Appendix B:  

*Case Studies and Photos*
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Case Study #1: The “Overflow” to the County Drain

**Background:** The home was constructed in 1963. At that time, a permit was issued for a drain bed sewage system, but current records are not clear whether there was any final follow-up inspection (final inspections were not required in the 1960s). In 2017, when the property’s well and sewage system were evaluated for the TOST program, the homeowner from 1963 still owned the property. During the TOST evaluation, the Registered Evaluator (RE) found a sump crock in the middle of the drain field. The RE could not tell where the sump crock discharged, but county GIS records showed that the property is adjacent to a county drain, which was a red flag. When BEDHD interviewed the homeowner, he revealed that the sump crock had always been there because the area flooded.

**Why Was This a Concern?** Buried connections between sewage systems and public county drains are common, but they are difficult to detect. Besides the original sewage system installer, there may be no one who knows about these illegal connections to public water. In this case, untreated sewage was discharged to the county drain, and thus our surface waters, for 54 years with no one the wiser. Without a TOST inspection, this condition would not have been discovered and fixed.

**Resolution:** A new sewage system was permitted and installed, and the home was authorized for transfer.
Case Study #2: Health Hazard and Groundwater Contamination

**Background:** This home was constructed in the early 1990s. The home was repossessed by a bank and went through the TOST program in 2017 before sale. During the inspection, the Registered Evaluator (RE) found an unplugged, abandoned well next to the existing well for the home. The RE also found that the septic tank was leaking.

**Why Was This a Concern?** Old, unplugged wells create a way for surface contaminants to enter the groundwater. So, even though no one is drinking out of them, they are a way that drinking water for other in-use wells can be contaminated. Although these old wells threaten drinking water aquifers, many times they are left unplugged. Often homeowners do not want to pay to have them plugged, or they simply may not know why old wells should be plugged.

Not plugging a well may save a homeowner a little money in the short term, but in the long term it can make everyone’s wells more expensive if deeper wells are needed to avoid contaminants (like nitrate). TOST allows evaluators and professionals with expertise in recognizing abandoned wells to get onto properties and perform evaluations.

**Resolution:** The abandoned well was properly plugged by a licensed well driller. While on the property, the well driller found and plugged a second abandoned well.
Case Study #3: Fifty Years of Pollution

Background: This home was built in the early 1950s. BEDHD had no records for this property. The well and sewage system were evaluated through TOST in 2017. During the evaluation, the Registered Evaluator (RE) found a line going directly from the septic tank into a nearby creek, one well with construction deficiencies, and a second unplugged well.

Why Was This a Concern? Untreated sewage contains many organisms (bacteria, viruses, parasites, etc.) that can cause disease. These organisms also can make our recreational waters unsafe, which can lead to impairment designations, beach closures, and harmful algal blooms. However, it can be a challenge to identify the properties that contribute to this pollution. BEDHD had no reason to evaluate or inspect this property’s well or sewage system until the TOST evaluation: BEDHD never got a complaint or permit application for this address. Without the information identified by the RE under the TOST program, this buried illegal connection (from the septic tank to the creek) would still be emptying directly into surface water.

Resolution: BEDHD issued a permit for a new sewage system. BEDHD required the household well to be further evaluated and the abandoned well to be plugged. The home remains vacant and monitored to make sure that it remains unoccupied until a new sewage system is installed.

Photo Credit: Duane King, RE
Case Study #4: The Girl Who Lived in the Farmhouse

**Background:** Before TOST, the well and sewage system of this home were evaluated by BEDHD through a voluntary program. The sanitarian who performed the inspection could not find any sewage system components (such as a drain field) after the septic tank. He recommended that the sewage system be further evaluated, but the person that requested the inspection chose not to follow this advice. The buyer planned to investigate the system after the sale and, if needed, install a new system, but it never happened. A few years later, the same sanitarian was back on the property because the girl who lived there had become ill with a disease that can be caused by contact with sewage. The sanitarian found raw sewage running down the hill beyond the home. During his inspection, the family dog ran back and forth through the sewage before running into the home.

