Testimony
Bill Reference?
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I want to summarize my comments today as follows:

1. Multi-barrier Treatment: In the water industry, our objective is to provide safe water to the customers. We do this by creating and maintaining barriers to prevent various contaminates from reaching our customers. This multi-barrier approach will not guarantee we will always have safe water but it increases the probability that we will meet our goal. Although we can never be 100% confident the water is safe in all regards regardless of the technological barriers we construct, our role is to provide as many barriers as possible to assure the safest water possible. The loss of one of the barriers reduces our confidence that the water is safe.
    a. With open recreation allowed Berlin Pond, we lose the first barrier for protection of the area around the intake. Without an isolation zone around the intake, operators lose their ability to question unauthorized individuals in a boat or shanty located directly over the water intake from which drinking water is sent to the capital city of Vermont.
    b. In my opinion, the greatest threat to allowing open recreational use of Berlin Pond is the significant reduction in the ability to observe any willful contamination event.
2. Increasingly Strict Federal Regulations: Federal regulations continue to evolve and these regulations present more and greater challenges for water system owners. Although the compliance regulations continue to evolve, the water treatment facilities are frozen in time as these facilities were built to deal with the regulations in effect at the time of construction. In the case of Montpelier, the water treatment facility was placed on line on May of 2000 more than 15 years ago.
    a. The new regulation of greatest concern is known as the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). This rule sets certain standards for the raw water based on E. Coli levels. Once the E. Coli level exceeds 10 E. Coli per 100 mils, Montpelier must then test for Cryptosporidium and depending on the concentration of Cryptosporidium oocysts found in the raw water, Montpelier may have to increase their level of treatment as the facility was designed based on removal/inactivation of Giardia Lamblia cysts and not for removal/inactivation of Cryptosporidium oocysts. The City is currently evaluating the economic effects of alternative enhanced treatment levels for removing or inactivating the Cryptosporidium oocysts.

3. Limited Testing: There are a vast number of contaminates present at some concentration in all natural waters. It is important to understand, we never test for many of these contaminates. For instance, we know that Giardia Lamblia cysts and Cryptosporidium oocysts are both dangerous pathogens that can survive normal chlorination, but we basically rarely test for these cysts. Also we do not routinely test for the contaminates that we know are present and that we know cause health effects. For instance, although we know disinfection byproducts are harmful, we test for these contaminates only on one day in about 100 days and only at one or two locations.

Multi Barrier Treatment:

How do we set up these barriers to confidently provide safe water to our customers? The first barrier is source selection. We need to select the highest elevation most protected source supply with the least number of potential sources of contamination. The second barrier once we select the source of supply is to protect it from contamination caused from natural events and development. Source protection for surface supplies is accomplished though ownership and control of the shoreline and as much of the drainage area as economically feasible. Restricting access to the water, the shoreline, and susceptible portions of the watershed are crucial to maintaining this barrier to prevent contamination to our drinking water supplies. Source water protection is a process that is defined in detail in the Source Protection Plans required for all Vermont Communities. In addition to source protection, there are other physical barriers such as filtration to remove contaminates and disinfection to inactivate biological contaminates in treatment processes but importantly these processes do not remove or inactivate 100% of the contaminates.

Perhaps the most significant issue when considering source water protection is to prevent unauthorized access to the source of supply. Most water purveyors restrict all access within a certain radius around the intake – typically several thousand feet. Any unauthorized access within the radius is dealt with regardless of the perceived intent. Consider the loss in security when allowing access to and directly over the intake structure? How can a public works person diagnose the intent of an individual? Are those people in a boat or ice shanty near the intake fishing or engaging in willful contamination of the source of supply? If willful contamination sounds like a completely unlikely concept, doesn't pressure cooker bombs going off during the Boston Marathon sound just as unlikely?

Increasingly Strict Regulations:

The LT2ESWTR published by EPA in 2006, provides for categorization of source water types based on cryptosporidium concentrations. There are four categories referred to as "bin" numbers. Cryptosporidium is highly resistant to chlorination even at levels much higher than used in drinking water systems. In addition, cryptosporidium oocysts are very difficult to identify and quantify and only specialty laboratories can perform this work. Currently it is generally thought that even these specialty laboratories can only

quantify about 10% of the oocysts actually present. Because of these factors, systems in Vermont were basically assumed to be in bin 1 unless the first round of testing completed about 6 years ago indicated high levels of E. Coli. As a bin 1 source, additional treatment was not required.

Under the LT2ESWTR, water systems must monitor their source water on a set frequency (currently every 6 years) to test for E. coli bacteria. Filtered water systems can be exempt from source monitoring if they can provide a total of at least 5.5 logs (99.9997%) removal/inactivation) of treatment. The treatment facility was designed under the requirement to provide 3.0 logs (99.9% removal/inactivation) of treatment for Giardia Lamblia.

