

## Mears, David

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**From:** Riddell, Linda  
**Sent:** Thursday, March 01, 2012 3:22 PM  
**To:** Thompson, Christine  
**Cc:** Gjessing, Catherine; Mears, David  
**Subject:** VCE FOIA Request  
**Attachments:** RE: Records Request -- Chloramine; FW: Proposed water system improvements; FW: Proposed water system improvements; FW: Proposed water system improvements; FW: Recent DBP Research Presentations; FW: Records Request -- Chloramine; FW: VCE Request for Meetings; Proposed water system improvements; RE: Current Status of DBP Systems; RE: Proposed water system improvements

Attached are the only messages that I was able to pull from David's emails for the dates requested. I also don't have any other documents for the requested time period.

**Linda L Riddell**

Executive Assistant

Vermont Department of Environmental Conservation  
Office of the Commissioner  
Temporary Fayston Location  
(802) 583-7123

[Linda.Riddell@state.vt.us](mailto:Linda.Riddell@state.vt.us)

**Note: Written communications to and from state officials regarding state business are considered public records and will be available to the public for review.**

## Mears, David

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**From:** Mears, David  
**Sent:** Tuesday, May 24, 2011 4:36 PM  
**To:** Schultz, Gary  
**Subject:** RE: Records Request -- Chloramine

Thanks!

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**From:** Schultz, Gary  
**Sent:** Tuesday, May 24, 2011 3:26 PM  
**To:** Mears, David  
**Cc:** Gjessing, Catherine  
**Subject:** RE: Records Request -- Chloramine

We're on it. Just talked to Catherine.

---

**From:** Mears, David  
**Sent:** Tuesday, May 24, 2011 3:06 PM  
**To:** Schultz, Gary  
**Cc:** Groveman, Jon; Gjessing, Catherine; Johnson, Justin; Riddell, Linda  
**Subject:** FW: Records Request -- Chloramine

Gary: Please coordinate with Catherine in formulating an appropriate search and response related to the attached request. David

David K. Mears, Commissioner  
Vermont Department of Environmental Conservation

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**From:** Matt Levin [<mailto:matt@vce.org>]  
**Sent:** Tuesday, May 24, 2011 2:47 PM  
**To:** Chen, Harry; Mears, David  
**Cc:** Annette Smith  
**Subject:** Records Request -- Chloramine

See the attached records request. Please let me know if you have any questions.

Thanks --  
Matt

*Matt Levin*  
*Outreach and Development Director*  
*Vermonters for a Clean Environment*  
802-229-4281  
[matt@vce.org](mailto:matt@vce.org)

## **Mears, David**

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**From:** Mears, David  
**Sent:** Tuesday, February 14, 2012 1:48 PM  
**To:** Thompson, Christine  
**Subject:** FW: Proposed water system improvements

Chris: Tracy Dolan left me a voice message indicating that she has asked Bill Irwin to call you. Please let me know how that conversation goes and whether it makes sense for us to convene a call with Commissioner Chen. David

David K. Mears, Commissioner  
Vermont Department of Environmental Conservation

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**From:** Chen, Harry  
**Sent:** Tuesday, February 14, 2012 12:39 PM  
**To:** Mears, David  
**Cc:** Dolan, Tracy; Irwin, William; Thompson, Christine  
**Subject:** RE: Proposed water system improvements

David,

I agree that a meeting to discuss the issue with the goal of aligning our message and strategy makes sense.

Harry

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**From:** Mears, David  
**Sent:** Tuesday, February 14, 2012 12:31 PM  
**To:** Chen, Harry  
**Cc:** Dolan, Tracy; Irwin, William; Thompson, Christine  
**Subject:** FW: Proposed water system improvements

Dear Harry and Tracy: From the e-mail chain below, there appears to be the possibility that our two departments are taking a different stance on an issue relating to how much information about monochloramine should be shared with the residents of Grand Isle before they vote on a bond for improvements to the public water supply system. Just a few days ago, we learned that the town is not planning to share this information publicly until after the bond vote. For that reason, I asked Christine Thompson of our drinking water program to write to the town to encourage them to share information about monochloramine in advance of the bond vote. While we support the use of monochloramine and have been working with EPA to press the town to switch to a system that reduces the concentration of disinfection byproducts in their drinking water, we do not want to be party to a process that withholds information that we know, from experience, may be of importance to some residents.

