sub-workgroup has the following recommendation: **Allocate resources to enter existing well completion reports into the CT DCP database.** The new database created by DCP will help to make Connecticut consistent with nearby states in how well completion reports are handled, and the data on the location of new wells will be valuable moving forward. However, not migrating the data on the hundreds of thousands of existing wells in the state will severely limit the utility of the new database. This data gap is specifically called out in the State Water Plan (see Section 2.1.2.2). One of the recommendations in the Plan is to create an electronic database for private well records. The new database created by DCP has addressed this recommendation, representing an important first step. However, the Plan also specifically states the following: “As resources permit, existing logs should be entered into the database.” (see Section 5.2.3.12).

A complete database would also complement several related recommendations in the State Water Plan (See Section 5.1 Future Water Data Needs). For example, implementation of a water quality testing and reporting program for private wells has been suggested; a complete database of well locations would be extremely useful to examine water quality data spatially. Water quality concerns in private wells will be addressed by an upcoming topical sub-workgroup under the Implementation Workgroup for the State Water Plan (first meeting scheduled in September 2020).

It is clear that numerous State agencies would benefit from having these data in a modernized, useful format, consistent with what other states have available. A complete database would also help to inform future water planning in the State, and complement emergency response in the event of spills of hazardous chemicals. Several members of this group have expressed interest in assisting in any way possible to make this a reality; however this work would be impossible without some financial resources from the State.

References

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APPENDIX A

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