PUBLIC HEARING WRITTEN TESTIMONY

PUBLIC INFORMATION HEARING
SUPERIOR SILICA SANDS
August 23, 2017

August 30, 2017
To: Dan Masterpole, Director
Chippewa County Department of Land Conservation and Forest Management
From: Leon B Boland
N7607 1010 St.
Elk Mound, WI 54739
Subject: Written Testimony for Superior Silica Sand's Revised Permit Application
(Hearing 8/23/17)

1) My first concern relates to the identity of the report's authors. Because the application seems not to be posted on-line and I have not had time to visit LCFM offices, I am unable to learn who the Wisconsin Registered Professional Engineer is who supervised and was responsible for the preparation and substance of the storm water portions of the application document—as is required by NR 135. The two page permit amendment signature document contains no signature or seal of a Wisconsin Registered Professional Engineer and the SWPPP document certificate is signed by a Josh Clements who is identified elsewhere as an electrician and whose title is shown as "Director of Operations".

   If I am misunderstanding the requirements of NR 135 in relation to "Professional Engineer" involvement or if, indeed, such involvement is in place I need to be enlightened about that.

2) The final paragraph of page 10 of the SWPPP document contains the statement that. . ."These ponds are designed to hold a 100 year storm event to meet the standards of the Chippewa County Nonmetallic Mining Reclamation Ordinance."

   Please be mindful of the fact that standards like that mentioned above and the WDNR 10 year/24 hour design criteria are <u>MINIMUM</u> standards that the Professional Engineer must use as the lowest permitted storm occurrence – not the MAXIMUM storm that could be anticipated. If local weather and rainfall records indicate stronger, more intense rainfall events are to be expected in the locality of the structures being designed, then those larger storm figures must be used in the designs.

There is ample evidence that the 100 year/24 hour rain events have happened repeatedly in Chippewa County in recent years. For instance, during the night preceding September 22, 2016 4 ½ inches of rain fell at my home within a three hour period. A neighbor one mile west recorded 6 ½ inches in the same three hours and we have reports from Eau Claire and Chippewa Falls of 8 inches during the same storm.

The significance of this particular rain event is reinforced by evidence there were no mine personnel at the SSS mine site early that morning when one of the sediment ponds was about to overflow. On this same date before noon I took pictures of the confluence of the North and South branches of Trout Creek from the bridge on County Highway A. The North branch was very obviously clay laden where it joined the South branch—which was a characteristic trout stream color. This location is less than three miles downstream from settling pond mentioned above. No other mines discharge into that three mile segment of the North branch of Trout Creek.

Perhaps the question needs to be asked: "why should Chippewa County permit a storm water amendment which implies increased reliance upon SSS "good faith" self-reporting when there seems to be no record of any self-reporting by that company of an event of failure which occurred less than a year ago—and for which the company was apparently cavalierly unprepared as manifested by total absence of staff immediately after a major rainfall event?"

3) Another issue which would be analyzed by any competent Professional Engineer designing structures related to a storm water control system such as proposed by SSS is the matter of the cumulative effect of "back-to-back" large storm events. The SWPPP synopsis document makes no mention of such a consideration. Nor does it consider the ramifications of early-season or late-season frozen ground conditions during a heavy rainfall event.

4) The proposed design system is quite heavily dependent upon infiltration of storm and waste water into the ground water table. Little is said about the extreme viscosity and impermeability of glauconitic clay. Even less is said about the methods of or frequency of removing that clay from the bottoms of settling or infiltration ponds. Nothing at all is said about disposal of that very troublesome clay. These issues need to be addressed thoroughly.

5) Most of the above concerns relate to unplanned stormwater and process water discharges. We should be equally concerned about the ramifications of PLANNED discharges into nearby iconic trout streams. Clearly, issues arise about that as a design notion:
    a) If the water sampled prior to or during a release is found to contain unsafe levels of heavy metals or whatever—then what happens? Does the discharge terminate? If so, then what?
    b) What are safe levels of these contaminants being tested for?
    c) Who does the testing? Who supervises the sampling?
    d) How appropriate is TSS 40? How does that number relate to water normalcy of Trout Creek?

6) The SWPPP clearly implies the use of acrylamides for settling purposes. Does this proposal identify what happens to ground water aquifers subjected to acrylamides or to the surface water recharge rates into aquifers? Its one thing to use these chemicals in water treatment plants but it's something else to apply them to potentially hundreds of acres of surface water ponds lying directly above highly permeable sandstone strata. These issues require elaborate clarification and justification.

7) The events of 9/22/16 at this SSS mine and the much earlier 9/8/14 EOG/DS 18 Mile Creek disaster clearly tell us that these rather reckless mining ventures should be reined in or curtailed rather than easing expectations or regulations about them in any manner.

Please <u>DENY</u> this amendment application and apply even more surveillance of the existing permit.

Leon B Boland, P.E.

Chippewa County does not have sufficient evidence to rule in favor of the proposed amendment to the Superior Silica Sand Auburn Mine Reclamation Plan and should deny the application until they do have enough evidence. Such evidence should include:

Independent studies by experts on the specific heavy metals contained in all levels of earth exposure caused by the mining.

Independent studies by experts on the specific levels of toxicities to humans, livestock, wildlife (including aquatic), and plant life (including aquatic) by each specific heavy metal. For example, sheep experience copper toxicity at much lower levels than other livestock.

Independent studies by experts on the specific testing methods that should be used to test for these metals.

Independent studies by experts on the **cumulative** affects of these metals on Public health, safety, and welfare as well as on specific livestock, wildlife and plant life (including aquatic).

Independent studies by experts on the **cumulative** effects of changing volumes of water on public health, safety, and welfare as well as on specific livestock, wildlife and plant life (including aquatic). When will flooding or supersaturating of soils become problematic especially when the area is experiencing above normal precipitation?

Independent studies by experts on the **cumulative** effects of changing pH, turbidity, and temperature of water on public health, safety, and welfare as well as on specific livestock, wildlife and plant life (including aquatic).

Independent studies by experts on the specific testing methods that should be used to test for these metals and monitor accumulation of these in the environment.

All such studies should be done by independent experts approved by the County and funded for by the applicant(s). Until such time as the County has such studies and has a developed a Stormwater Ordinance reflecting the results of these studies, any requests for changes should be denied. The current plans should be followed until proof has been provided that their current plan is not working, that unnecessary hardship is created for the mine by not following their plan (cost savings and ease are not hardships), and that any amendment to the Plan does not harm public interests.

Sincerely,
Brian Hostak
E9679 780th Ave.
Colfax, WI. 54730

I am requesting denial of the proposed amendment to the Superior Silica Sand Auburn Mine Reclamation Plan submitted August 10, 2017.

The proposed amendment would allow external drainage of stormwater, contaminated stormwater, and wastewater to Trout Creek and/or groundwater. This would set a precedent for external drainage and soon be followed by similar requests from other mines. The WDNR WPDES permitting process does not take into consideration the cumulative impacts of external drainage from more than one mine. Some of the water discharged will have been exposed to heavy metals because of the mining operations. Toxicity from a number of these metals is cumulative, but there are no cumulative limitations put in the WPDES permit either for one mine or for multiple mines. This would cause serious health safety conditions to the public as well as to wildlife.

The proposed amendment also states that the operator shall record and implement best management practices. Self-monitoring is not any assurance that this will be done either by Silica Sands or by any other mines making similar requests. Having either the WDNR or Chippewa County monitor mining discharges is also not assurance. Changing political environments, budgets, and personnel will mean different levels of monitoring, plus additional costs to the taxpayer. Any monitoring of stormwater/wastewater discharging should be required to be done by third party independent experts approved by the County with the cost paid by the mine owner/operator—not the public.

According to the proposed amendment, “the operator shall document all changes made to the Stormwater Prevention Plan during the preceding year ... in the Annual Reclamation Report”. This basically gives the mine the freedom to do what they want regardless of what is stated in the Storm Water Pollution Plan submitted by them. Since the documentation of any change made may well be reported more than a year after the fact (if it is reported at all, since self-reporting guarantees nothing), the county or any expert consultants hired by the county would not be given any time to prevent unsafe practices from being implemented.

The WDNR WPDES permits only provide general guidelines. They do not take into consideration specific locality and processing situations. (We have heavy metals in this area that are exposed by the mining process. We have trout creeks in the area that would be affected by different temperature, pH, and chemical discharges into them.) It is up to the local governments to protect the local people’s health, safety, and welfare. Since Chippewa County has already granted Reclamation Permits to these mines (often because of the lack of knowledge of specific ramifications at the time of the permitting), it is extremely important for the County to be diligent in their protection by not allowing further laxity in any of the reclamation plans.

Please deny the proposed amendment to Superior Silica Sands Auburn Mine Reclamation Permit.