In the message below, the town suggests that they intentionally withheld this information at the suggestion of Bill Irwin. If so, Bill and Christine should probably have a conversation to figure out how to proceed. I have asked Christine to draft a letter that both she and Bill could sign encouraging the town to inform its citizens about the switch to monochloramine as a disinfectant and to share that draft with Bill. If nothing else, that letter could be a starting point for a conversation between our two departments. I am around all day today if you want to talk. Sincerely, David (371-8933 or 583-7112)

David K. Mears, Commissioner  
Vermont Department of Environmental Conservation

---

**From:** Thompson, Christine  
**Sent:** Tuesday, February 14, 2012 12:07 PM  
**To:** Blatt, Eric; Mears, David  
**Subject:** FW: Proposed water system improvements

FYI

Christine Thompson, Director  
Drinking Water and Groundwater Protection Division  
Mailing address: 103 South Main St., Waterbury, VT 05676  
Office location: VSAC Building, Winooski, VT  
Phone: 802-338-4859  
[christine.thompson@state.vt.us](mailto:christine.thompson@state.vt.us)

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**From:** RICHARD DREVES [<mailto:dreves802@msn.com>]  
**Sent:** Tuesday, February 14, 2012 9:50 AM  
**To:** Thompson, Christine; alan huizenga  
**Subject:** RE: Proposed water system improvements

Dear Ms. Thompson: Thank you for your E-mail. Let me assure you that we are well aware of the implications associated with the introduction of monochloramine, having been one of the 15 water systems evaluated by the AE COM study sanctioned by our Legislature, and a member of the of the Lake Champlain Coalition of Municipal Water Users. Our omission of references to monochloramine was intentional and also suggested by Dr. William Irwin from the Vermont Department of Health. His suggestion was to go ahead with the Bond vote as warned, and then address the chloramine issue with public informational meetings one the money was approved.

This issue was discussed with several people from a State level and with Alan Huizenga of Green Mountain Engineering last week, and to my understanding, our plan to address monochloramines after the bond is approved by public vote, was approved and also supported by Mr. Paul Giuliani, Esquire. (Alan Huizenga 802-862-5590, [ahuizenga@gmeinc.biz](mailto:ahuizenga@gmeinc.biz)) . I will forward this to Alan and If you still have an issue, I would suggest you talk with him as he is the more informed person on our end.

Thank you,

Richard Dreves

---

**From:** [Christine.Thompson@state.vt.us](mailto:Christine.Thompson@state.vt.us)  
**To:** [dreves802@msn.com](mailto:dreves802@msn.com); [Eric.Blatt@state.vt.us](mailto:Eric.Blatt@state.vt.us); [David.Mears@state.vt.us](mailto:David.Mears@state.vt.us) |  
**Date:** Mon, 13 Feb 2012 16:12:18 -0500  
**Subject:** Proposed water system improvements

Dear Mr. Dreves

I recently learned the Grand Isle Consolidated Water District held a public meeting last week to discuss tomorrow's bond vote for your water system improvements. Evidently no mention of the proposed use of monochloramine was made during the meeting.

Because the use of monochloramine in other parts of VT has been a concern for some citizens, I strongly recommend the public be made aware of its proposed use by your water system as soon as possible so there is plenty of time for meaningful discussions if they are needed.

In the event you get requests for information about monochloramine, the Department of Health has an excellent "Frequently Asked Questions" webpage at: <http://healthvermont.gov/enviro/water/faq.aspx>

Sincerely,  
Christine Thompson

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To: [dreves802@msn.](mailto:dreves802@msn.); [Eric.Blatt@state.vt.us](mailto:Eric.Blatt@state.vt.us); [David.Mears@state.vt.usa](mailto:David.Mears@state.vt.usa) |  
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**To:** [dreves802@msn.com](mailto:dreves802@msn.com); [Eric.Blatt@state.vt.us](mailto:Eric.Blatt@state.vt.us); [David.Mears@state.vt.us](mailto:David.Mears@state.vt.us) |  
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## Mears, David

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**From:** Mears, David  
**Sent:** Sunday, July 17, 2011 10:04 PM  
**To:** Nicolai, Jean  
**Cc:** Johnson, Justin  
**Subject:** FW: Recent DBP Research Presentations

Jean: What do you think of the idea of convening a meeting with Annette Smith, Dept of Health, and perhaps others such as some of the water supply system operators, to discuss the latest information on chloramine? David

---

**From:** Annette Smith [vce@vce.org]  
**Sent:** Sunday, July 17, 2011 11:25 AM  
**To:** Chen, Harry; Bill Bress; Austin Sumner; William Irwin  
**Cc:** Mears, David; Johnson, Justin; Nicolai, Jean; Solomon, Ray  
**Subject:** Recent DBP Research Presentations

Dear Commissioners and staff of DEC and VDH dealing with water supply issues,

I found this program (see below) about a recent Disinfection By-Products Workshop held in Australia on the internet and wrote and asked for the proceedings. They were kind enough to mail me a CD, which arrived in the mail yesterday. Links to the presentations are at the end of this email. These are some of the top researchers in the field so I was pleased to be able to get copies of their latest work.

I will note that with the change in administration, the recent retirement of Dr. Swartz, the impending retirement of Dr. Bress, and the change in the Division Chief of the Water Supply Division, we are losing quite a bit of institutional knowledge about the chloramine issue. Matt informs me that Austin Sumner and William Irwin will be on point for the Health Department. Perhaps we should have a meeting sometime in the next couple months, prior to the introduction of chloramine into more Vermont systems, and get up to date on the research, much of which relates to the regulated disinfection byproducts from chlorine versus the unregulated ones from chloramine. I think those of you who are now dealing with EPA regulations will find these presentations to be useful.