**Why Was This a Concern?** There were major problems with voluntary programs like the program that existed before TOST. The investigations were often inconclusive, because BEDHD does not have the resources to excavate a person’s yard to look for a sewage system. Recommendations were often ignored and, without strong evidence of a sewage failure, BEDHD did not have authority under its Sanitary Code to require corrections.

**Resolution:** The homeowner identified that he used his life’s savings during a poor economy to put in a new sewage system. (To help avoid this, even if someone doesn't have to pay a monthly sewer bill, they could set money aside regularly for any necessary repairs that might come up with the sewage system.) BEDHD has no record of any other illness at the home.
Case Study #5: “Run-Off Tile” at the End of the Drain Field

**Background:** The sewage system for this home was installed in 1970 in what the permit said were “clay soils subject to flooding.” In 2016, the well and sewage system were evaluated through a TOST inspection. The Registered Evaluator (RE) reported that the sewage system appeared to be in good condition. However, a BEDHD sanitarian saw a suspicious line going from the edge of the drain field. In a follow-up visit, this was found to be true. It is thought that this “bleeder” line was installed a decade prior. Interviews with the sellers revealed that the area tended to flood in wet periods of the year and that the sewage system was prone to backups.

**Why Was This a Concern?** A bleeder line leading from a sewage system is a sign that, historically, the system cannot keep up with the water use in the home. When sewage systems are overloaded and back up, sewage is not being treated properly. Lines like this that carry untreated sewage from overloaded sewage systems generally connect to county drains and agricultural field tiles. These, in turn, almost always connect to our shared waterways.

**Resolution:** The seller argued that the sewage system was keeping up with the household, but the buyer insisted that a new sewage system be installed (and BEDHD agreed). The system was installed and the bleeder line’s connection to the drain field was removed.
Background: This home was built in 1980, and the sewage system was installed at the same time. The household well was older than the home. In 2016, a TOST evaluation of the well and sewage system was performed. The Registered Evaluator (RE) found that the sewage system was overloaded and backing up into the septic tank. The RE also found that the well was drilled directly into an old dug well and was flooded above the top of the casing.

Why Was This a Concern? An overloaded sewage system cannot accept additional sewage—it’s already full. This is a concern for two reasons: (1) it is not properly treating the sewage, and (2) it is not keeping up with normal household water usage and will either back up into the home or on the ground’s surface. Sewage systems typically need to be replaced after 20-30 years; this system was 36 years old and had simply reached the end of its life.

Additionally, a flooded well is at much higher risk of contamination. While the TOST program does not require updates to all wells that don’t meet current code, modifications are required when there are significant health risks.

Resolution: A new sewage system and a new well were installed.
Case Study #7: A Tale of Two Septic Tanks

**Background:** Home #1 had its sewage system installed in 1984 and had a TOST evaluation performed in 2015. The Registered Evaluator (RE) noticed that the precast concrete baffle within the septic tank was very corroded. Home #2 had its sewage system installed in 1989 and had a TOST evaluation performed in 2017. The RE identified that the precast concrete baffle was completely missing, the lid to the septic tank had broken into pieces, and there were visible cracks in the top of the tank.

**Why Were These Concerns?** Precast concrete baffles were somewhat of a failed experiment. Baffles are necessary to keep solids from entering the final disposal in a sewage system, but concrete baffles are often severely broken down by the extremely corrosive environment inside a septic tank. While they continue to function if the baffle remains to hold back solids, baffle corrosion may indicate more serious structural problems within the septic tank. BEDHD has observed that septic tanks that were constructed in the mid-1980s through the mid-2000s tend to be more likely like to have corrosion and structural failure.

**Resolution:** After a site visit by BEDHD staff, Home #1 was authorized for transfer with strong disclosures about the concrete baffle. Due to the nature of the tank at Home #2, the septic tank was replaced. The septic tank installer said that the tank nearly crumbled at a touch and was one of the worst he’d ever seen.