Sincerely,

Johnne Smalley
E9760 Tower Road
Coflax, WI 54730

I respectfully request that Chippewa County Department of Land Conservation and Forest Management deny the application for amendment to the existing Nonmetallic Reclamation Plan for the SSS Auburn Mine, Permit #2011-02. The reasons for the request for denial are as follows:

(1) Discharge from settling Pond 1 and storm water pond S4 would go into ag land that has unknown amount of sediment run off into Trout Creek. Is the ag land sediment run off controlled as it is a higher elevation than Trout Creek? Even though the WPDES General Permit requires monitoring for TSS and discharges less than 40 mg/L, there is no assurance the increased water flow from the mine through ag land and/or the increased TSS of
(2) The SWPPP does not detail where the dewatering waters from sediment and sludge go. Since WPDES General Permit 2.3 indicates these waters cannot be directly discharged to surface waters, how will they be managed at the SSS Auburn mine?
(3) Although the WPDES general permit makes special requirements for discharge of pollutants to outstanding, exceptional and impaired surface waters, for surface waters that fall outside of those categories the WPDES general permit is less clear about protection. Who has determined what the specific carrying capacity of the nearby trout stream for additional pollutants is compared to what the potential pollution load will be from the SSS Auburn Mine discharges? There is no evidence in the amendment application that such a study has been completed. If it is not required, how can the public be assured the pollutants will not contaminate the nearby stream and impact the fish?

(4) According to the WPDES general permit bioaccumulating toxic pollutants are allowed to be discharged if the company has utilized the best technology to prevent such discharges. Bioaccumulating toxic discharges should not be allowed under any circumstances.

(5) It is not clear who is responsible for overseeing the implementation of the Storm Water Pollution Prevention Plan. In case it is Josh Clements who signed the Permit Amendment, what are his qualifications to assure the appropriate implementation of the monitoring and interpretation of the monitoring results?

(6) The requirement for 100 year, 24 hour storage is greatly appreciated. If, however, there is a precipitation event that requires a discharge due to overfilled settling and storm water ponds, how will the temperature be controlled to avoid negative thermal impact on the nearby surface waters? During the public hearing it was said the discharge would occur during cooler seasons if the settling and storm waters would be too warm for discharge. Heavy rain events resulting in discharges with possible thermal impact are not necessarily going to occur in cooler seasons. What do you do then?

(7) The SWPPP does indicate if discharge prior to <u>another</u> anticipated rain event is not feasible untreated wastewater will be pumped to another pond or active pit. Where is that pit and how?

(8) Visual checks of the storm water pollution prevention controls are not required under certain circumstances. How will WDNR determined the veracity of these reported circumstances by virtue of the annual report listing these unattainable visual checks?

(9) Metals monitoring is required by WPDES General Permit. The General Permit does not specifically indicate the mine will not be allowed to discharge if metals are found to be above the acceptable level for the nearby stream. And again, who determines what level is acceptable for the nearby stream?

(10) The SWPPP indicates commencement of discharge to surface waters will not occur prior to sampling by WDNR and LCFM. What sampling will LCFM do and how often will it be done? Will that sampling be made readily accessible to the public? Do LCFM and WDNR have adequate staffing and resources to regularly do testing prior to discharge? Will the WDNR and LCFM staff be available during or after major rain events that may result in Superior Silica doing a discharge?

(11) Many of the monitoring and inspection tests rely on the company self-reporting their efforts. How is the public to trust these reports and tests and SSS's dedication to protect our surface and ground waters when the industry as a whole has a record of a number of ordinance violations even considering that WDNR has shown a relaxation in applying NOVS to violations.

(12) What assurance is there that WDNR or LCFM will know if stormwater controls are ineffective if those agencies rely on SSS self-report unless there is a noticeable spill or other damaging events that demonstrate the system's weakness?

(13) The SWPPP indicates the overflow structures will be modified to assure wastewater discharge "without scouring or erosion of the receiving water." What are the modifications and how are those being assured?

Overall, the risk from allowing contaminated stormwater and wastewater discharges is too great to support a granting of the Non-metallic Reclamation Plan amendment for the SSS Auburn Mine—NMM Permit 2011-02. Because the WPDES General Permit allows discharges does not mean they are a good idea.

Respectfully submitted,

Katherine Stahl
N7607 1010 St.
Elk Mound, WI 54739

After listening to the information presented at the public hearing and doing further research, I maintain my original reques,t as provided in the oral testimony.

Do not strike the language regarding a no discharge mine.
Do not add language that allows discharge of storm water, contaminated storm water and waste water offsite, to both ground and surface water.

Reasons:

1. **The language in the draft amendment provided, allowing offsite discharge was not consistent with the information provided as part of the public hearing presentation. The draft amendment was less specific.**
2. **The owner and the operator did not make any representations during the hearing and they did not answer any of the questions or concerns from others present.**
3. **There has been no verification as to whether adequate engineering work has been performed in support of either the SWPPP or unavailable Operations Plan.**
4. **The Storm Water Pollution Prevention Plan is too vague to provide a clear explanations of the processes, methods and communications covering operations, monitoring and reporting.**
5. **The owner/operators only recently submitted a draft Operations Plan that is being discussed with the DNR and Chippewa County, so affected persons have not had a chance to ask questions as to how proposed activities will be conducted, monitored, and reported.**

It would seem to me that the WDNR was premature in issuing the WPDES permit to allow offsite discharge when there was not an opportunity to consider an operations plan

And by extension, I believe the owner and operator have not even submitted a complete application if both SWPPP and Operation Plan were not timely submitted.

To adequately weigh the conditions required to protect public health, safety and welfare of those affected, I would think both the Chippewa County Land and Water Conservation and Forestry Department and the affected parties, should have adequate time to examine and respond to the Operations Plan before any final decision considering allowing offsite discharge.

To further explain my testimony of August 23, 2017 and my referencing several Chippewa County land and water plans and ordinances, developed through public participation and adopted with public processes, I believe the purpose and goals of those plans cover and have authority over any storm water prevention plan and operation plan submitted by a private party.

Thank you for your thorough and thoughtful consideration of the many factors involved.

Linda Zillmer
902 Holly Hill Lane
Birchwood, WI 54817
Lake Chetac and Birch Lakes, Headwaters of the Red Cedar basin.

Public Hearing Testimony- Linda Zillmer
Superior Silica Sands, LLC application to amend Non-metallic Reclamation Plan
SSS Auburn Mine – NMM Permit 2011-02
August 23, 2017 7:30 p.m. – Chippewa County Courthouse, Room 302

1. **Request to KEEP section 6.2 Storm Water Management requirements as originally approved. Do NOT strike as edited July 19, 2017**

"During all phases of the mining operations, storm water will be contained within the active mining area or will be directed into one of the constructed storm water infiltration basins."

2. **Request to DENY section 6.2.1 Offsite Water Discharge as proposed to be added July 19, 2017**

…language to allow offsite discharge of storm water, contaminated storm water and wastewater
...language to provide conditions under which the discharges would be managed.
…language that considers storm water discharge, contaminated storm water discharge and wastewater discharge to ground and surface water in the same manner. (These are separate types of discharge)
…language that provides that only the mine operator evaluates the adequacy and effectiveness of BMP's and simply record, and not immediately report, complications preventing implementation.
…language that allows operators to change the Storm Water Pollution Prevention Plan during the preceding year and document intended changes during the following year.
http://www.co.chippewa.wi.us/home/showdocument?id=14959

Testimony

When considering amendments to a Non-metallic mining reclamation plan, consideration is required of not only NR135, but also the many local, county, state and federal plans, ordinances, statutes and regulations which apply to the proposed changes in mining and processing operations and reclamation, as well as the known and anticipated impacts of those changes.
The importance of local control is that the people most directly affected by a decision should have authority to determine what activities or trade-offs might be allowable and where to draw the line as to what is not allowable.
Chippewa County has developed, over decades of work and stakeholder relationship building, plans and ordinances to balance resource conservation with community and economic development. (See 2009 listing of plans provided as part of this testimony)
When requests for amendments of a reclamation plan, or exemptions from those plans and ordinances, would negate achieving the very purpose for those plans and ordinances, the County has an obligation to weigh both current and future impacts and deny those requests.
When considering the proposed amendments, a primary question would be whether the changes are consistent with the plans and ordinances which have been developed through public processes and reflect the best available science at that time.

Wisconsin Stats., Chapter 92 requires Chippewa County to develop a County Land and Water Resource Management Plan. The basis for the state granting counties authority for planning and regulation is primarily to protect public health, safety and welfare.
Chippewa County receives financial support from the State of Wisconsin towards the salaries of Land and Water Conservation staff to maintain and implement the county-developed Land and Water Resource Management Plan.
The Chippewa County Land and Water Resource Management Plan clarifies how the county will manage non-point water pollution from both agricultural and nonagricultural resources.
2009 Chippewa County Land and Water Resource Management Plan
http://www.co.chippewa.wi.us/home/showdocument?id=4805 TEXT
http://www.co.chippewa.wi.us/home/showdocument?id=4806 TABLES
2014 Schedule of Activities to implement the Chippewa County Land and Water Resource Management Plan http://www.co.chippewa.wi.us/home/showdocument?id=5124
In urbanizing areas, the county works with municipalities to control storm water run runoff. (A Chippewa Falls Urban Area Storm Water Management Plan was adopted in 2007.
Chippewa Falls Urban Area Storm Water Management Plan
http://www.co.chippewa.wi.us/home/showdocument?id=2468

Chippewa County should first develop a Storm Water Management Plan for non-metallic mining operations prior to consideration of allowing operators offsite discharge. The ever-increasing concentration and intensity of non-metallic mining, processing and transportation operations warrants an understanding and assessment of the cumulative impacts and not simply that of individual operators.
Non-metallic Mines in Bedrock August 30, 2016
http://www.co.chippewa.wi.us/home/showdocument?id=11080
Chippewa County Non-metallic mines with reclamation plans February, 2015
http://www.co.chippewa.wi.us/home/showdocument?id=7212
Just as Chippewa County is a leader in assessing the impact of many "straws" withdrawing groundwater on water quantity, and the potential impact to surface waters, Chippewa County should be assessing the impact of many "pipes" discharging wastewater and non-point source impacts of storm water and contaminated storm water to ground and surface water.
Chippewa County Groundwater Study http://www.co.chippewa.wi.us/government/land-conservation-forest-management/non-metallic-mines/chippewa-county-groundwater-study
Non-metallic reclamation test plot trials
http://www.co.chippewa.wi.us/home/showdocument?id=13323

Chippewa County also has adopted a Comprehensive Plan
http://www.co.chippewa.wi.us/government/planning-zoning/comprehensive-planning
"Beginning on January 1st, 2010, Chippewa County's land use actions must be consistent with their adopted comprehensive plan. The Comprehensive Planning Law requires nine elements to be included. Those nine elements are: issues & opportunities, housing, transportation, utilities & community facilities, agricultural, natural & cultural resources, economic development, intergovernmental cooperation, land use and implementation."