At the seminar I attended in DC last month, the people who have been in the room with leadership at EPA recently say that we should watch for a health advisory coming from Administrator Lisa Jackson for NDMA. The collective wisdom is that the days of chloramine are over, that the risks of NDMA formation outweigh by far the risks from the regulated DBPs of chloramine. That sentiment is reflected in the presentations. We could learn something by testing outfalls from the wastewater treatment plants in the Burlington area for NDMA, comparing the results from the chlorinated (Burlington) and chloraminated (CWD) systems. VCE has been trying to figure out how to get that testing done (we have funding for it) but so far have had no success.

Annette

<http://cwqrc.curtin.edu.au/workshop/program.cfm>

Curtin Home > Science and Engineering > Curtin Water Quality Research Centre > Workshop > Program

# Disinfection By-Products (DBP) Workshop: Emerging Issues in DBP Research and tl

Tuesday 17<sup>th</sup> May 2011

## Program

Tuesday 17<sup>th</sup> May 2011

8:00-8:30	Arrival
	Opening
8:30-9:00	Dr Jim Gill AO, Chancellor Curtin University
	Keynote Speaker
	<b>Professor Emeritus Steve Hrudey - University of Alberta, CANADA</b>
	<i>Overview and epidemiology with brief scientific and DBP regulatory history</i>
	<b>Dr Richard Bull - MoBull Consulting, USA</b>
9:00-10:30	<i>Toxicological evidence - relevance to human health outcomes</i>
10:30-11:00	Morning Tea
	<b>Associate Professor William A. Mitch - Yale University, USA</b>
	<i>Nitrogenous DBPs and emerging issues</i>
	<b>Professor Xing-Fang Li - University of Alberta, CANADA</b>
11:00-12:00	<i>Recent novel DBPs - halogenated benzoquinones</i>
12:00-13:15	Lunch
	<b>Presentation from Water Corporation Western Australia</b>
	<b>Presentations from CWQRC - Curtin University, WESTERN AUSTRALIA</b>
	<i>Emerging DBPs</i>
	<b>ROUND TABLE DISCUSSION</b>
	Moderated by Steve Hrudey and Jeff Charrois - Panel with all speakers.
13:15-14:45	<i>Where are we going with DBP research and regulation?</i>
15:15-15:45	Afternoon Tea
15:45-17:00	<b>Student Presentations</b>
17:00-17:30	Close

<http://www.vce.org/DBP%20Workshop%20Presentations/Caroline%20Nottle.pdf>

<http://www.vce.org/DBP%20Workshop%20Presentations/Ina%20Kristiana.pdf>

<http://www.vce.org/DBP%20Workshop%20Presentations/Jessica%20Boyd.pdf>  
<http://www.vce.org/DBP%20Workshop%20Presentations/Richard%20Bull.pdf>  
<http://www.vce.org/DBP%20Workshop%20Presentations/Richard%20Walker.pdf>  
<http://www.vce.org/DBP%20Workshop%20Presentations/Steve%20Hrudey.pdf>  
<http://www.vce.org/DBP%20Workshop%20Presentations/William%20Mitch.pdf>  
<http://www.vce.org/DBP%20Workshop%20Presentations/Xing%20Fang%20Li.pdf>

-----  
Annette Smith  
Executive Director  
Vermonters for a Clean Environment, Inc.  
789 Baker Brook Rd.  
Danby, VT 05739  
office: (802) 446-2094  
cell: (802) 353-6058  
<http://www.vce.org/>  
[vce@vce.org](mailto:vce@vce.org)

## Mears, David

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**From:** Mears, David  
**Sent:** Tuesday, May 24, 2011 3:06 PM  
**To:** Schultz, Gary  
**Cc:** Groveman, Jon; Gjessing, Catherine; Johnson, Justin; Riddell, Linda  
**Subject:** FW: Records Request -- Chloramine  
**Attachments:** recreq\_DECDOH\_0511.pdf

Gary: Please coordinate with Catherine in formulating an appropriate search and response related to the attached request. David

David K. Mears, Commissioner  
Vermont Department of Environmental Conservation

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**Sent:** Tuesday, May 24, 2011 2:47 PM  
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Thanks --  
Matt

*Matt Levin  
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[matt@vce.org](mailto:matt@vce.org)*

Vermonters  
for a  
Clean Environment

789 Baker Brook Road  
vce@vce.org

Danby, Vermont 05739  
802-446-2094

May 24, 2011

Dr. Harry Chen, Commissioner  
Vermont Department of Health  
*via email*

David Mears, Commissioner  
Vermont Department of Environmental Conservation  
*via email*

Dear Commissioners Chen and Mears,

Pursuant to Vermont's Public Records Act, V.S.A. Section 315-320, I hereby request to inspect and photocopy documents pertaining to your departments' work on chloramine. Specifically I am seeking all letters, reports, and other writings, including electronic mail and documentation, issued, produced, recorded, or received pertaining to internal discussions, interaction with Vermont water districts, or with the EPA on the use and/or impacts of the use of chloramine as a secondary disinfectant, between January 1, 2010 and May 24, 2011.

