DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY

Maine Geological Survey

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OPEN-FILE NO. 21-13

Title: *Locating Your Well and Septic System—A Homeowner's Guide*

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Date: *June 2021*

Contents: 6 p. report

Recommended Citation: Locke, D.B., 2021, Locating Your Well and Septic System - A Homeowner's Guide: Maine Geological Survey, Circular 21-13.

Locating Your Well and Septic System – A Homeowner's Guide

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Typically, when people purchase a home in an area which is not served by public water and/or a municipal wastewater treatment system, the question of where the domestic water supply well and septic system are located needs to be answered. Banks and other lending institutions usually require this information for the purpose of setback verification as well as to collect water samples from the well for analyses and to check for the proper functioning of the onsite wastewater treatment system. Real estate closings are very often delayed if the location of the well and septic system is not defined. In Maine, we have drilled bedrock wells, drilled or jetted overburden wells and points (installed in sand and gravel), and dug wells (installed in sand, gravel, glacial till, and much less commonly, in clay and silt). For a complete summary of well types and ground water in Maine, please refer to the Ground Water Handbook for the State of Maine. Like water wells, septic systems are installed in the ground and they are designed to treat all household effluent coming from sinks, showers, and toilets in a safe and sanitary fashion.

Like water wells, subsurface wastewater disposal systems come in a variety of types and sizes depending upon soils, slope, depth to limiting factors (such as water table, low permeability soil horizons, and the bedrock surface), lot size, distance to water bodies and abutting lots, and design flow. For an overview of how and why septic systems work the way they do, refer to Disposal System Design Theory. For an overview of site septic system types, soils, and the site evaluation process, refer to Site Evaluation for Subsurface Wastewater Disposal. For information pertaining to the regulation of well drillers and well construction, refer to the Maine Well Driller's Commission. For information pertaining to location and construction details of existing domestic water wells, refer to the Maine Geological Survey's Water Well Database. For information pertaining to the regulation of site evaluators and septic systems, refer to the to the Maine Subsurface Wastewater Unit at the Maine Department of Health and Human Services. For information on existing subsurface wastewater disposal system permits (including location), refer to the septic system permit search page.

LOCATING A WELL OR BURIED WELLHEAD

In many instances, finding your water well is not difficult as you simply need to look for a steel casing (often 6-inches in diameter) with a metal cap in the case of drilled wells (Figure 1) or concrete/glazed ceramic tile (often 36 inches or larger in diameter) in the case of dug wells (Figure 2).

Many of the older dug wells were dug by hand and lined with mortared field stones (For more details concerning dug wells in Maine, refer to Maine's Dug Wells). In other cases, finding the well can be much more challenging especially if the well is buried. Typically, wells which are buried are drilled bedrock wells which were often installed prior to 1975. The reason for this is that earlier drilled wells often utilized a sanitary seal at the top of the casing in combination with the water line and electrical wiring exiting the well at 90 degrees in the direction of the served building. Since

Figure 1. Drilled well. *Photo courtesy of Maine CDC*.

Figure 2. Dug well. *Photo by Maine Geological Survey*.

the water lines would be susceptible to freezing, this sanitary seal had to be buried at a depth of about 5 to 6 feet or more. In some instances, concrete well tiles of the type used for dug wells (Figure 3) were used to accomplish and maintain this objective while in other cases, the well and sanitary seal were simply buried in the ground (Figure 4).

Wells in pits or buried in soil often were difficult to service especially if shallow ground water accumulated in the pit or if the ground was frozen. In an effort to address the problem and the need for a better approach, the pitless adaptor was invented. While there are essentially two designs of pitless adaptor, the spool type (Figure 5) and slide type (Figure 6), it is the slide design which was first patented by Milton B. Martinson on June 19, 1953 that is the most commonly used for domestic water wells.

The spool type of pitless adaptor utilizes an internal spool assembly resembling a very large valve with upper and lower o-ring seals which fit into the outer discharge housing. The Slide type of pitless adaptor utilizes slide assembly inside of the well casing complete with an o-ring seal fitted as an integral component of the drop pipe. The slide type of pitless adaptor requires that a hole is drilled through the well casing at the prescribed depth. Many units utilize rubber gaskets to effect a watertight seal while others require the adaptor to be welded directly to the casing. It should be noted that there have been cases of leakage of shallow ground water into the well at the outside junction between the pitless adaptor and the outside of the well casing for the slide types which is why welding is sometimes recommended.