Element 6 (Chapter 9?) Agricultural, Natural and Cultural Resources Element
http://www.co.chippewa.wi.us/home/showdocument?id=1256

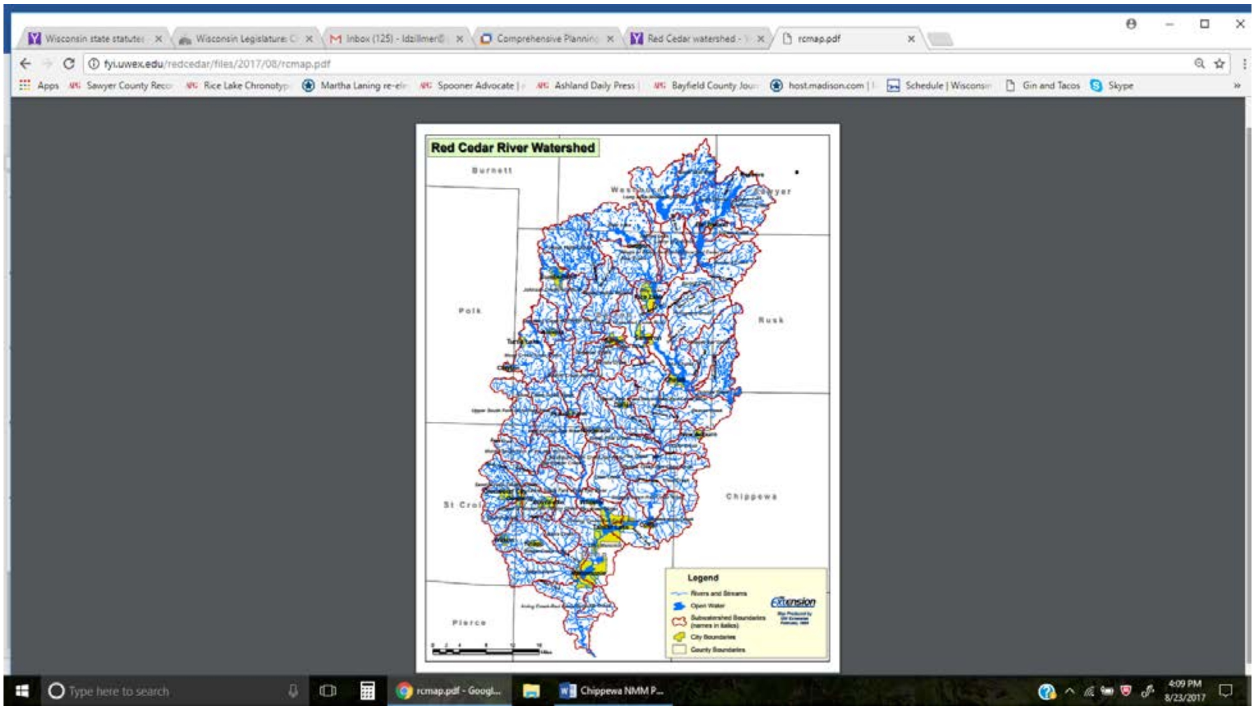
Element 9 (Chapter 12?) Land Use Element
http://www.co.chippewa.wi.us/home/showdocument?id=1274

Red Cedar Basin

Within Chippewa county there are a number of non-metallic industrial sand mining operations located within the Red Cedar basin. Over the decades, significant work, time and resources have been invested to address both point source and non-point source pollution.

From urban storm water management to farmer led councils, communities across Wisconsin have been making progress on eliminating or reducing run-off of sediments, nutrients and pollutants.

A TMDL has been adopted for the Red Cedar Basin and approved by the DNR and the EPA
"A River Runs Through Us – A Water Quality Strategy for the Land and Waters of the Red Cedar River Basin" *http://fyi.uwex.edu/redcedar/files/2017/08/RedCedarPlanFinalMedResolution.pdf*



To now allow industrial sand mining and processing operations to discharge contaminated storm water and waste water to ground and surface water seems to fly in the face of progress being made in urban and agricultural areas and would negate the solutions being developed and implemented.

The public notice for the hearing is not clear as to whether the proposed discharge to surface waters (Trout Creek) is direct or indirect through infiltration to groundwater. If discharge is directly to surface water, thermal impacts must be addressed and mitigated.

As demonstrated in Spring Creek, flowing through Lodi, Wisconsin, thermal impacts of run-off have significant impacts to the viability of different species of fish.

Spring Creek Watershed Project – What we have learned, three years later -2010
https://archive.usgs.gov/archive/sites/wi.water.usgs.gov/non-point/9KH32/9KH32_presentation.pdf