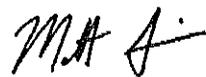
I am addressing this request to you in the belief that you are the custodian of such documents. If you are not, I request that you forward my request to the proper custodian of such documents and inform me of whom that person is.

If the law does not allow me to have access to some of these records, please so inform me within two business days, as provided by law, and inform me of the specific exemption that applies to each record or portion of a record being withheld. If an otherwise public record has a portion that is exempt from disclosure, I request that you block out the exempt portion and release a copy of the rest of the document together with a notation of the specific exemption that applies to the portion withheld.

If some or all of my request is denied, please tell me the title and name of the person responsible for the denial and, as the law requires, please inform me of the appeal procedures available to me and the name of the person to whom appeal may be made.

Please call me at 229-4281 if you have any questions.

Sincerely,



Matt Levin  
Outreach and Development Director

## Mears, David

---

**From:** Mears, David  
**Sent:** Wednesday, January 26, 2011 5:55 PM  
**To:** Riddell, Linda  
**Cc:** Berry, Patrick; Schultz, Gary  
**Subject:** FW: VCE Request for Meetings

Linda: Can you schedule a meeting for me and Gary with Annette? Please invite Patrick as well. David

Patrick: Feel free to decline if you are too swamped – if you cannot attend, it would be useful if you have participation from an aquatic biologist from your department if any have time to hear Annette's concerns. Then we would have someone who can help all of us understand this issue. This chloramine issue is a significant one and is likely to come up in the next few months so I will need to find out the answer to the question of whether this chemical disinfectant poses any threats to aquatic life at some point.

Thanks, David

---

**From:** Annette Smith [mailto:vce@vce.org]  
**Sent:** Wednesday, January 26, 2011 4:18 PM  
**To:** Mears, David  
**Cc:** Riddell, Linda  
**Subject:** Re: VCE Request for Meetings

Commissioner Mears,

Thank you for your response.

1. Chloramine. Yes, chloramine is toxic to aquatic life, which is why I suggested involving Pat Berry, but if it is too hard to schedule I can talk to him about it separately. I am most interested in discussing new water treatment possibilities (getting beyond chloramine). I will look for a message from Linda about scheduling. There is an associated issue involving chloramine and a possible contaminant that may be formed and discharged through wastewater treatment plants, so that's another area I would like to discuss.
2. I have written separately to Commissioner Berry and Jon Groveman. If I schedule something with them before I hear from Linda, I will let her know and see if you have any availability around the same time.
3. I have written separately to Dept. Commissioner Johnson about a meeting regarding Omya.

I look forward to seeing you soon.

Annette

On Jan 24, 2011, at 6:59 PM, Mears, David wrote:

Dear Annette: It was a pleasure to hear your voice on my voice-mail. In response to your request for meetings, I suggest the following:

- (1) Chloramine: I am glad to set up a meeting with you and my water supply division manager Gary Schultz and would enjoy hearing your thoughts on alternative disinfection methods. You indicated that Patrick Berry should

participate – I may be able to wrap Patrick into a meeting but scheduling both of us at one time is a challenge. Can you tell us a little more about the connection between chloramine and Fish and Wildlife? I recall that chloramines residuals may have an impact on some fish species – is that the connection? My assistant is Linda Riddell – look for a message from Linda looking for a time we can meet.

- (2) Wind: You are right that Jon and Patrick are involved in evaluating wind issues – really all of the leadership team in ANR is involved at some level but Jon and Patrick are on point at the moment. I am copying both Jon and Patrick on this message. You may want to follow-up directly with them about trying to find a convenient time to discuss ANR's role on wind projects.
- (3) Omya: Justin Johnson is handling the Omya solid waste certifications and related issues as I am recusing myself. Feel free to touch base with Justin (who is also cc'd on this message) to discuss and he can coordinate with Deb or Deputy Secretary Chris Recchia as appropriate.

Sincerely, David

**Mears, David**

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**From:** Thompson, Christine  
**Sent:** Monday, February 13, 2012 4:12 PM  
**To:** 'dreves802@msn.com'  
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**Subject:** Proposed water system improvements

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I recently learned the Grand Isle Consolidated Water District held a public meeting last week to discuss tomorrow's bond vote for your water system improvements. Evidently no mention of the proposed use of monochloramine was made during the meeting.

Because the use of monochloramine in other parts of VT has been a concern for some citizens, I strongly recommend the public be made aware of its proposed use by your water system as soon as possible so there is plenty of time for meaningful discussions if they are needed.