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Photo Credit: Matt Strole, RE
Case Study #8: Passed TOST, but Buyers Wanted a New Well

**Background:** The home was constructed in 1926. The BEDHD has no record of a well permit or final inspection of the water supply. The home is served by municipal sewer. In 2016, a TOST evaluation of the well was performed. During the evaluation, the Registered Evaluator (RE) found that the well was a small-diameter well with the well casing used as a suction line. This type of construction has never been permitted: it is vulnerable to contamination and most often not professionally drilled. BEDHD once required that this kind of well be replaced, but it now allows them as long as they meet minimum depth (25’) and isolation requirements. A BEDHD sanitarian met a registered well driller on this property and measured the well, which was found to meet these requirements. After BEDHD issued its transfer authorization, the buyer realized that the small-diameter well would likely not provide enough water for their household and insisted upon a new well.

**Why Was This a Concern?** Wells must meet certain standards through the TOST program, but they are minimum standards. In this case, the well was deep enough and properly isolated from contamination sources so, although it had never “been up to code,” it was not considered a major health hazard. While this information pleased the seller, the buyer had wrongly thought that BEDHD would require a new well. Either decision would have made one party to the transaction mad and, in the end, the parties negotiated to have a new well installed.

**Resolution:** A new well was installed, but it was not required by BEDHD.
Case Study #9: A Septic Tank Full of Sand

**Background:** No well or sewage system permits were on file for this property. In 2014, the systems were evaluated by a Registered Evaluator (RE) before sale. The RE found that the septic tank needed to be pumped and the outlet of the septic tank was not seen. He also identified a small drain bed following the septic tank. When a BEDHD sanitarian went to the site, she saw that the septic tank appeared to be filled with soil, and she could not find a drain bed. No drain field stone could be found, and it was unknown whether the system was even receiving sewage or if sewage was bypassing the system.

**Why Was This a Concern?** Before the TOST regulation, private evaluators did not have any oversight or set of standards to follow for their evaluations. Some evaluators performed a thorough inspection, but other evaluators would base their reports on minimal facts – or no facts at all. One of the main parts of the TOST program is the comprehensive evaluation criteria that REs are expected to follow. All evaluators should report the same thing from the same sites. When it appears that an RE isn’t following these standards, they are held accountable. BEDHD’s response can be additional education or discipline, depending upon the nature of the offense.

**Resolution:** At the realtor’s request, a new sewage system was installed. It is worth noting that in the absence of the TOST program, the buyers of this property would not have had a working sewage system and would have found themselves to be the new owners of the latest public health nuisance in the county. And they would likely have been on the hook to pay for the repairs.

*Recreation of original drawing*
Case Study #10: Broken-Off Wellhead

Background: BEDHD did not have an application for a well permit for this address and could not find a well log. According to a nearby community member, the well was drilled in the early 1980s. When this home went through a TOST evaluation in 2015, the Registered Evaluator (RE) found a 4” PVC plastic well with the top completely broken off. This was a direct route from the ground surface to the groundwater.

Why Was This a Concern? Just like abandoned wells, wells with obvious damage or construction problems can let surface contamination enter the groundwater, without going through the natural protection of the soil layers in the earth. Surface or near-surface contamination in the form of agricultural runoff, pesticides, chemicals, fertilizers, animal waste, and rotting organic material can then directly enter the drinking water supply. Normally there is no route for these contaminants to pollute the neighborhood’s drinking water wells, but open wells provide an easy way for this to happen.

Resolution: A new well was installed and the old well was properly plugged, making it harmless.
Case Study #11: A Fix Outside of TOST

Background: In 2006, a well was drilled to serve the trailer at this address. In 2016, BEDHD received a request for exemption from a TOST evaluation. The property owner stated that the home had been demolished and the well and sewage system were properly abandoned. BEDHD had no well plugging record, which is a document that is required to be completed by a well driller whenever a well is plugged. After further investigation, it was determined that the well had been cut off below the ground’s surface and buried. The property owner claimed they did not know where to find the improperly abandoned, unplugged well. BEDHD required that the well be located and either properly plugged or extended above the ground’s surface in order for it to be kept as an irrigation well.