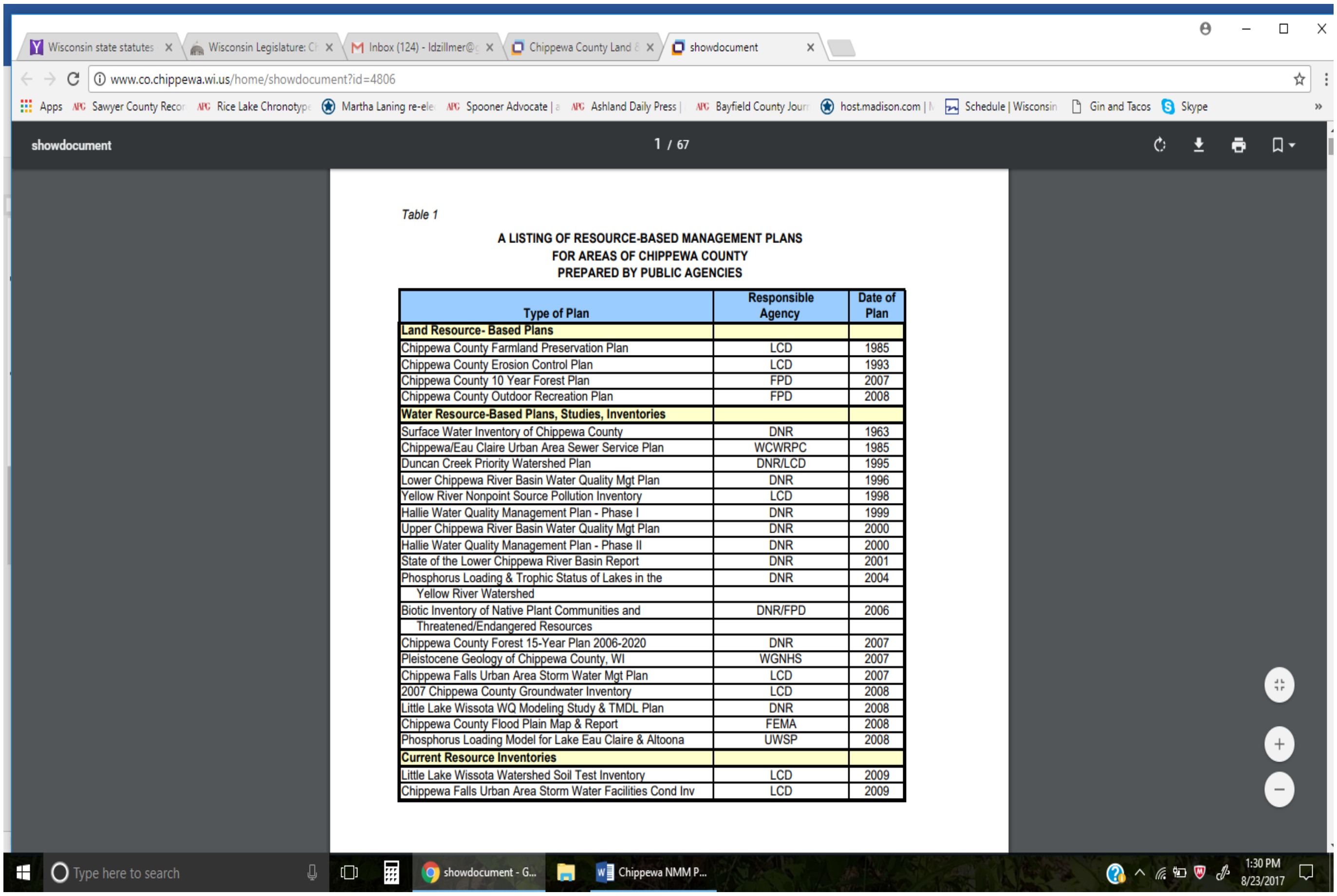


Table 1

A LISTING OF RESOURCE-BASED MANAGEMENT PLANS
FOR AREAS OF CHIPPEWA COUNTY
PREPARED BY PUBLIC AGENCIES

Type of Plan	Responsible Agency	Date of Plan
Land Resource- Based Plans		
Chippewa County Farmland Preservation Plan	LCD	1985
Chippewa County Erosion Control Plan	LCD	1993
Chippewa County 10 Year Forest Plan	FPD	2007
Chippewa County Outdoor Recreation Plan	FPD	2008
Water Resource-Based Plans, Studies, Inventories		
Surface Water Inventory of Chippewa County	DNR	1963
Chippewa/Eau Claire Urban Area Sewer Service Plan	WCWRPC	1985
Duncan Creek Priority Watershed Plan	DNR/LCD	1995
Lower Chippewa River Basin Water Quality Mgt Plan	DNR	1996
Yellow River Nonpoint Source Pollution Inventory	LCD	1998
Hallie Water Quality Management Plan - Phase I	DNR	1999
Upper Chippewa River Basin Water Quality Mgt Plan	DNR	2000
Hallie Water Quality Management Plan - Phase II	DNR	2000
State of the Lower Chippewa River Basin Report	DNR	2001
Phosphorus Loading & Trophic Status of Lakes in the	DNR	2004
Yellow River Watershed		
Biotic Inventory of Native Plant Communities and	DNR/FPD	2006
Threatened/Endangered Resources		
Chippewa County Forest 15-Year Plan 2006-2020	DNR	2007
Pleistocene Geology of Chippewa County, WI	WGNHS	2007
Chippewa Falls Urban Area Storm Water Mgt Plan	LCD	2007
2007 Chippewa County Groundwater Inventory	LCD	2008
Little Lake Wissota WQ Modeling Study & TMDL Plan	DNR	2008
Chippewa County Flood Plain Map & Report	FEMA	2008
Phosphorus Loading Model for Lake Eau Claire & Altoona	UWSP	2008
Current Resource Inventories		
Little Lake Wissota Watershed Soil Test Inventory	LCD	2009
Chippewa Falls Urban Area Storm Water Facilities Cond Inv	LCD	2009

Sources: Chippewa County Land and Water Resource Management Plan 2009 (Text and Tables) and 2014 revisions/updates.

Submitted by Linda Zillmer
902 Holly Hill Lane
Birchwood, WI 54817

Located on Lake Chetac and Big Birch Lakes, Headwaters of the Red Cedar Basin, part of the Lower Chippewa River Basin

---

Comment for amendment of Superior Silica Reclamation Permit to allow discharges, 8-23-17

Nine years ago WDNR told us that sand mining was not that big of a deal as it had been occurring in the state for over 100 years. We were told that there would be no sulfuric or acid mine drainage issues with this type of mining. Now after finding sulfuric acid issues in some mines the Department is doing a study which unfortunately will not be done for several years. So.... are we over running our headlights again?

EOG has demonstrated that it is possible and practical to keep suspended solids below 40 PPM , so all other mines wishing to discharge water from mines must also follow suit.

If the stormwater comes in contact with any tailings or mined material of any sort and discharged these discharges as well as process water that is discharged must be regularly checked for PH, heavy metals, and suspended solids, petroleum residuals as well as any process chemicals used in the mine or returned in waste from the dry plant processes Discharges must also be monitored for temperature in order to maintain quality habitat for the trout fishery the area is known for,.

Superior Silica should place and maintain a gauging station in the creek to record both natural flow of the stream and discharge from the mine into the stream continuously for the life of the mine. Discharges must be managed to not substantially change the stream flow or quality in order the trout fishery the area is known for is not adversely affected. All the results of the tests, monitoring of flow and water discharged should be posted on a public website by the company on a regular basis, at the very least weekly. Another way to dispose of excess water in the mine would be to continuously mist the sand stockpiles with it to increase evaporation of ~~the~~ excess water.

Ken Schmitt
4988 120th Ave.
Colfax, WI 54730
715-568-5508
KLS2@bloomer.net

To: Dan Masterpole

Christian Huppert

These comments are in addition to comments(oral and written) made at the Permit Hearing held on August 23, 2017 at the Chippewa County Court House, Chippewa Falls, WI.

1. Two maps in the booklet provided at the meeting appear to be incorrectly labeled as Chippewa Sands Sites rather than the Superior Silica Sand Site in Chippewa County (Town of Auburn).

2. The information provided at the meeting was not posted on line in advance so that citizens could read and then comment on the packet. This must have been an oversight, but it is not meeting the standards citizens expect given past practices of the County.

3. The maps label two ponds (P1 and P2) as described in the Prevention Plan paper. However, the map that Mr. Huppert presented shows 3 ponds. Inconsistencies create confusion; it is imperative that the maps come into compliance with what is planned to occur. In fact, it is difficult for the citizen to even comment when these inconsistencies occur whether they be in the industry presentation or in the Conservation Department presentation.

4. I have studied over the WET PROCESS as described by Jim Devlin and which the DNR is prescribing as a method to determine whether or not the water discharged into Trout Creek will be safe for organisms and other aquatic life at the source of the contaminated stormwater and wastewater discharges from the ponds. I have mentioned this method to several and the responses I get are: "This is a very primitive method"! As science has developed new strategies and techniques over time, one would believe there must be a more sophisticated method which would take into consideration all the toxins, contaminants that one can not visually see as the water is discharged from the facility. Mr. Devlin commented on concerns about coffee/creamer colored waters. There are more concerns than "visual effects". Concerns include what can't be visually seen! Water quality including measures of heavy metals, flocculant residue and the impacts of polyacrylamides and acrylamides on human and aquatic life are not being tested by using this method. (See the attached document from the DNR website which describes the WET Testing Method).

Why "wait" to see if Trout Creek becomes impaired. Let's prevent it with strict regulation before it becomes impaired!!!

Let's be certain by applying adequate scientific methods which will determine whether or not that water is drinkable/clean/free of toxins and other carcinogenic causing agents before the water even touches the Creek! The State of WI and Chippewa County will be held accountable for protecting the public from contaminants. In fact, both the County and the State should initiate studies that are in fact encouraged by these two entities to apply the scientific method in studying the nature of the discharges and without any interference from Superior Silica Sands. There should be no guessing nor primitive methods involved when it comes to discharging contaminated stormwater or wastewater which contains typical unknown contaminants.......typical of the oil and gas industry because they do not provide the ingredients that are put into the chemicals they use in this process. It is well known that the frac sand industry uses paid industrial scientists who skew results to show results the company would like to show.

Frac sand mines must be regulated in WI with restrictions. The footprint involved is huge; the size increases and changes daily; contaminant sources are abundant and no real science without help from the industry is really being employed. Citizens deserve better throughout this state.

Sincerely,
Patricia J. Popple
561 Summit Avenue
Chippewa Falls, WI 54729 715-723-6398

http://dnr.wi.gov/topic/wastewater/WETfaq.html

Frequently Asked Questions (FAQ)

The answers to the following FAQs are kept brief here, due to space limitations. Each of these issues is addressed in more detail in The WET Guidance Document and/or The Methods Manual (PDF, 545KB). References to specific sections of these documents have been added to each FAQ, as appropriate.

Do you have an FAQ or a question regarding WET tests or biomonitoring? If so, contact the WDNR's Biomonitoring Coordinator, Kari Fleming.

NOTICE: The WET Guidance Document and these FAQs are intended solely as guidance, and do not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

- What Are WET Tests?
- How Long Does It Take To Complete A WET Test?
- What Organisms Are Used In WET Tests?
- Why Do We Need To Do WET Tests?
- How Much Do WET Tests Cost?
- How Do I Tell One Lab From Another In Terms Of Quality?

- What Do Test Results Mean?
- How Common Are WET Test Failures?
- What Is My Regulatory Liability With Failed Tests?
- What Do I Do If I Fail?
- What Is Involved In A TRE? (How Much Do They Cost? How Long Do They Take? How Successful Are They?)
- What Can I Do To Get WET Testing Out Of My Permit?
- What Does The DNR Do With Receiving Water Data (Collected During WET Tests)?
- Do I Have To Keep Using Receiving Water As A Diluent After A Control Failure?
- Can Improper Sampling Techniques Cause WET Failures?
- Is Test Variability Unusually High In WET Tests?

What are WET tests?

In whole effluent toxicity (WET) tests, lab-reared aquatic organisms are exposed to various dilutions of effluent for a specific time period, in order to predict at what levels the effluent may cause harm to the organisms (e.g., at what level death, reproductive impairment, or growth inhibition occurs).

Test treatments consist of a series of solutions containing different proportions of an effluent sample. A control treatment (an exposure of organisms to dilution water with no effluent added) is used to provide a measure of the acceptability of the test by indicating the quality of the test organisms and the suitability of the dilution water, test conditions, and handling procedures. At the end of the test, the performance (e.g., survival, growth, or reproduction) of the effluent treatments is compared to the performance of the controls to determine whether the effluent had a significant impact on the test organisms.

For more information regarding WET testing procedures and requirements, see the The Methods Manual (PDF, 545KB).

