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Sand and Sediment In Drinking Water[1]

There are three common explanations for sand/sediment (abbreviated S/S) in drinking water wells as described below. The term "sediment" when used in this fact sheet, means material that is visible but too small to be felt when rubbed between the fingers. The term "sand" means material that can be both seen and felt.

1. **ROCK CUTTINGS OR LOOSE SOILS REMAINING FROM THE INSTALLATION OF A NEW WELL**

   If a well is newly constructed, particles remaining from the construction can be removed by pumping the well water to waste; sometimes for an extended period of time. This flushing procedure is discussed in the fact sheets concerning wells; WD-WSEB-1-2 through- 1-6. This material will appear as both a cloudy or muddy condition and, if a bedrock (artesian) well, may have in part, sharp edges.

2. **PRECIPITATES FROM CERTAIN DISSOLVED MINERALS IN THE WATER**

   Minerals, including iron or manganese (Fe/Mn) are present in well water in New Hampshire. Another common cause that could cause sediment in water is hardness. Hardness precipitate, by itself, would have a white/yellow color. Fe/Mn precipitates typically are loose sediments that are too small to be felt between the fingers. Hardness precipitates typically "plate out" as a solid. Sometimes this solid may break off and can be captured as irregular sized pieces.

3. **CONTINUOUS ENTRY OF FINE CLAY OR SAND PARTICLES FROM THE SOIL OR FROM POOR QUALITY BEDROCK**

   This fact sheet discusses the conditions where a well defect or an unstable naturally occurring condition in the bedrock fractures, allows fine sand or sediment to enter the well. This material generally would have a grit-like feel.

ORIGIN OF SEDIMENT

In dug wells (those approximately 3 feet in diameter and 10-15+-feet deep) sediment entry can occur if the soil backfill passes through the joints between the sections of well casing or through the perforations typically present in the lowest well casing. In fieldstone wells, soils can migrate into the well throughout the casing circumference and height. Sand could also migrate through the crushed stone around the bottom of a dug well casing and then into the well. In bedrock wells, sediments can enter the well from either of the areas; at the interface between the casing and bedrock or from the unstable soil above the top end a rock fault. These areas are described below.

1. The material contained in this fact sheet was excerpted from the New Hampshire Department of Environmental Services web site (http://www.des.state.nh.us/ws.htm).

Sediment can enter at the overlap between the steel well casing and the socket that has been drilled into the bedrock. This is considered a construction defect. In this case, setting up the well drilling equipment and pounding the steel casing into the socket again may stop the sand entry. A more assured method is to install a mechanical seal inside the well hole. See page 3 for more detail on a Jaswell type mechanical seal.

Sand can also enter into the top of any of the bedrock fractures that the well has encountered. In this case the sand originates at the upper end of the rock fracture, which is covered by loose soil. In this situation, there is no manmade defect in the well, rather the sand entry is only an unfortunate aspect of that location's geology. (This situation could also occur if the rock fault in the rock consisted of highly weathered bedrock.)

IDENTIFYING SAND ENTRY LOCATION IN BEDROCK WELLS

In bedrock wells it is very difficult to determine which of the possibilities explained immediately above, is the origin of the sand problem.

1. In some cases, TV cameras can be lowered into the well to inspect the tightness of the bottom of the steel casing or to view each intersected rock fracture. The pump must be pulled to make room for the camera. A budget estimate for this work would be $1,000.
2. Another investigative method is to install a temporary packer (a device to close off certain vertical levels of the well) so that each segment can be pumped individually. The pumpage from each level can then be evaluated for the presence of sand. A budget estimate for this work would be over approximately $1,000.

In either case there is only a moderate probability of identifying the entry location of the sand by this method.

CORRECTIVE ACTION

"In-The-WeIl" Solution for Dug Wells

In dug wells the entry point(s) of the sand should be sealed. However, this may not be easily accomplished. If impractical, the situation could be allowed to continue and the pump suction line raised. In the longer term, the accumulated sand in a dug well can be removed by a 'mudsucker" construction pump or by clamshell bucket. When raising the suction line you increase the water systems sensitivity to drought conditions.

Where substantial sand is entering a dug well, bacterial problems are likely. This is due to the likely short-circuiting of the natural soil tightness and filtration due to the constant resettlement of the soil outside of the well casing. In addition, backfill will need to be added around the top of the well to replace the soil being lost.

"In-the-Well" Solutions for Bedrock Wells

A few devices are available to seal off leakage at either the well casing/bedrock socket overlap or lower fractures in the well hole. The best-known device of this type is a Jaswell seal. A consequence of

installing a Jaswell seal is the likely loss of a portion of the well's safe yield. A variation on this approach would be to permanently seal that level of a bedrock well that has the problem using cement grout. Once the cement has hardened, a well rig would drill through the sealed area reestablishing a clear well hole. This approach will also reduce a portion of the well's safe yield.

More recently, a mechanical system has been developed that can be added to the intake of your pump to remove sand **before** it enters the pump. This system is also costly and requires pulling the pump for retrofit installation. If major amounts of sand are entering the well, it must be periodically removed or it will accumulate and will be pulled into the well pump.

"In-the-Home" Solutions

Because it is often difficult to pin down the location of the sand entry and expensive to install a Jaswell seal, some homeowners conclude that it is more cost effective to leave the well "as-is" and remove the sand only when the water and sand reach the home.

Two "in-home" treatment options are discussed below. This choice is possible only if the relative amount of sand entering the well is small. If the "in-home" option is chosen, it should be recognized that the sand will cause some continuing damage to the well pump and a shortening of its life expectancy.

Centrifuge Device

This device removes sand by spinning the water within the housing of the device. Sand has a greater density than water, and thus accumulates around the perimeter of the device and is periodically bled off. A disadvantage is that clay sized particles (which are smaller than sand) may not be totally removed. The cost of this type of device would be approximately $500. There is some energy loss with this device.

Sand Filter

This option consists of installing a commercial backwashable filter that would strain out sand particles. Periodically the device would be cleaned by backwashing. The cost of such a filter would likely be over $1000.

TESTING YOUR WATER

EAI Analytical Labs will provide you with your free water testing kit containing: sample bottles, detailed sampling instructions and a tracking form. Bacteria samples bottles are distributed pre-sterilized and all sample bottles contain their necessary preservatives. Kits are available for pickup or they can be mailed to you. If you are interested or have any questions regarding the analysis of your water, please give us a call.