Why Was This a Concern? Unplugged wells are a threat to groundwater resources because they create a route for contamination to bypass protective soil layers and reach drinking water aquifers. In this case, the well was simply cut off below the ground surface, buried, and forgotten. Although this site was not required to have a TOST evaluation performed, the well was found and made safe as a direct consequence of the TOST program.

Resolution: Once the well was made safe, BEDHD granted the exemption.
Case Study #12: The House on the River

Background: BEDHD first became involved with this home through a private loan evaluation before the TOST program. During the evaluation, a drain field could not be found, but the line from the septic tank appeared to be going toward the river. BEDHD recommended further investigation, but this advice was ignored and the buyer promised to connect to the available municipal sewer. BEDHD followed up and everything appeared to be going according to plan; however, unknown to BEDHD, the buyer later cancelled the sewer hookup because it was too expensive. No one ever reported this to BEDHD. After TOST was implemented, the home was sold in violation of the regulation. BEDHD then followed up with enforcement. A Registered Evaluator (RE) performed an evaluation and found a new line from the septic tank—straight into the river.

Why Was This a Concern? Everyone understands that sewage in our rivers is bad, but why did this happen? First, the home was built in the late 1800s, before any concerns with sewage even existed. Second, the voluntary evaluation program was ill equipped to force action—there was very little that BEDHD could do to prevent a suspected (but not absolutely proven) illegal discharge. The Sanitary Code does not provide for the inspection of existing systems. Lastly, without the financial transaction of a property sale, as with TOST, many new buyers are simply not able to afford major well or septic repairs immediately after purchase.

Resolution: A new sewage system was installed and approved.
Case Study #13: A Known Problem

Background: The home was constructed in 1996, and well and septic permits were issued. The home then had a TOST evaluation performed in 2017. Although the home was vacant at the time, the stone in the drain bed was black and tarry and sewage was surfacing above the system. An abandoned dug well was also found and plugged in anticipation of the TOST submittal. The homeowners said that the sewage failure had happened about a year prior to the TOST evaluation, but aerial photographs appear to show sewage surfacing starting as early as 2010.

Why a concern? Sewage systems do not last forever and eventually need to be replaced, just like the roof, water heater, or furnace. If sellers do not adequately maintain their systems and allow them to fall into disrepair, they could be passing along a public health nuisance to the next owner. While TOST does not require existing wells or sewage systems to meet current code, that does not mean that existing public health nuisances can be ignored: New, replacement systems must always meet current code, which is a requirement of both Sanitary and Well Construction Codes, not TOST.

Resolution: A new sewage system was installed and approved. Now the abandoned well and the failed sewage system are corrected and no longer pose significant risk to public health.
Case Study #14: “Worst Case Scenario”

Background: There were no permits for the original well or sewage system for this address. In 2015, a TOST evaluation was performed. The Registered Evaluator (RE) reported that he had observed a very small drain bed constructed of pea stone and no distribution tiles were located. Because of this unusual and potentially unacceptable construction a request was made for further evaluation to confirm the presence of distribution tile. The buyer and seller proposed to set up an escrow account to plan for the worst case scenario, full replacement of the sewage system, so that they could close on the home immediately and before this further evaluation could take place. BEDHD accepted the proposal but after closing, no sewage system could actually even be located. The area that the RE had identified was not connected to the sewage system at all and was potentially nothing more than an old gravel parking space.

Why Was This a Concern? In many cases, there are no records or information available documenting older sewage systems. BEDHD sees enough evaluations however to know when something is amiss. For example, while BEDHD does not require any action for undersized sewage systems, a very small drain bed is suspicious in that it is often an indication that there may be more to the story. For example, there may be another, unevaluated, system or, as was discovered here, connection to an agricultural field tile or drainage ditch, which incidentally are generally discharging to surface waters. Without review by a third party, there is no accountability of evaluators, which are normally hired by and paid by the sellers, and evaluations may not be entirely accurate.

Resolution: A new sewage system was installed and approved.