How long does it take to complete a WET test?

There are typically two types of WET tests. Acute tests last 48 to 96-h. The objective of an acute test is to determine at what concentration the effluent may produce a harmful effect during a short-term exposure under controlled conditions. Because death is an easily detected harmful response, the measured effect for acute tests is lethality

The second type of WET tests are chronic tests. Chronic tests predict the concentrations that interfere with normal growth, development, and reproductive potential of aquatic organisms. During chronic tests, several life stages of the organism are continuously exposed to the test material at various concentrations. Chronic tests required by the WDNR last about 7 days. The response measured for fathead minnows is growth and survival; for *C. dubia* it is reproduction and survival. The *C. dubia* test encompasses the entire life cycle of the organism and therefore the most sensitive stages. The fathead minnow test, which uses fish less than 1 day old, seeks to also use the most sensitive life stage of the organism. For more details, see The Methods Manual (PDF, 545KB).

What organisms are used in WET tests?

Species used for WET tests must be sensitive to toxic substances, necessary for the overall health of the food chain, and representative of the indigenous population present in the possible area of impact of the test material. These so called "indicator organisms" are used to estimate what may be happening in the environment when the effluent is introduced. All of the species required by the WDNR have been used in toxicity tests for many years.

The species *Ceriodaphnia dubia* belongs to a group of freshwater microcrustaceans, and may be referred to as water fleas, zooplankton, cladocerans, or daphnids. These invertebrates are a major component of the freshwater zooplankton and are the dominant planktivorous (algae-eating) herbivores in lakes. They are abundant in ponds, quiescent sections of streams and rivers, and lakes throughout North America. The selection of *C. dubia* for routine use in toxicity testing is appropriate for a number of reasons, including: 1) they are broadly distributed and present throughout a wide range of habitats, 2) they are an important link in aquatic food chains and a significant source of food for small fish, 3) they have a short life cycle and are easy to culture in the laboratory, 4) they are sensitive to a broad range of contaminants, and 5) their small size requires small volumes of test water, leading to ease in sampling and transportation of wastewater samples. Fathead minnows (*Pimephales promelas*) belong to the family Cyprinidae (the family which includes carps and minnows), the dominant freshwater family in terms of number of species. The fathead minnow is native to much of North America and thrives in ponds, lakes, ditches, and streams. Fathead minnows are good laboratory fish, taking readily to that life and adapting well to the dry commercial fish food, brine shrimp, etc., that is necessary for laboratory culturing.

Selenastrum capricornutum is a freshwater green algae and is representative of higher order vascular plants. It is NOT a blue-green algae (which we usually associate with algae blooms and nuisance conditions). Like the other species used in WET tests, *S. capricornutum* was chosen because of its importance in the food chain and its ability to represent other species in its trophic level. Like the other species, the selection of *S. capricornutum* for routine use in toxicity testing is appropriate for a number of reasons, including: 1) They are broadly distributed and present throughout a wide range of habitats (i.e., they are abundant in ponds, streams, rivers, and lakes throughout North America), 2) they are an important link in aquatic food chains and are a significant source of food for higher organisms (e.g., zooplankton, fish, etc.), 3) they have a short life cycle and are easy to culture in the laboratory, 4) they are sensitive to a broad range of contaminants, and 5) their small size requires small volumes of test water, leading to ease in sampling and transportation of wastewater samples.

Why do we need to do WET tests?

When limits were first written into WPDES permits, they were based on physical factors such as biological oxygen demand (BOD) and suspended solids. Later, additional components were added, such as the 126 "priority pollutants". Water quality criteria were then used to calculate effluent limits for these pollutants, where possible. However, water quality criteria, and therefore effluent limits, exist for only a few of the thousands of chemicals in use today. Another mechanism is needed to predict the effects of chemicals which do not have water quality criteria.

Like many other states and the USEPA, Wisconsin uses an integrated approach for controlling toxic pollutants that uses WET testing to complement chemical-specific analyses as a means to protect aquatic life. The use of WET testing is necessary in addition to chemical-specific testing, due to several factors, including: 1) the limitations of chemical-specific analysis methods (e.g., chemical-specific lab analyses may not be sensitive enough to determine if a water quality criteria is being met), 2) inadequate chemical-specific aquatic toxicity data (i.e., not enough data to calculate chemical-specific water quality criteria), and 3) the inability of chemial-specific criteria to predict the toxicity of chemicals when combined in an effluent.

Since the promulgation of chs. NR 105 and NR 106, Wis. Adm. Code, WET testing has become a major part of the Department's water pollution control program. All surface water dischargers are evaluated using The WET Checklist to determine if WET testing should be included in their WPDES permit.

How much do WET tests cost?

Due to the labor associated with the culturing and maintenance of organisms and the length of testing, WET tests are relatively expensive when compared to some chemical-specific or permit related tests. However, the market for these tests is becoming increasingly competitive and costs have dropped dramatically over the years. When asked by the biomonitoring team during the summer of 1995, laboratories estimated test costs as follows: acute tests = @ $500.00 each; chronic tests @ $1000.00 - $1500.00 each. This made a combined acute/chronic test battery cost as much as $2000.00.

Cost estimates for these same tests in 1997-1999 showed that costs had fallen at some labs to:

Acute tests	$200.00 - $300.00 each *
Chronic tests	$600.00 - $1500.00 each ($900.00 average) #
Combined acute/chronic	approx. $800.00 - $1800.00. #

* based on a 1997 estimate

based on a DNR survey of certified WET labs, conducted in 1999

Remember, these are only estimates! Costs depend on the specifics of each test (e.g., number of dilutions, species, replicates, etc.), the lab you choose, and are not necessarily the same in all situations.

How do I tell one lab from another in terms of quality?

All WET tests conducted for compliance with a WPDES permit must be conducted by a laboratory certified or registered by the WDNR (according to NR 149.22, Wis. Adm. Code). Today there are 5 laboratories certified by the WDNR and one permittee lab that is registered to do their own testing. For a list of the certified labs available to do WET tests for hire, see Certified WET Labs . In order to become certified, a lab must pass an on-site audit conducted by the WDNR's Bureau of Integrated Science Services. Due to their small number, the Biomonitoring Coordinator is able to keep in close contact with the labs conducting WET tests. If you have questions or concerns about the quality of a WET laboratory, you can contact the WDNR's Biomonitoring Coordinator, Kari Fleming. To receive a copy of a lab's latest audit report, permittees can contact the Bureau of Integrated Science Services at (608) 267-7633. For more information regarding how to choose a WET testing laboratory, see Chapter 2.1 of The WET Guidance Document.

What do test results mean?

Acute WET tests estimate the "end of pipe" conditions, or the effect of the effluent without any dilution considerations. Acute test results are usually reported as an "LC50" (the "Lethal Concentration", or % effluent which causes 50% of the organisms to die). If greater than 50% of the organisms die in 100% effluent, the test is "positive" and it is determined that the effluent has the potential to cause harm to aquatic life in the receiving water.

LC50s are statistical analyses used to estimate the lethality of a sample in WET acute tests. In order to calculate an LC50, at least one of the test concentrations must cause more than 50% mortality. The lower the LC50, the more toxic the effluent. For example, an LC50 > 100% means that full strength effluent did not kill 50% of the test organisms. An LC50 = 50% means that half strength effluent killed 50% of the test organisms.

Chronic WET tests estimate the effects of the effluent after it has mixed with the receiving water. An "IC25" is used to estimate the effects on growth or reproduction of a sample in WET chronic tests. The IC25 value is compared to the instream waste concentration (IWC) for the facility. The IC25 is an estimate of the effluent "Inhibition Concentration" which causes a 25% reduction in growth or reproduction of the test organisms. If the IC25 is lower than the IWC, the effluent has the potential to impact the organisms in the receiving water.

For more information regarding LC50s and IC25s, see Chapter 2.4 of The WET Guidance Document.

How common are WET test failures?

Data from the WDNR database in 1998 showed that industrial facilities are a little more likely to fail acute WET tests than are municipal facilities. Data collected from 1989-1997 showed that 25% of the municipalities that performed acute tests failed at least one. On an individual test basis, municipalities failed 65 of 520 tests, or about 12.5% of the time. On the other hand, data from 1989-1997 showed that 50% of the industries that performed acute tests failed at least one. Industrial facilities failed 140 of 847 total acute tests performed, or 16.5% of the time.

Data also shows that industrial facilities are a little more likely to fail chronic WET tests. Data from 1989-1997 showed that 23% of the municipalities that performed chronic tests failed at least one. On an individual test basis, municipalities failed 53 of 373 tests, or about 14% of the time. This same time period showed that 42% of the industries that performed chronic tests failed at least one. Industrial facilities failed 83 of 493 total tests performed, or 17% of the time.

What is my regulatory liability with failed tests?

Many WPDES permits contain language requiring WET monitoring to be conducted and providing specific follow up actions in the event of a test failure. Typically, two follow up tests must be performed within 60 days of the failure. Inclusion of such language in a permit does not constitute an effluent limitation and thus an effluent violation does not occur with a test failure. In certain instances such as repeated test failures, inability or unwillingness to address toxicity issues, and/or a clear potential for impact to the receiving water fish and aquatic life community, a WET effluent limitation may be included in the permit. WET limits are expressed in "Toxic Units (TU)" in WPDES permits as "1.0 TUa" (acute) or "1.0 rTUc" (chronic). Basically, once a WET limit appears in a premit, any WET test failure is a permit violation.