While there are clear advantages to both designs, they both accomplish the same objective in the transmission of water from the well to the building/home utilizing a safe, sanitary, and frost-proof connection. The spool type of pitless adaptor is more commonly used in large, high capacity wells and well pump systems while the slide type of pitless adaptor is the type commonly used in smaller capacity systems including residential applications. When an older buried well is located for purposes of pump service/ replacement, deepening, cleaning, and bacterial disinfection, it is strongly advised that the well casing is fitted with a pitless adaptor and raised to a minimum of

Figure 3. Well in well pit. *Photo courtesy of Alberta Environment and Parks*.

Figure 4. Buried well. *Photo courtesy of Lakeland Water Pump Co*.

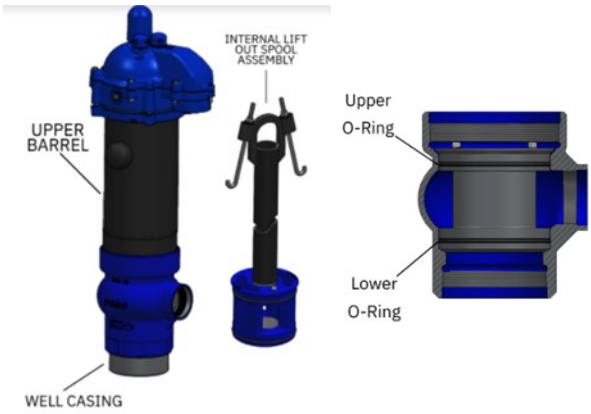

Figure 5. Spool type pitless adaptor. *Image courtesy of Boshart Industries*.

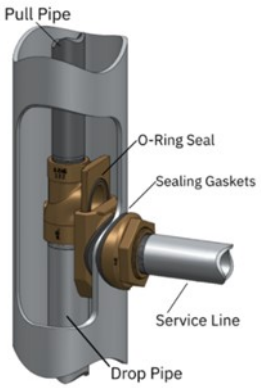

Figure 6. Slide type pitless adaptor. *Image courtesy of Boshart Industries*.

8 inches above finished grade. It should be noted that raising the well casing to the surface is necessary for ease in future pump service, bacterial disinfection, and any time that water level measurement and monitoring is desired. Also, a surface wellhead aids in maintaining proper setbacks when new or replacement septic systems are installed by the owners/abutters as it is clearly visible.

In cases of locating buried wellheads, the owner who contracted for the well to be drilled is likely the best source of information regarding approximate position. If that person is not available, an abutting neighbor may also be a valuable source of information if they were around at the time of the well installation. Otherwise, when locating a buried wellhead, start with determining the location of the pressure tank in the basement and identify approximately where the water line passes through the foundation wall (Figure 7).

This can be accomplished by measuring the horizontal distance along the wall from the water line entry point to the two basement wall corners (The basement wall thickness (or an estimate thereof) should be added to each of these measurements). Then go outside and measure from the outside corners along the foundation these distances. This should provide a reasonable starting point (from the outside of the home) of where to initially trace the line to the well. From this point, the search process can get more involved. Some locations can reasonably be ruled out such as nearness to very large trees with extensive limbs as it would not have been likely that a well drilling rig could have been set up in such a location. Wells also would typically not be drilled within a road right of way. Also, property lines and proximity to septic systems can be used as a general guide since the well is not likely to be less than 100 feet from the disposal field or less than 60 feet from a septic tank (without a septic system waiver or Specialty Well Permit), or over on an abutting lot. Nearness to homes/buildings should not be necessarily ruled out for locations since it was often very common to drill wells near homes thinking that having a well in very close proximity to the foundation was a good idea. In northern Maine, it is not uncommon to find a well actually in a bulkhead basement entryway under the stairs or sometimes even in a basement (obviously drilled prior to construction of the home). Please note that wells located in basements are generally not a good idea as they are more vulnerable to contamination from home heating oil tank leaks or the well can cause flooding if the static level rises above the level of the casing top. Also, there are many instances of drilled wells being installed inside of pre-existing dug wells (sometimes even stone-lined types) utilizing the dug well as a sort of makeshift pit. If there is an old dug well on the property, this should be investigated to verify if the drilled well is at the bottom. Anomalously low areas on a lawn or other property areas may also be a possible location where the well may have been drilled.