In the event you get requests for information about monochloramine, the Department of Health has an excellent "Frequently Asked Questions" webpage at: <http://healthvermont.gov/enviro/water/faq.aspx>

Sincerely,  
Christine Thompson

Christine Thompson, Director  
Drinking Water and Groundwater Protection Division  
Mailing address: 103 South Main St., Waterbury, VT 05676  
Office location: VSAC Building, Winooski, VT  
Phone: 802-338-4859  
[christine.thompson@state.vt.us](mailto:christine.thompson@state.vt.us)

**Note: Written communications to and from state officials regarding state business are considered public records and will be available to the public for review**

## Mears, David

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**From:** Mears, David  
**Sent:** Sunday, April 24, 2011 4:45 PM  
**To:** Schultz, Gary  
**Cc:** Solomon, Ray; Nicolai, Jean; Pingree, Rodney; Kessler, Gary; Johnson, Justin  
**Subject:** RE: Current Status of DBP Systems

Dear Gary: I finally had the chance to get to your message and Ray's memorandum. Thank you for providing the information and for the underlying work – I found Ray's memo quite useful. I also reviewed a stack of documents that the Champlain Water Supply District gave me about monochloramine. I appreciate your division's good work on this challenging set of issues and look forward to finding a way to help the affected communities come into compliance in a manner that is cost effective and protects the public health. I am glad you are working with Gary Kessler's shop to sort out the specific challenges associated with EPA's recent decision to require enforcement of the phase I DBP rule.

Sincerely, David

David K. Mears, Commissioner  
Vermont Department of Environmental Conservation

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**From:** Schultz, Gary  
**Sent:** Friday, April 01, 2011 12:56 PM  
**To:** Mears, David; Kessler, Gary; Johnson, Justin  
**Cc:** Solomon, Ray; Blatt, Eric; Nicolai, Jean; Pingree, Rodney; Raymond, Tim  
**Subject:** Current Status of DBP Systems

David, Justin, and Gary,

I know asking you folks to take the time to read this e-mail and a seven page memo on the current status of the DBP systems prior to our meeting on the 27<sup>th</sup> is asking a lot with all that is going on. Ray Solomon has put together the attached summary. Ray is our treatment genius and has been working closely with these and other systems for several years trying to optimize their treatment so that they could continue to use chlorine as a secondary disinfectant.

Several years ago when the Stage 1 Rule came into effect, we and the DBP systems all thought the answer would be monochloramine. In most, maybe all, of the systems, switching from chlorine to monochloramine would have brought them into Stage 1 compliance without significant changes to the mechanical part of their filtration process. They were pretty much ready to move forward, but then the push for a monochloramine ban hit the legislature, and the systems were in limbo for over two years while they waited to see if the legislature was going to ban monochloramine. During this period of time, Ray worked with the systems piloting coagulant additions, different filtration rates, and different chlorine concentrations and injection points that would remove more organic precursors, reduce DBP formation, and therefore allow them to continue to use chlorine. He continues to do so to this day.

The legislature eventually did not ban monochloramine when they realized, as the result of a \$250,000 study done by a nationally known engineering firm, how much it would cost municipalities to remove enough organic precursors up front so that they could continue to use chlorine. They did, however, require an opportunity for a public hearing if the system changed disinfectants. In order to fund any treatment changes, the system needs a bond vote and they are less than anxious to have a heated, controversial hearing on switching to monochloramine prior to a bond vote. They realize that the October 2013 deadline date for compliance with Stage 2 is rapidly approaching and they would like to meet those limits without having to switch to monochloramine.

My point in giving you this background is that these systems have been actively working with us to be in compliance the Stage 1 deadline that has passed and the 2013 deadline, and we think that they will. Ultimately, Ray believes some will have to switch to monochloramine, and they are willing to do so if they have to. At the risk of overgeneralizing I think

it's safe to say that they're all hoping that enhanced coagulation and changes in operation will allow them to meet the Stage 2 limits, but if not, they'll switch to monochloramine.

I can't see what good an enforcement action on the part of EPA would do to improve the situation, our working relationship with the system, or hasten compliance with Stages 1 and 2 with these systems. I know that EPA has their enforcement priority tracking system that draws its information from our database. Unfortunately, the database does not include the information in the attached memo or a reflection of the number of meetings we've had with these systems. In these instances, we are not dealing with large public works departments, we're dealing with part time operators and volunteer water boards that we have to take by the hand and help them through the process. Our goal is not only to bring them into compliance but also to leave them with a treatment system that is within their technological ability to operate. I guess my real rub here is why would we would willingly support EPA ordering them to do what they already doing? Why can't EPA trust us to do our job which is, get them into compliance? In years past we had a partnership with EPA and shared the same goals. Now it's all what EPA wants.

With our concurrence, EPA did issue an enforcement order on Catamount / Bolton, a private DBP system serving the ski area and area homes and businesses. In my opinion, EPA's performance here has been pretty underwhelming. They do have their enforcement bean to count, but Catamount has blown off their December 2010 compliance date and I don't see any action on EPA's part. It's actually kind of interesting to watch.

Sorry this is so long.