Since WET limitations are usually implemented in situations that indicate a high likelihood that the effluent is toxic or where sensitive conditions exist, WET limit violations are taken very seriously by the Department. The test itself is intended to measure the direct potential for impairment of fish and aquatic life communities related to substances present in effluents at toxic concentrations. Thus, any failure of a WET effluent limitation should be considered serious and appropriate action taken.
For more information, see Chapter 1.8 (Enforcement of WET Limits), Chapter 2.2 (Toxicity Reduction Evaluations), or Chapter 2.4 (Toxic Units) of The WET Guidance Document.

What do I do if I fail?

In most cases, permits only require WET monitoring. Then, in the event of a test failure, two follow up tests must be performed within 60-90 days. Since this language in a permit does not constitute an effluent limitation, an effluent violation does not occur with a test failure. Therefore, in these situations, only the two retests are required. If the two retests are "passes", this may indicate that the original failure was caused by a one-time or infrequent event. This, by itself, does not usually cause the Biomonitoring Team significant concern.

However, the Biomonitoring Team recommends that a permittee start investigating as soon as the effluent has shown the potential for persistent toxicity, instead of waiting for the WDNR to take action. What is meant by an effluent "showing the potential for persistent toxicity"? This means situations where a facility has experienced severe or repeated failures in a series of tests. When a group of tests such as an original test followed by two retests have produced toxic results, it is an indication that a persistent toxicity problem exists in the effluent being tested. These positive results are cause for concern.

When an effluent has shown potential for severe or persistent toxicity, the WDNR has the authority to modify the permit to include additional WET monitoring, compliance schedules for WET limits, and/or Toxicity Reduction Evaluations (TRE), since the potential for exceedance of water quality criteria exists. The Biomonitoring Team prefers to allow permittees to investigate on their own in order to attempt to identify the cause of toxicity, without modifying the permit. In this way, the Biomonitoring Team and the permittee can attempt to fix the problem and avoid the complications and time restrictions brought about when TREs are placed in permits. For more information, see Chapter 2.2 (Toxicity Reduction Evaluations) of The WET Guidance Document.

What is involved in a TRE? (How much do they cost? How long do they take? How successful are they?)

A toxicity reduction evaluation (TRE) is an investigation completed by the permittee, intended to determine those actions necessary to remove toxicity. The TRE may identify a solution as simple as improved housekeeping procedures or require a more extensive investigation to identify cost-effective treatment or source reduction options.

- **STEP 1:** One of the first steps of a TRE is the collection of data and facility-specific information. This step is used to define TRE study objectives, identify what is already known, and possibly provide clues as to the causes and sources of toxicity. This information may suggest immediate actions which may be useful in reducing effluent toxicity.

- **STEP 2:** The next step of the TRE process involves optimization of facility operations in order to try to reduce effluent toxicity. Three areas are usually investigated during this step: 1) facility housekeeping, 2) treatment plant operation, and 3) the selection and use of process and treatment chemicals.

- **STEP 3:** The next step is where most of the costs of a TRE are incurred, when a laboratory conducts a toxicity identification evaluation (TIE). The objective of the TIE is to characterize and identify the actual cause(s) of toxicity through a series of effluent manipulations and toxicity tests. The evaluation can use both characterization procedures and chemical-specific analyses, therefore, the identifications may range from generic classes of toxicants (e.g., metals, organics, etc.) to specific chemical compounds. Multiple samples are needed for TIEs and one objective of the TIE is to determine if and how toxicity varies over time.

- **STEP 4:** Once the TIE step has been completed, the TRE process can go in two directions. One approach is to evaluate options for treating the final effluent, the other is to identify the source(s) of toxicity and then evaluate upstream treatment options, process modifications, product substitutions, or source reduction. A decision can be made to pursue both approaches, and then to select the most technically and economically attractive option.

  Because of the differences between operations and complexity of facilities and in the differences between characteristics and variability of effluents, flexibility in the design of TRE studies is essential and approaches used are often facility specific. Because of the facility-specific nature of these studies, it is also hard to estimate the time associated or the costs. The laboratory work involved in the TIE portion of the study is often the most expensive part of the TRE. Past studies which have been most successful have been very well organized, and much work was often done up front to try to narrow the scope of the project (i.e., in the data collection, facility optimization steps). The TIE step involves a series of effluent manipulations at the lab, where the manipulations that are successful give you a clue about the family and characteristics of the toxicant(s) you are looking for. The TREs that often are the most costly and time consuming (often seeming to never really find the problem) are those that are missing the up front work. With the correct data collection and treatment plant knowledge, it may be possible to narrow the focus of the TIE to a few chemical families, rather than the entire universe of chemicals. However, one must be careful not to jump to conclusions, for if too many steps are skipped, the one that would have given the right answers may be eliminated. For guidance on how to start a TRE, see Chapter 2.2 of the WET Guidance Document. For a list of labs that have performed TREs, see WET Labs With Experience Performing Successful Toxicity Reduction Evaluations

What can I do to get WET testing out of my permit?

The WDNR determines the amount of WET monitoring needed by individual discharges, based on their potential to exhibit effluent toxicity, using The WET Checklist. The more factors present which have the potential to impact a discharge's toxicity potential, the more monitoring is necessary to insure that toxicity is not occurring. In order to make attempts to reduce the amount of monitoring recommended for their discharge, permittees need to know what may influence their effluent's toxicity potential, so adjustments can be made where possible.

Factors which the Biomonitoring Team has included in their guidance for determining a discharge's toxicity potential include, but are not limited to: 1) Instream Waste Concentration (IWC), 2) WET data history & Reasonable Potential Factors (RPF) (facility-specific WET data is used to calculate an RPF. "Reasonable potential" is defined as where an effluent "is projected or calculated to cause an excursion above a water quality standard". When reasonable potential exists, effluent limits are given), 3) compliance history and the effects of WWTP loading, production variability, WWTP upsets, and WWTP operations on effluent variability, 4) stream classification, 5) chemical-specific effluent data, 6) additives, 7) discharge category and contributors, 8) WW treatment, and 9) ecological impacts. For more information regarding WET limits and monitoring requirements, see Chapter 1.3 of The WET Guidance Document (Representative Data, Reasonable Potential & Monitoring Frequencies).

Some possible steps that permittees can take to reduce their toxicity potential may include:

- conduct additional testing and/or TREs if toxicity problems have occurred (e.g., reduction/elimination of toxic sources may make old data nonrepresentative, additional "passes" may make past "failures" have less impact, etc.),
- investigate what operational adjustments could be made that could reduce toxicity, such as increasing aeration basin detention time, sludge age, etc.,
- maintain or strive for compliance with other limits,
- make efforts toward reducing or improving reaction time to WWTP upsets,
- improve WWTP practices which may effect effluent variability or toxicity (e.g., improve facility housekeeping practices),
- make efforts to remove/reduce toxic discharges (e.g., pollution prevention activities, selection and use of process and treatment chemicals, etc.), and
- communicate with industrial contributors and educate them about the implications of their actions.

What does the DNR do with receiving water data (collected during WET tests)?

The WDNR requires most permittees to use the receiving water upstream of the discharge as the diluent in WET tests (i.e., effluent is mixed with receiving water to make up test concentrations). In order to insure that only effluent effects are measured in these tests and that receiving water effects do not interfere with test results, certain criteria have been established to keep track of receiving water performance. These criteria are very stringent (e.g., acute receiving water controls are only allowed 10% mortality, as opposed to the 50% mortality an effluent is allowed to "pass") and therefore a receiving water that does not meet one of these criteria is not necessarily "toxic". In most cases, natural factors can be found which explain why a receiving water did not perform perfectly in a WET test.

However, in order to insure that receiving water samples that have shown repeated control problems are not indicative of potential toxicity problems in the receiving water, the Biomonitoring Team maintains an "ambient biomonitoring network" with the UW-Madison State Laboratory of Hygiene's Biomonitoring Lab (exit DNR) (SLH). Through this project, WDNR staff select sites where toxicity problems may be present and the SLH performs toxicity tests and identification studies in an attempt to reduce or eliminate the problem.

In 1996, the Biomonitoring Team and SLH developed a toxicity screening test for use with DNR "basin teams". This new tool provides a quick estimate of potential toxicity problems, while requiring less time and effort on the part of WDNR staff (which means many more sites can be tested). With this new screening tool, basin teams can screen effluents and receiving waters for potential toxicity problems and set priorities within the watershed and evaluate the effectiveness of their actions.

Do I have to keep using receiving water as a diluent after a control failure?

Following a test where the receiving water has not met test acceptability criteria, the permittee should evaluate the situation to see if there are any obvious factors which may be contributing to the poor performance of the receiving water (e.g., if the sample was taken near another discharge, a dam or other physical structure, or another potentially toxic source). The receiving water control results, subsequent sampling evaluation, and change in sampling location (if applicable) should be noted in the test report or accompanying cover letter. If the permittee does identify a possible contaminating source, it will be necessary for the permittee to change the location of their receiving water sampling.