Figure 7. Pressure tank.. *Photo courtesy of Wardwater.com*.

If you are adventurous and wish to possibly save on the costs in locating the buried well, it may be possible to determine the approximate position of the well by first disconnecting the elbow or fitting connecting to the water line (just inside of the foundation wall) and running a clean wire inside of the water line pushing it forward until it stops and noting the length. If you wish not to pursue this approach, it is recommended that you hire a professional utility location service to assist you. Prior to digging of any kind, the homeowner or their authorized contractor **MUST** contact DigSafe (dial 811) to determine if it is okay to excavate in a defined area and that other possibly buried utility or electrical lines will not be impacted by such excavation activity. Also, prior excavation and disassembly of ANY waterline fittings, the power to the pump should be turned **OFF** at the electrical panel!

As stated above, a clean piece of vinyl-covered/ sheathed electrical wire like what is used for house wiring could be used to follow the path of the water line going from the house to the well. Please note that if there are significant bends or abrupt sweeps in the water line, this may result in a wire not being able to be advanced further! If the wire stops at the elbow entering the well's sanitary seal, then you are well on your way to locating where the wellhead is buried. At this point, the wire can be removed and the length measured. If the water line runs at right angles to the foundation wall, the distance and direction to the well can readily be ascertained and an attempt could be made to excavate for the well.

Typically, the wellhead will be 4-6 feet below grade so a backhoe will likely be necessary if you wish not to excavate by hand. Again, DigSafe needs to be

contacted prior to excavation and the power to the well pump needs to be turned off prior to digging or disconnection of water lines. If in the process of excavation, the electrical wire to the well or the water line is encountered, it may be appropriate to continue excavating by following the wire or water line to the well. Particular care needs to be taken not to damage the water line or wiring. Depending upon the type of wire encountered and condition of the water line, it may be necessary to replace both of these. If the water line runs at an angle other than 90 degrees and it is not at all clear where the well is likely situated, it may be appropriate to simply hire a utility line location company as homeowners usually wish to limit excavation as much as possible.

Usually, utility location firms utilize a similar approach in that they typically feed a trace wire through the water line from the foundation wall until it stops. This trace wire (transmitting wire) works in conjunction with a receiver device when both are energized which allows for relative ease in identifying the well and pipe/electrical connection path. The trace wire transmits an electromagnetic signal which is strongest at the very end and can typically be detected all along its length (at a somewhat weaker signal strength). There are many utility location service firms which operate in Maine which can assist the homeowner in locating their buried wellhead. Also, the local well driller who may be assisting you with the well work may have a preferred utility location firm. Some of these firms include Centerline Utility Services, Dig Smart of Maine, On Target Utility Services, First Call Utility Locating, and Bloodhound Utility Locators (Please note that these listings are offered as a courtesy and in no way constitute an endorsement.).