Gary

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**From:** Solomon, Ray  
**Sent:** Tuesday, March 29, 2011 3:30 PM  
**To:** Schultz, Gary  
**Subject:**

My best estimates for compliance, with a few more things thrown in

Ray

To: Gary Schultz

From: Ray Solomon

Subject: Current Disinfection Byproduct Status of Vermont Surface Water Systems

Date: 3/29/2011

Disinfection byproducts were discovered in 1974 in the Netherlands by J.J. Rook. Much to his surprise, he found chloroform in virtually every chlorinated surface water that he tested. Since then, dozens of byproducts have been found. The first DBP standard was proposed in 1979 by EPA. Systems with populations over 10,000 were limited to 100 ppb of total THM (trihalomethanes) on a running annual average. No regulated Vermont system failed this standard. Stage 1 standards for all Vermont surface waters were implemented in 2004. The standard requires a system wide running annual average of THM's below 80 ppb and a running annual average of HAA5's (haloacetic acids) below 60 ppb. 2013 will bring Stage 2, which requires each identified sampling point in the system to meet the Stage 1 levels.

Vermont surface water, compared to many U.S. surface waters, is soft and low in turbidity. Thus, filtration is usually direct rapid sand or slow sand. Neither of these processes is designed to use high alum or iron doses for coagulation. When it comes to DBP control, this is unfortunate since high alum doses combined with resulting pH suppression can result in significant DBP precursor removal in the filtration process. This lowers DBP's. Other methods used to reduce precursors, such as GAC filtration and anionic exchange resins can be very effective but are much more expensive and operationally intensive. This combines with the small size of most of our systems and makes these alternatives impractical. The AECOM study certainly illustrates this. Biological filtration can be an effective method to reduce precursors, but it is usually combined with ozonation to make the process more efficient. Once again, ozonation for small systems is expensive and burdensome to the operator.

Once chlorine is added, byproduct formation commences. For THM's, the process continues unrelentingly until either all the chlorine had been consumed, all the precursors have reacted, or the water had been consumed. The process is accelerated by increasing pH and temperatures. HAA5 formation differs from this pattern because they can actually be consumed by bacterial populations in the distribution system if chlorine residuals are very low and there is sufficient time. High pH slows, to some degree HAA5 formation. In order to meet CT requirements under the Surface Water Treatment Rule, chlorine will continue to be the primary disinfectant for our surface waters, so that some regulated DBP formation is inevitable. The formation can be limited by lowering chlorine residuals, to the extent possible, minimizing detention time in the distribution system, converting chlorine to monochloramine as it leaves the treatment plant, or blending with groundwater, which usually has a dramatically lower DBP formation potential. These factors guide our efforts to bring systems into compliance for both Stage 1 and Stage 2. Let's first specifically look at systems currently failing Stage 1.

## TRITOWN

The system draws water from a shallow Lake Champlain intake in Addison. A modular Trident dual stage filtration system designed to use direct filtration coagulant doses provides a low turbidity finished water. The system uses alum, cationic polymer and nonionic polymer for coagulation. Chlorine is used for primary and secondary disinfection. pH is adjusted upward and orthophosphate is added for corrosion control. The system had a very large distribution system for its population size and thus long water residency time. Chlorine residuals leaving the plant, especially in the summer, must be high in order to maintain a residual throughout the distribution system. These factors combine to generate DBP levels that at times violate the Stage 1 standard. Stage 2 will exacerbate the problem. Current RAA for stage 1 is about 77ppb HAA5 and 65 ppb THM's (TWERP graph).

We have developed a three stage plan for all Trident systems having DBP issues. First, alum doses will be raised as high as practical, ideally to 25-30 mg/l, which results in a pH of around 6.5. Trident systems cannot handle much more alum than this. Our pilot testing has shown a substantial decrease in TOC and a lowering of UV254 absorbance on Lake Champlain water if this dose can be utilized. TOC and UV254 are good surrogates for DBP precursors. If DBP formation cannot be lowered sufficiently by coagulant adjustment, chlorine addition will be split at the plant. Only sufficient chlorine will be added to meet CT requirements. As water enters the distribution system, additional chlorine will be added to obtain a sufficient residual throughout the system. This can be expected to have a small effect on lowering DBP's. If the first two stages fail to bring the system into compliance, the third stage uses ammonium sulfate injection at the inlet to the distribution system to convert chlorine to monochloramine. Given the DBP levels we see at the inlet to distribution systems, this conversion should bring systems into compliance.

In the case of Tritown, we have already attempted to raise alum dose to 28 mg/l from 8 mg/l. This resulted in very fast breakthrough of coagulated material through freshly backwashed filters even at reduced flow rates, and increased nonionic polymer dose. We will, however, continue to raise alum dose as much as possible. Plans have been approved for the split chlorine injection system. Construction has begun. We have raised pH slightly to see if this will lower HAA5's. A pilot study was done to compare DBP level for all chlorine versus chlorine/monochloramine disinfection. The chlorine/monochloramine scheme showed substantial reduction. Split disinfection should go online sometime in May and if DBP levels still are above standard, chlorine/monochloramine could go online by late Fall.