If the receiving water has performed poorly in repeated tests and no obvious cause or contributing factor can be found, subsequent tests of the discharge may be completed using laboratory water as the primary control water and diluent. A receiving water control should be set in conjunction with the test, as the secondary control, so receiving water performance can be monitored. The permittee or lab should call the biomonitoring coordinator to get approval for switching to the use of lab water. This change and the approval should then be noted by the permittee or lab on the WET report form. If after subsequent tests, receiving water problems appear to have diminished, the biomonitoring coordinator may again ask that the receiving water be used as the diluent. Acceptable laboratory control water can be synthetic (reconstituted) or natural uncontaminated ground or surface waters collected from another source. When laboratory water is used as the primary test control or diluent water source, hardness (as $CaCO_3$) must be adjusted as required in the Methods Manual (Section 4.4).

For more information regarding dilution waters used in WET tests see Chapter 2.7 of The WET Guidance Document (Invalid RW Controls).

Can improper sampling techniques cause WET failures?

It is very important that sampling equipment is cleaned appropriately, in order to insure that samples are representative of the effluent and no confounding factors are present (i.e. to remove any possible contamination). If the facility sampler or a portable sampler is used, the tubing should be replaced with new tubing, including the pump head tubing. If this is not possible, all tubing should be cleaned and rinsed according to Section 1 of the Methods Manual. Artifactual toxicity may occur when sampling equipment is not cleaned regularly. Microorganisms can colonize surfaces that are in contact with the effluent. Some of these microbes can produce endotoxins that are toxic to the test organisms. Before sampling, you should replace all of the tubing and clean any parts that contact the sample.

It is also important that a representative sample be obtained under "normal" operating conditions unless there is a specific reason to collect a sample during an atypical situation. Collection of samples for WET testing will usually consist of either two or three separate 24 hour composites samples. Samples should be chilled during collection, through the use of a refrigeration unit or a cooler with at least twenty pounds of ice. During hot weather or when collecting very warm effluents, it may be necessary to add more ice before the end of the sample period.

Disconnection of tubing or power supplies is probably the single most common cause for missed samples. All tubing and cords should be secured to surrounding structure to prevent accidental disconnections. Frozen sample lines can also occur in winter if using a composite sampler. You should consider minimizing the risk of freezing by selecting a protected site for the sampler, repositioning the tubing, or decreasing the intervals between sampling. If possible, select a site that is indoors.

Section 2 of the Methods Manual requires samples to be rejected by the laboratory if the sample arrives at the laboratory over the < 36 hour holding time or if they are warmer than 10ºC (unless the amount of time elapsed from the end of collection is < 4 h). If samples are rejected, tests may have to be restarted and/or repeated, at the cost of the permittee. Courier services will usually guarantee delivery within certain time periods, with the purchase of additional shipping insurance. Shipping insurance may cost from $5 - $30 per sample, but may prevent costs associated with test restarts or repeats. Sample containers should be placed in a cooler and packed with ice. If the sample is shipped via commercial carrier, you should seal the sample and ice within a large plastic bag, as the carrier may return the sample if it leaks in transit.

For more information regarding sample handling and acceptability requirements, see Section 1 of The Methods Manual (PDF, 545KB) and Chapter 1.1 of The WET Guidance Document.

Is test variability unusually high in WET tests?

Comparisons of WET method precision with method precision for other analytes commonly limited in WPDES permits clearly demonstrate that the variability of the WET methods is within the range of variability experienced in other types of analyses. Several independent researchers and studies also have concluded that method performance improves when prescribed methods are followed closely by experienced analysts. Factors which can affect WET test variability, precision, and success include: the experience and skill of the laboratory analyst; test organism age, condition, and sensitivity; dilution water quality; temperature control; and the quality and quantity of food provided. The issue of WET variability has been discussed by a variety of groups in many different forums. Chapter 2.9 of The WET Guidance Document discusses WET variability and ways to control it in more detail. Other guidance has also been written by other groups such as the Society of Toxicology and Chemistry (SETAC) "Expert Advisory Panel on WET Test Performance and Data Interpretation" (see http://www.setac.org (exit DNR)).

WET variability can basically be categorized into 3 types:

- **Intratest (within-test) variability.** Sources of intratest variability include the number of replicates, the number of organisms per replicate, and the sensitivity differences between organisms.

- **Intralab (within-lab) variability.** Intralab variability is that which is measured when tests are conducted under reasonably constant conditions in the same lab. Sources of intralab variability include those sources described for intratest variability, plus differences in: 1) test conditions (e.g., seasonal differences in dilution water & environmental conditions), 2) organism condition/health, and 3) analyst performance.

- **Interlab (between-lab) variability.** Interlab variability reflects the degree of precision that is measured when a sample is analyzed by multiple labs using the same methods. Variability measured between labs is a consequence of variability associated with both intratest and intralab variability factors, plus differences allowed within the test methods, technician training programs, sample and organism culturing/shipping effects, testing protocols, and testing facilities.

WET Variability can be controlled in a number of ways, including: 1) **Strict adherence to clearly specified methods, 2) Increasing analyst & regulator experience, and 3) Using quality labs.** Wisconsin has addressed these issues in an attempt to reduce WET variability.
In order to control WET variability and improve the consistency of methods used by Wisconsin labs and permittees, the WDNR created the "State of Wisconsin Aquatic Life Toxicity Testing Methods Manual in 1996. The Methods Manual contains specific procedures regarding testing and sampling procedures, types of tests, quality control/quality assurance procedures, etc., that labs must follow when performing WET tests for permit compliance. The WET Guidance Document also provides guidance regarding issues that may effect test variability (e.g., sampling procedures, selecting a quality lab, etc.).

In order to insure labs are of the highest quality and are able to demonstrate a serious commitment to a quality assurance/control program, the WDNR, under state statutes, certifies labs to perform different types of environmental analysis. In order for a lab to apply for certification for acute and chronic WET testing, the lab must submit a completed application and a quality assurance plan to the lab certification program and pass an on-site evaluation. WET labs must have an ongoing reference toxicant program, a review process for all test data and reporting, a good sample custody system, proper equipment maintenance, dilution water quality monitoring, facility maintenance, and attention to test organism health, and make other demonstrations of good lab practices in order to pass an audit.

For more information, contact: Kari Fleming

Reclamation Hearing: Superior Silica Sands, LLC--August 23, 2017-Chippewa County Courthouse, Chippewa Falls, WI

After reviewing the proposed plan amendment which would allow controlled discharges of storm water, contaminated storm water and wastewater into Trout Creek and eventually into the Red Cedar & then Chippewa River Watershed, I am deeply concerned that Wisconsin is turning its waterways and the area into a cesspool of discharge which we know little about as a general population.

There is no more important time than now to follow the Precautionary Principle which was developed at a Wingspread Conference in Wisconsin in 1998. It says: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action." – Wingspread Statement on the Precautionary Principle, Jan. 1998

With that in mind, I must ask these questions:

1. What are the specific contaminants found in contaminated storm water and wastewater? How will they be treated so as to be dumped into a major trout stream? Will the process used be different than a conventional sewage treatment plant? How can the public and surrounding land owners and creek users be assured that the water in that creek will produce any harmful impacts as time goes on?
2. Will sand particles, sediments, and other harmful contaminants be removed before the discharge? Will any pollutants impact fish/other wildlife and humans in anyway with the buildup of residues throughout the Creek? Will warmer water decrease the trout population in areas of discharge?
3. Will heavy metals become a part of the pollution or will those contaminants be removed? By what means? How much in the way of contaminants will be absorbed by fish/aquatics and other animals?
4. What criteria will be used to determine safety levels of the kind and amount of pollutants in the water to allow for healthy men/women/children? Will closing down a water treatment facility be a part of the plan if these criteria are not met? Will the be a plan B?
5. Will there be any interactions between materials naturally occurring, organic material already in the receiving body of water to form by-products which may or may not be safe and heathy?
6. Will there be limits established or unlimited discharges only requiring monitoring and reporting of the discharges by the industry? Will it be left up to the county to find problems or will the industry be responsible for hourly, weekly, monthly and yearly monitoring and correct any deficiencies or violations taking place? Who will be responsible for major decisions? The County or the Company?
7. Will there be limits established or will unlimited discharges be allowed only requiring monitoring and reporting of the discharges?

   In regard to environmental and public health concerns:

   1. The County should evaluate the permit to be certain that with the treatment/processes used, the fluid treated and discharged should be exceedingly safe to humans and aquatic health. or life
   2. All approaches to the discharge area and at a reasonable distance downstream should be clearly posted with warning signs discouraging any use of or contact with the stream or water.
   3. An advisory to all anglers should be issued indicating fish taken down stream or upstream may be contaminated to discourage fishing and consumption.

4. Residential landowners and owners of private wells should be notified of the effluent being dumped into the water and should be discouraged from drinking, bathing, cooking etc. until the water is considered safe continuously.
5. Municipalities should be notified downstream of the expected contaminants or changing conditions of the water.
6. Everyone living near bodies of water where discharges are occurring should be warned that there could be direct exposure threat to public health through ingestion, inhalation and dermal absorption pathways.

DILUTION IS NOT THE SOLUTION TO POLLUTION!

ADDING MORE STAFF TO THE DEPARTMENT IS CRITICAL IN ORDER TO MONITOR AND SUPERVISE OPERATIONS. FRAC SAND COMPANIES SHOULD FUND.

