Thelen, Mary Beth (DEQ)

From: Joan Rose <rosejo@msu.edu>
Sent: Monday, November 30, 2015 4:37 PM
To: Thelen, Mary Beth (DEQ)
Subject: : Meeting with Director Dan Wyant
Attachments: Flint Water Quality Assessment Letter.doc

Hello Mary Beth.

Can you pass this on to Dan. He wanted a copy of this letter. I sent this before the decision to switch back to Detroit water.

Joan

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On 11/20/2015 10:54 AM, Thelen, Mary Beth (DEQ) wrote:

> This is an automated response to your email message.
>
> **November 20, 2015, 8:00-5:00**
> Thank you for your email. I am out of the office. I will respond back to you as soon as I can. If this is urgent, please contact Karen Shaler at 517-284-6700. She will also monitor my email.
>
> Thank you.
>
> Mary Beth
>
> Mary Beth Thelen
> DEQ
> 517-284-6700

MICHIGAN STATE
UNIVERSITY

Oct. 1, 2015

Honorable Congressman Dan Kildee
5th District of Michigan
Flint MI

Dear Congressman Kildee

I am a public health water microbiologist and hold the Homer Nowlin Chair in Water Research at Michigan State University and my expertise involves water quality and health. I am a member of the National Academy of Engineering and I have served as Chair of the Drinking Water Committee, (2004-2010) Science Advisory Board of the US Environmental Protection Agency,

I am preparing this short letter in regard to my assessment of the water quality and health issues in Flint. I have reviewed Dr. Marc Edwards' proposal, methods and results for lead. I have been in discussion with the County Health Department and reviewed the health issues. I have served on the Technical Advisory Committee for the City of Flint and have read the reports provided by Veolia and the City. I have been involved since January, 2015.

I will attempt to address five critical questions.

1. Is there a water quality problem in Flint?
2. How well is the problem understood?
3. What water quality testing should be done?
4. How can the state help the citizens of Flint?
5. How do we restore water quality and wholesomeness, protect public health and restore confidence?

1. Is there a water quality problem in Flint?

In the US and in Michigan we pride ourselves not only on our safe drinking water meeting the national *Safe Drinking Water Act*, (*SDWA*) health based primary standards but on the wholesomeness of the water with high expectations associated with taste, odor and appearances. The *SDWA* however does not cover all of our water quality issues particularly in regard to the piping and plumbing system that makes up what is called the distribution system. **It has been well documented that when one changes the source water one can change the quality of the finished water at the tap due to the chemical, biological and physical conditions of the distribution system.** See "The Rise and Fall of the CAP: What went wrong with Tucson's Water Delivery of the CAP" http://academic.engr.arizona.edu/HWR/Fall02/Stacy/CAP_Project/Documents/AZDS_Rise_Fall_of_CAP.pdf

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There is no doubt that Flint had and still has a drinking water quality problem and this is effecting the health and wellbeing of the residents. The violations of the *SDWA* are well documented.

- In the summer of 2014, the first health violation was the finding of *E.coli* which mandates a boil order due to the potential for acute infectious disease risks associated with fecal contamination. This bacteria mandates that immediate action is taken which is why boil orders are issued and after which the treatment including disinfection must be examined.
- Following this were the violations of the disinfection- by-products standards for Total Trihalomethane TTHMs as a result of misbalance of the disinfection process where chlorine reacts with organics and forms these by-products. This is known as a chronic health risk in which long term exposure to these TTHMs may be a source of cancer.
- In addition the wholesomeness of the water in key areas of the city was clearly effected, with red and cloudy water emerging from the taps was probably due to iron sloughing from the pipes. With iron other things also come off the pipes, including lead and microbes.
- The public complained of skin irritation and illnesses which were never diagnosed. However *Legionella* infections (a waterborne pathogen) increased.

It is not a coincidence that this was associated with the change in the source water (higher hardness, more chlorides, more fecal pollution in the Flint River compared to Lake Huron). By the time winter came around and the weather changed and the temperatures went down, some of the issues abated. The Water Utility took on extensive changes in design, treatment and operations to decrease the *SDWA* violations. There was a sense of urgency to address the water quality before the spring and summer as warmer temperatures exacerbate these problems. While dollars were provided for treatment changes and upgrades, less funds were allocated toward monitoring the distribution system. Dr. Marc Edwards from Virginia Tech University an internationally renowned scientist associated with plumbing and water quality issues received funds from the National Science Foundation and began monitoring and has found high levels of lead in the tap water. He set up a web site for his data [http://flintwaterstudy.org/]. The health department has seen cases of *Legionella* continue and now lead blood levels have been found in children. **Many of the public still have water which is not drinkable despite meeting standards, thus wholesome and safe water is not being provided to all the citizens of Flint. This is not the intention of the *SDWA*.**

2. How well is the problem understood?

The science and mechanisms of dissolution of materials like minerals, iron, biofilms which accumulate on a pipe are understood. The role of Chlorides associated with corrosion are known. *The Lead and Copper Rule* was designed to address the leaching of lead from the distribution system and mandated a very specific monitoring program.
http://water.epa.gov/drink/ndwac/upload/lcrwgmeetsumaxd32514.pdf

Yet when it comes to the real-world distributions systems, the older infrastructure, the complex nature of the spatial network is not easy for the water industry to predict and anticipate the problems. There is a great deal of focus on meeting the primary health standards of the *SDWA* and rightly so, but for smaller utilities R&D, extra monitoring is not undertaken thus when problems emerge, it becomes a reactive cycle. When and where will lead show up in your glass of water are difficult questions to answer.