## NORTH HERO

The system draws from Lake Champlain at the northern tip of North Hero on the east side, in a shallow intake. Like Tritown, a Trident system is used for filtration with alum coagulation and nonionic polymer for coagulation with upward pH adjustment, orthophosphate and chlorine addition after filtration. A distribution pipe runs the entire length of North Hero, with several dead ends. This can result in very long detention times. In fact, most Lake Champlain systems generate substantial amounts of DBP's. The systems which violate the standard usually have shallow intakes or long detention times, or both. Current RAA for North Hero is 62 mg/l HAA5's and 78 mg/l THM's (TWERP).

In December 2010, we raised the alum dose to 28 mg/l. This dose is currently working under a reduced flow rate. (3gpm/sq.ft). Clarified pH is 6.6. Awaiting DBP results, the system has engaged an engineer to design split chlorination, if required. We have not yet received a design.

#### VERGENNES PANTON

The system utilizes Lake Champlain through a shallow intake in Panton. Coagulation with a blended cationic polymer and polyaluminum chloride precede pressure sand filtration. The filters are old and are currently in the process of being replaced. A high alum dose is not currently possible. Plans for replacement filters have been approved. Construction is likely to begin in the summer of 2011. Space requirements necessitated the use of the Trident system. Incorporated into the plan is the three stage system for dealing with DBP's. The current RAA is 61 mg/l for HAA5's and 59 mg/l for THM's (TWERP).

#### GRAND ISLE CONSOLIDATED WATER SYSTEM

The system draws from a deep intake on the west side of Grand Isle. The intake is shared by the Weed Fish Hatchery. The system uses proprietary media in Kinetico pressure filters with a low dose blended cationic polymer/polyaluminum chloride coagulant. Chlorine and orthophosphate are injected after filtration. A large gravity storage tank is directly attached to the plant, followed by a distribution system with long detention times. Because of system pressure constraints, the water level in the storage tank cannot be appreciably lowered. RAA for DBP's is currently 56 ppb HAA5's and 45 ppb THM's. The system has recently dipped below the Stage 1 standard.

The plant's design does not allow high alum dose or split chlorination. The current plan, if DBP reduction is required, is to construct a large diameter chlorine detention pipe followed by conversion to monochloramine before the storage tank. Pilot studies will be conducted this summer to ascertain the effectiveness of this scheme. Engineering plans have not been received.

#### RUTLAND CITY

Rutland feeds water from Mendon Brook to a large raw water reservoir to supply a slow sand filtration plant. After slow sand filtration water is chlorinated, orthophosphate is added and water is fed directly to two onsite 2.5 MG storage tanks. The distribution system is extensive with several consecutive systems attached. RAA for DBP's is 71 ppb HAA5's and 42 ppb for THM's.

The three stage plan is not possible at this facility since slow sand filters are not easily compatible with coagulation. Split chlorination and monochloramination could be utilized, but the City is interested in pursuing alternatives. They are currently running a pilot study to determine the effectiveness of a "GAC sandwich" in each slow sand filter. Three columns have been set up, one control (normal SSF), a SSF with six inches of fresh GAC and a SSF with exhausted GAC. The goal of the pilot is to see how long GAC lasts before losing its capacity to adsorb precursors, and whether the exhausted GAC will promote superior biological filtration compared to the control column. Depending upon these results, ozonation may be employed to enhance the biological filtration. Since the columns were just placed into service, we do not

have any meaningful results to report. A minimum of six months will be needed to assess these alternatives.

## PROCTOR

Proctor draws its water from an impoundment in Kiln Brook where it is piped to the treatment plant which was built in the 1920's. The plant consists of baffled detention for flocculation and setting followed by gravity rapid sand filtration. A blended cationic polymer/polyaluminum chloride is used for coagulation. Chlorination is needed before filtration because there is insufficient CT after the filters. There are several other deficiencies that need to be fixed at the plant. Despite this, filtered water turbidity is generally excellent, usually below 0.03 ntu. RAA for DBP's is 100 ppb for HAA5's and 110 ppb for THM's.

Because of the extensive improvements needed at this old plant needed to comply with Stage 1 rules, the village has decided to abandon the plant and utilize an existing and approved groundwater source. This, unfortunately, will result in several users outside of Proctor without water.

Several factors have complicated our efforts to bring systems into compliance with Stage 1 DBP standards. In general, most systems that have had difficulties meeting the standard are small with limited capacity and expertise. In these cases, it is important to try the most basic approaches first, before jumping to technically challenging, and sometimes very expensive solutions. Layered on this issue is the controversy instigated by the conversion of secondary disinfection to monochloramination by Champlain Water District in 2006. Although this resulted in a greater than 50% reduction in haloacetic acids, health concerns raised by public interest groups generated State legislative involvement and bills proposing a moratorium in the use of chloramines. Under these circumstances, water systems with DBP issues were reluctant to pursue this as a solution and hesitant to pursue more expensive solutions given that chloramination is dramatically less expensive. They were essentially left in limbo.