LOCATING A SUBSURFACE WASTEWATER DISPOSAL SYSTEM

Unlike water wells, subsurface wastewater disposal systems require a permit (some towns and municipalities require a well permit, but this is NOT mandated by the State of Maine.). Unless the septic system is very old, there is a strong likelihood that there is a septic system permit and septic system design available in town and/or State files. When septic systems are designed, the site evaluator examines the onsite soils for suitability and for sizing of the system. Also, the system design is presented in both plan view as well as in cross-sectional perspectives. While new systems are typically designed prior to the actual construction of the residence, the proposed building corners are often provided to the site evaluator as this information is necessary for the siting of the septic tank and to determine if the system will operate entirely by gravity or if a pump system is needed. However, be aware that distances shown on the design plans between the dwelling, septic tank and disposal field may not be entirely accurate since the exact proposed dwelling location may have been unknown to the site evaluator. The form used for the septic system design in Maine is the HHE-200. Septic system designs can be found on the Maine Department of Human Services septic system permit search page which was referenced earlier. This form and the accompanying pages detail the location of the system relative to the home and other buildings, test pits and soil borings, property lines, wells, and streams/drainages. Visually, the septic system location is especially evident if vent pipes were used (Figure 8) or if it was necessary to utilize extensive fill in construction of the bed which resulted in the creation of a raised bed or mound system with associated fill extensions (Figure 9). In Maine, we don't utilize mounds per se, but we do utilize what we refer to as raised bed systems when site conditions require it. In other words, septic systems may be raised to improve performance and to ensure that wastewater treatment is optimized. The State of Maine Subsurface Wastewater Disposal Rules require that the bottom of the disposal area is separated from a limiting factor such as the seasonally high water table or bedrock (ledge) by 12 to 24 inches. This results in the top of the finished grade over the leachfield will be 36 to 48 inches above the depth to the limiting factor. The State code allows septic systems to be constructed on soil with a depth to limiting factor of as little 12 inches, so raised beds are not uncommon. Along the coast of Maine, bedrock is the most common limiting factor and soils are often thin requiring the use of raised beds (Figures 10-11). In other cases, the septic system footprint may be less obvious especially where there are optimal soil conditions requiring minimal fill

Figure 8. Ventilation pipes are sometimes specified in the septic system design. When they are used, the plumbing vent in the home roof acts as the high-end vent and the vent at the end of the system acts as the low-end vent. Vents often resemble "candy canes" without the stripe, but they can be disguised as birdhouse poles. In many cases, vents in home systems are not used.. *Photo courtesy of thedrainbrain.com*.

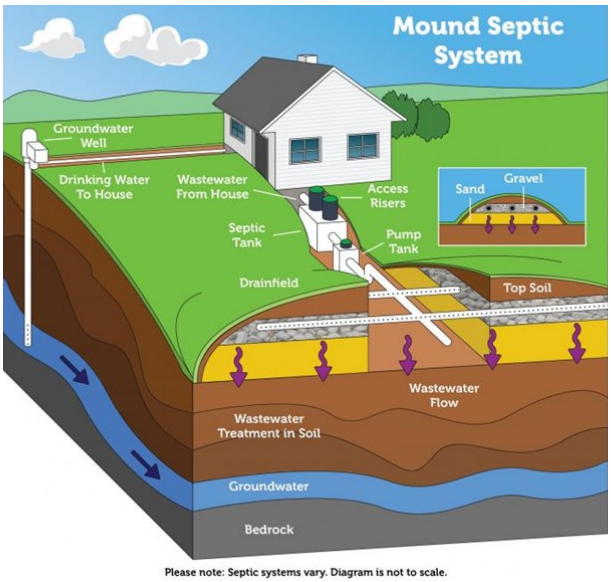

Figure 9. Diagram of a mound septic system. Diagram is not to scale. *Image courtesy of epa.gov*.

Figure 10. Raised bed septic system, Harpsell, Maine. *Photo by D.B. Locke, MGS.*

Figure 11. Raised bed septic system, Harpswell, Maine. *Photo by D.B. Locke, MGS.*

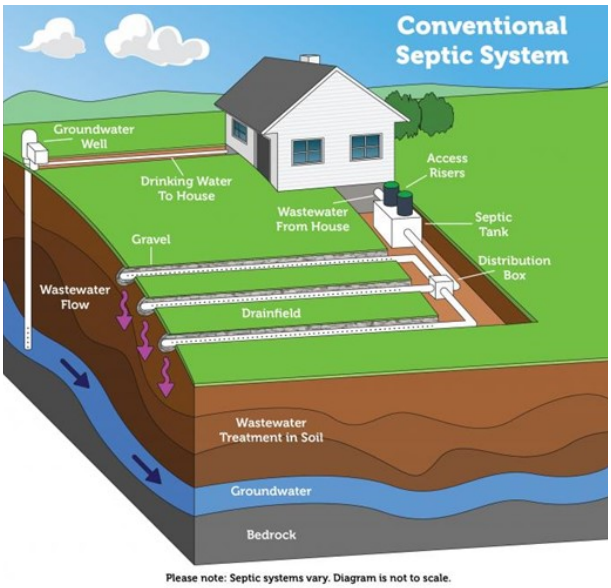

Figure 12. Diagram of a conventional septic field. Diagram is not to scale. *Image courtesy of epa.gov*.

material (Figure 12).