Unless water systems opt to monitor for cryptosporidium directly, systems must monitor the raw water for E. Coli. If levels exceed 10 E. Coli per 100 mLs, systems must monitor for Cryptosporidium twice per month for 12 months. If source testing indicates a higher level of oocysts present, Montpelier would go from a bin 1 system to a bin 2 system. The increase in the mean Cryptosporidium concentration that would key this change is miniscule. **In fact, going from less than 0.075 oocysts per liter to over 0.075 oocysts per liter, would key an increase in the bin number. This is especially significant as according to the literature, humans infected with cryptosporidiosis can shed up to 10,000,000 per gram of feces**. If the oocysts are less than 1 oocyst per liter, Montpelier would not go to a bin number higher than 2. However, at a bin number of 2, the increase in treatment is significant. Montpelier would need an additional 1.5 logs of treatment (or going from 3.0 logs to 4.5 logs). The capital and annual costs for providing this increase level of treatment are currently be evaluated by the City.

Some comments regarding source water testing are in order. One typically thinks that water works professionals must test for everything all the time to insure safe water to our customers. Actually, we continuously test only very few parameters and most of these parameters do not pose immediate health effects. In Vermont, we typically only continuously test for chlorine residual, pH, and turbidity. Other parameters such as synthetic or volatile organic contaminates (SOC's and VOC's) are tested only quarterly or in some cases on a three-year routine. In addition we only test for some VOC's and SOC's but many more exist.

How do we provide assurance that the water is safe to drink? We make assumptions based on using multi-barriers to protect and treat the water provides theoretical assurance as confirmed by the very limited testing that the water is safe. For instance, if there are no humans having access to the raw water, we can assume there is little chance that VOC's and most SOCs could be present. This assumption is void if there is open recreational use of the water supply. Significantly by not maintaining an isolation zone around the intake, we cannot make any defendable assumptions regarding a willful contamination event.

Worse with most facilities including Montpelier, we would not identify or alarm the presence of agents used by those wishing to harm us. We would not even suspect the presents of these toxins and most would pass through the facility undetected and unaffected by treatment. Our only defense for such a willful contamination event is protection of the raw water source of supply by restricting access by unauthorized individuals near the intake.

The last point relates to the misconception that ANR officials don't need to worry about the water quality in Berlin Pond because Montpelier has a state of the art water treatment facility. Although Montpelier facility is one of the best facilities in the state if provides a level of treatment not significantly greater than any other facilities serving other communities using surface water. These Vermont facilities includes unit operations that are suited for removal of particulates and microbial contaminates. Disinfection inactivates well over the 90% giardia lamblia cyst inactivation requirement without causing significant disinfection byproducts. These Vermont water treatment facilities have performed well over the past several and will likely serve well over the next two or three with normal equipment maintenance and replacement. But these facilities do not perform beyond their capabilities. There are contaminates that cannot be removed by these unit operations at the plant such as petrochemicals, pharmaceuticals, and organic contaminates. In addition, as indicated above, cryptosporidium oocysts are not inactivated with the current disinfection system and any active oocysts will likely remain viable to customers.

We must remain vigilant as there are threats that could jeopardize the customer's water quality in spite of having surface water treatment facilities. Some of these issues are due to natural changes in the environment and some directly due to development activities within the watershed. If zebra mussels reach the source of supply, zebra mussel veligers can easily pass through the intake screen and attach to the inside of the raw water piping grow to such a density so as to significantly restrict the water flow to the water treatment facility. These mussels that thrive in Lake Champlain are already in the Winooski River and are moving further upstream. With fishing allowed on the pond, the simple act of dumping out a minnow bait bucket could start such an infestation in the raw water supply. Algae blooms due to eutrophication could release toxins at levels high enough to exceed WHO maximum contamination levels. As raw water supplies are open to recreation, development in the watershed is likely to increase which brings more use of the watershed; more cars and trucks with some making heating oil deliveries. More gardens that need to nitrogen and phosphorus. One accidental fecal release by a swimmer suffering from giardiasis or cryptosporidiosis can release millions of cysts or oocysts into the water supply. In addition, in my opinion, the greatest threat would be the willful contamination of the water supply near the intake with a contaminate that can completely pass through the treatment facility undetected.

The aspect of allowing any individual access to the water in the vicinity of the intake by allowing unrestricted recreation of the raw water supply increases risks to unacceptable levels. These risks include increased levels of Cryptosporidium oocysts and the threat of willful contamination.

To summarize, the key issues I raise in my testimony include:

1. Highlighting the realization that allowing recreational use of the pond, shoreline, and watershed removes a key barrier to providing safe water to customers. The most significant is the inability to ascertain the intent of unknown individuals in the vicinity of the intake and the lack of authority to restrict any activity near the intake. In my opinion, this is the single most significant reason to control the area around your water supply.
2. The recreational use of Berlin Pond will in all probability increase the level of pathogens in the raw water supply. If testing indicates only 0.075 cryptosporidium oocysts per liter in the raw water, Montpelier will be required to increase the level of treatment and the costs will be significant.
3. Presenting the reality that we do not test for every known contaminate continuously. In fact, most all the water reaching our customers has never been tested for contamination. Extremely toxic chemicals can pass undetected through a water treatment facility undetected.
4. A typical water treatment facility does not assure that water will be safe 100% of the time. Even the best most technologically advanced facilities cannot provide such assurance regardless of the cost. There are known contaminates that cannot be removed at any of the water treatment facilities in Vermont.

Respectively submitted,

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