Biofilms which support *Legionella* is also not well described in most water systems. *Legionella* infections only come from piped water, it is a waterborne disease. But often we do not know where exactly the bacteria are impacting the public. While cooling towers have often been the primary culprit, water fountains and shower heads have also been implicated. Often the disease shows up in those most vulnerable and hospitals are definitely at risk, and thus water systems in hospitals require specific attention.

- There are enough data to better define the problems but all of the information has not been pulled together and synthesized. This includes public complaints, water quality data from the recent lead monitoring, as well as *Legionella* infections. This would include disinfection residuals, heterotrophic bacteria counts, as well as iron and other water quality parameters. If there is to be efforts to fix any of the pipes and distribution system that means that mapping of the lead data as well as the other water quality information is needed.

3. What water quality testing should be done?

Water testing is one in which the issues of i. where you sample, ii. when you sample, iii. how you sample and iv. how many samples you take influence the results. One can bias the results by taking too few samples and by sampling at a place and time when the results are likely to be high or low. It is clear that the citizens of Flint wanted their water tested as 252 kits were returned out of 300 to Dr. Marc Edwards. The methods used by Dr. Edwards follow those recommended by the *Lead and Copper Rule (*USEPA).

The water testing in Flint needs to be diagnostic not focused on a regulatory goal. This means more extensive testing is needed to identify the issues and

problems. I stated in an email January 22, 2015, to Mr. Howard Croft, the mayor and other officials "I definitely think more testing for hardness, iron, TDS, *E.coli* maybe lead from people who are having aesthetic issues is needed."

Added to this list would be corrosivity, heterotrophic bacteria and *Legionella*. The sampling should be targeted to where they think the problems are and enough samples in time and space need to be collected to ensure the negative result is meaningful.

4. How can the state help the citizens of Flint?

There is a need for an immediate solution as well as a long term repair. Because this is a public health issue the MI Department of Community Health should immediately assist the county health unit. All citizens effected should be provided with filters that remove lead. This I believe was done in Lansing. Water can be bottled at the plant and provided to those who need potable and wholesome water. Work should begin immediately to address *Legionella* in hospitals and other buildings where vulnerable people are at risk. Dr. Janet Stout would be extremely helpful in this regard.

More testing is needed. Things again will calm down during the winter months as things warm up in 2016 the problems could re-emerge.

The state revolving funds should be used and emergency/disaster funds requested as this is a public health issue.

It is not clear how fast the water quality will improve if Flint begins using Lake Huron water either from Detroit or as their new intake is built. This should be investigated.

Long term a full assessment of the distribution system is needed. It will take time and money to restore the piping system thus the worst areas should be tackled first. Thus a plan that establishes a priority based on age of the distribution system and water quality should be formulated along with the timeline.

5. How do we restore water quality and wholesomeness, protect public health and restore confidence?

Flint is an example of what many cities may be facing in the future. New sources of water are needed for many locales either due to scarcity growth or cost. The aging infrastructure has already been noted by the American Society of Civil Engineering. In particular distribution systems need to be rehabilitated which means that time and money must be spent on assessment and then "fixing" the problems. This crisis is an opportunity to

step up and do the right thing for City of Flint and for the State. Just as the *Cryptosporidium* outbreak in Milwaukee led to changes at the national level for safe drinking water, it also led to significant changes for the city and now they have emerged as a leader developing the Global Water Center http://www.thewatercouncil.com/global-water-center/. In Canada the outbreak of *E.coli* 0157H7 and *Campylobacter* led to changes in groundwater rules throughout the provinces and the Walkerton Clean Water Centre https://www.wcwc.ca/en/.

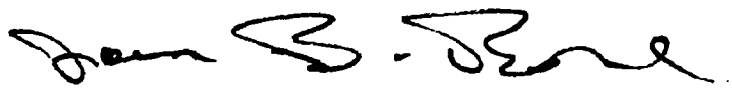
These tragedies where whole communities were effected and children died as a result of water contamination were not associated with some failure of "Standards" but a failure to examine the data, address new emerging concerns/contaminants and to pay attention to management of the water treatment processes.

To rebuild confidence will take years along with honest communications and some short term immediate help for the citizens of Flint.
The state should put together an Independent panel that could address the short term and long term assessment and solutions not just for Flint but for other cities. How can addressing the problems in Flint facilitate the Michigan water strategy?

I hope that this short write up helps.

Please let me know if you have any further questions.

Sincerely,



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