Like the process of searching for a well, the first step in searching for the septic system location is examining where the sewer line exits the house or house foundation. This will point the homeowner where first to look for the septic tank. Often, the location of the building sewer (for homes/buildings served by septic systems) is located on opposite sides of the basement or on an adjacent wall from the water supply piping simply because of a need for a setback between the well and the wastewater disposal field (100 feet). Since it is generally not prudent to have wastewater combined with solids flow long distances, the septic tank is usually near the house. In Maine, the minimum setback distance between the tank and a full foundation, frost wall or house built on a slab or posts is 8 feet (assuming the design flow of the system is less than 1000 gallons per day (gpd). Also, septic tank access covers may be buried although watertight risers installed within 6 inches of land surface (finished grade) are required for ease in access for inspection and pumping/cleaning. Access cover handles are constructed of steel bar which is typically ¼ inch in diameter making it readily found with a metal detector. If the location of the disposal field is still not apparent once the septic tank is located, an electromagnetic trace wire system can be utilized from the tank outlet to the distribution box or ground penetrating radar (GPR) can be used to actually map the disposal field (Figure 13). In some cases, it may also be necessary to use a soil probe to identify the edge of the crushed stone or manufactured unit (edge of disposal field) as this is the critical component (not the piping) measured for setback purpose from wells.

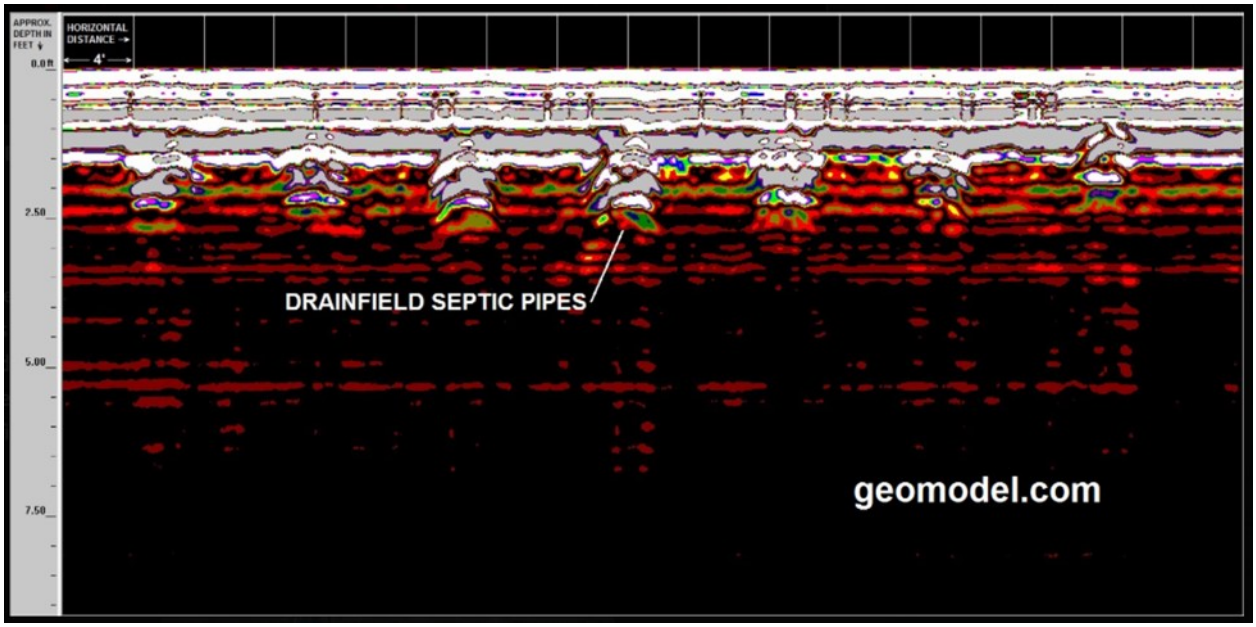

Figure 13. Image of ground penetrating radar transect across a subsurface wastewater disposal system showing the actual piping. Note that the piping acts as a reflector hence the upside down "U" pattern. *Image courtesy of geomodel.com*.