Further, many systems are in a rather gray area when it comes to meeting the Stage 1 standard. That is to say that they tend to go in and out of compliance, depending on the vicissitudes of their raw water. A good example of this is what occurred in the summer of 2006 in Lake Champlain. Systems that had never been out of compliance were suddenly confronted with very high levels of DBP's that pushed them above the standard. We made treatment modifications at several systems, including greater alum doses, lowered chlorine doses and reduced detention times. In most cases the levels came down and the systems went back into compliance. But was it our efforts, or a return to lower precursor levels in the lake that caused the reductions? These uncertainties slow developing more comprehensive strategies.

Let's take a look at some systems that have lowered their DBP levels so that they are now in compliance. These examples illuminate the road ahead for those systems out of compliance or those that may have Stage 2 issues going forward.

## SWANTON

Swanton draws water from the Maquam Shore of Lake Champlain. They use a modular Aquarius rapid sand filtration system with flocculation, tube settlers and mixed media filtration. In the summer of 2006, a spike in their DBP's brought the RAA to 82 ppb THM's and 63 ppb HAA5's. We were able to lower detention time in the distribution system by modifying the hydraulics at the remote storage reservoir and raising the alum dose to 40 mg/l. This was the greatest alum dose we could comfortably use. It did, however, shorten filter run length. DBP levels were reduced. RAA is currently 41 ppb THM's and 32 ppb HAA5's.

Swanton is replacing their aged filters with Trident two stage filters. Although alum dose will have to come down somewhat, we have incorporated into the design the ability to provide UV, split chlorination and secondary monochloramination, if necessary to meet Stage 2 requirements.

## NEWBURY

This system has springs in a low lying swampy area. It uses 1 micron absolute cartridge filters since it is classified as a groundwater under the direct influence of surface water. In late 2009, DBP RAA was THM's 78 ppb and HAA5's 88 ppb. At that time, the system began blending with groundwater from a series of small drilled wells. Current RAA is 28 ppb THM's and 36 ppb HAA5's. This is a good illustration of what a typical groundwater can do in lowering DBP's.

## BENNINGTON

This system draws water from Bolles Brook, a typical New England upland stream, soft, low in pH, extremely low in alkalinity, usually low in turbidity, very flashy (turbidity changes radically during rainstorms), and high in color. In short, a challenging water to treat. The filtration plant, built in the late 1970's is a modular Aquarius, not well suited to treating this water. Until 2007, the system needed to pre chlorinate in order to meet CT requirements. At that time, RAA was 79 ppb THM's and 100 ppb HAA5's. After a finished water storage reservoir was built, pre chlorination was ended and DBP levels dropped. Currently the RAA stands at 69 ppb THM's and 48 ppb HAA5's.

Although the system currently meets the standard, coagulation modifications need to be pursued so that precursor levels can be lowered and other treatment issues addressed. This may be somewhat difficult given the nature of their water and the current treatment scheme.

## CHAMPLAIN WATER DISTRICT

The system draws from Shelburne Bay in Lake Champlain. The filtration plant utilizes dual stage direct filtration, with low alum/cationic polymer coagulation dose. Although Stage 1 levels were below the standard in 2005, (RAA THM's 38, HAA5's 53), given the extremely long detention time in some parts of the distribution network, the system determined that Stage 2 requirements would be difficult to meet. In 2006 they converted to secondary chloramination. DBP's have declined markedly. Current RAA is 21 ppb THM's and 17 ppb HAA5's.

#### SOUTH HERO FD#4

This system draws from the southern end of Keeler's Bay in Lake Champlain. It uses dual stage Trident direct filtration with a combination poly aluminum chloride/cationic polymer coagulant. The system, like many of those on Lake Champlain went out of compliance for Stage 1 in 2006. We made some chlorine adjustments, and the system promptly went back into compliance. However, in 2008 and 2010 the RAA for HAA5's nudged over the 60ppb standard. It is currently back in compliance. We converted one of the three filters to the highest alum coagulation dose we felt the Trident could accommodate (28mg/l). Flow through the filter was lowered (68 to 52 gpm). The high alum filter showed a 26% reduction in UV 254 absorbance versus the standard coagulant filter, and a 14% reduction in TOC. Based on these results, we are in the process of converting the other two filters to the high alum dose. As a consequence, we will need to raise finished water pH with soda ash. These steps should prevent further excursions over the DBP standards, but time will tell.

South Hero FD#4 is a good example of the difficulties that all of our smaller surface water treatment plants face. A very conscientious part time operator has a myriad of evolving rules to keep up with. He must essentially deal with issues in the same way as systems with customer bases in the hundreds of thousands, without the resources or operational expertise. I believe that our incremental approach, as illustrated in the previous examples, is the best way to solve the DBP issues for our Vermont surface water systems.