While there are studies on-going in several states regarding the practices known to this industry and there are indeed some studies going on in Chippewa County, I am wondering how much by way of scientific study has been applied to the issues and concerns mentioned. Supposedly the DNR is studying, with a very limited staff, the impact of acid mining and heavy metals at frac sand mining locations. However, since no results will be released until 2021, it appears that the state and the county expect that nearby residents will be the guinea pigs in the study to see what happens. Studies in Turkey, for example, have shown that some vegetables absorb heavy metals when grown and cause endemic upper gastrointestinal cancer in some regions. What other types of issues face us when we pollute the environment around us?

We are aware there is radon in the hills and ridges and bluffs of northwest WI. What impact will it have on the health of people and animals once it reaches the waters surrounding them? And what about issues related to polyacrylamides/acrylamides? That surface hasn't been touched.

Please read Volz, C. D., et.al. at Http:/fracktracker.org for additional information.

I am attaching numerous articles regarding water issues that might provide additional information helpful in determining parameters for the industrial operation to insure that healthy and safe practices are expected.

Patricia J. Popple 561 Summit Avenue Chippewa Falls, WI 54729 715-723-6398 sunnyday5@charter.net

Implications of Effluent Discharge from the PBT – Josephine Facility Discharge For Exposures to Other Contaminants Known to be Present in Marcellus Shale Flowback Fluids and a Regional Appreciation of These Results

Of particular environmental public health significance is that Marcellus Shale flowback water contains other contaminants, in addition to those analyzed for in this study, which have health consequences if ingested, inhaled, and/or absorbed through the skin. While we make no statements regarding the presence of other contaminants in this effluent water being discharged into Blacklick Creek, it is imperative that additional testing be conducted immediately by federal and state health and enforcement agencies to determine if other contaminants of public health significance are entering this watershed. Additionally, oil and gas wastewater and Marcellus shale flowback fluids are being disposed of in "brine treatment" facilities and at POTW's throughout the Commonwealth of Pennsylvania and in Ohio, Maryland, West Virginia, and New York. The ramifications of disposal of large quantities of oil and gas wastewater through ineffectual brine treatment plants and POTW's needs further evaluation throughout the region to determine its impact on stream and river systems and public drinking water supplies, as well as to recreationalists and private well water users.

Local and Regional Public Health and Environmental Recommendations Based on PBT-JF Results

- The Pennsylvania Brine Treatment – Josephine Facility is discharging up to 60 ppm of 2-BE into Blacklick Creek, which is not listed in its discharge permit. Operations at this plant should be halted until all contaminants in accepted oil and gas fluids are known and it can be determined if the treatment processes used at the plant effectively remove these contaminants from the fluids being treated, so that effluent discharge concentrations of contaminants are consistent with human and aquatic health standards, guidelines and criteria. This recommendation should extended to other treatment plants and POTW's accepting Marcellus Shale flowback fluids in this drainage.
- All approaches to the effluent discharge area and a reasonable distance downstream (at least 100 meters) from stream-side and land-side should be posted with warning signs. These signs should discourage any use of and/or contact with stream water.
- An advisory should be issued to all anglers that fish taken from this stream, both up and down stream, may be contaminated and discouraging fish take and of course consumption.
- Studies to determine the levels of all potential Marcellus Shale flowback fluid contaminants in downstream water, sediments and pore water should be undertaken immediately. These should include sampling upstream of the effluent discharge point and at short, intermediate and longer distances downstream from the effluent discharge point. The number of samples taken (n) of surface water, sediments and pore water upstream and at the various distances downstream should be sufficient so that statistically significant differences of contaminant concentrations can be inferred. CHEC took additional samples of effluent and

performed both up and downstream transect sampling on April 1st and 2nd, 2011- these samples are now being analyzed for an expanded list of chemicals including antimony, radium radionuclides, phenols and derivatives, polynuclear aromatic hydrocarbons (PAH's), phthalates, and total petroleum hydrocarbons

- Residential and other private well water users downstream of the effluent outfall of the PBT-Josephine Facility should be advised that there may be contaminants in their well water and discouraged from using it for drinking, cooking or bathing. Well water from wells in close proximity to Blacklick Creek should be tested to assure that contaminants in Marcellus Shale flowback fluids and other oil and gas waste fluids are not present in concentrations that may affect human health.
- Municipal water authorities downstream of this outfall should be notified of the contaminants found in effluent from the PBT- Josephine Facility, of other possible contaminants in Marcellus Shale flowback fluids and oil and gas wastewater, and that there are other treatment facilities and POTW's in the Blacklick, Conemaugh, and Kiskiminetas drainages that accept and discharge oil and gas waste fluids into surface water. They should also be notified that landfill facilities in the drainage accept solid wastes produced from these treatment facilities. Downstream municipal water authorities should test raw unfinished intake water and finished drinking water for identified contaminants in effluent from the PBT- Josephine Facility, and other contaminants known to be present in Marcellus Shale flowback fluids and oil and gas wastewater.
- All municipal water authorities at reasonable distances downstream of "brine treatment" and POTW's accepting Marcellus Shale flowback fluids and other oil and gas wastewater in the region extending eastward across Ohio, Pennsylvania and West Virginia and New York should be notified of these results. It is important that they initiate sampling of raw, unfinished inflow water and finished drinking water immediately to insure that their systems are capable of handling all potential contaminants, without breakthrough above specific drinking water MCL's.
- The PA DEP and other states and federal regulatory authorities, including the Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC) should immediately review all surface water discharge permits granted to brine treatment facilities and POTW's that accept Marcellus Shale flowback fluids and oil and gas wastewater, to insure that 2-BE concentrations being discharged are below all applicable standard, guidelines and criteria. This review should be informed by results of this report but should be extended to all known contaminants in flowback and other oil and gas wastewater.

Environmental Forum on Emerging Contaminants

On Thursday, January 24, the Bureau of Water Standards and Facility Regulation will be hosting an Environmental Forum on Emerging Contaminants. Emerging Contaminants comprise a diverse collection of thousands of chemical substances including pharmaceuticals, veterinary drugs, fragrances, and cosmetics. These chemicals enter the environment and our waters from a variety of sources including wastewater treatment plant discharges, run off from agricultural land uses and on-lot septic systems. Research has indicated that several of these compounds are present in the environment only in very low concentrations, with many detected in parts per trillion. With advances in technology that improved the ability to detect and quantify these chemicals, we can now begin to identify what effects, if any, these chemicals have on human and environmental health.

Dr. David Bowne, a landscape ecologist and assistant professor at Franklin and Marshall College, will highlight his research regarding current levels of antibiotic resistance in the environment and will provide an assessment of variables affecting that resistance. Dr. Conrad Volz, Assistant Professor in the Department of Environmental and Occupational Health at the University of Pittsburgh Graduate School of Public Health (GSPH), will discuss the relationship between channel catfish estrogenicity index and the density of combined and sanitary sewer overflows in southwestern Pennsylvania.

The forum will commence at 10 AM and end by noon and will be held in the 2nd floor auditorium of the Rachel Carson State Office Building. For more information, please contact Arianne Proctor (717-783-7578) Bureau of Water Standards and Facility Regulation.

Abstracts and Speaker Biographies:

A Landscape Perspective on Antibiotic Resistance

David R. Bowne, Ph.D., Franklin and Marshall College, david.bowne@fandm.edu

Debra L. Wohl, Ph.D., Elizabethtown College, wohld@etown.edu

Abstract:

The rapid evolution of antibiotic resistance in bacteria is one of the most pressing public health problems in the nation. According to the Center for Disease Control, over 70% of the bacteria that cause hospital-acquired infections are resistant to at least one commonly prescribed drug. The fight against antibiotic resistance is primarily focused on clinical settings. Antibiotic resistant bacteria are, however, found in the environment as well. Intense use of antibiotics for livestock and other agricultural practices contributes to this pool of resistance. But not all cases of resistance are caused by direct use of antibiotics. Many metals, including mercury, lead, cadmium, cobalt, nickel, copper, and vanadium, are often correlated with antibiotic resistance. Naturally occurring resistance also stems from interactions between microbes in the environment. Recent research highlights the need to understand patterns of antibiotic resistance in the environment, as well as in clinical settings. Our research is one of the first to examine the

large-scale distribution of antibiotic resistance in enteric bacteria inhabiting soil. We determine the relationship of antibiotic resistance in Enterobacter aerogenes in Lancaster County to variables such as land use, concentration of heavy metals, bedrock type, watershed, and elevation. From soil samples collected from 84 randomly selected sites, we found mean proportions of isolates resistant to ampicillin (0.50), chloramphenicol (0.49), trimethroprim-sulfamethoxazole (0.42), kanamycin (0.05), tetracycline (0.03), and multiple drugs (0.23). Levels of resistance were typically lower in forest versus residential, pasture, and crop land uses but resistance among land uses was only significantly different for ampicillin and kanamycin. Analyses of heavy metal concentrations did not fully explain antibiotic resistance patterns. Lead was significantly related to ampicillin resistance, copper was significantly related to kanamycin and chloramphenicol resistance, and nickel was significantly related to kanamycin resistance. Kanamycin resistance also significantly differed between watersheds. Our research documents current levels of antibiotic resistance in the environment and provides an initial assessment of variables affecting that resistance. We suggest a greater effort be made to understand the relationship between land use, heavy metals, and antibiotic resistance in the environment.

Dr. David R. Bowne is a landscape ecologist at Franklin and Marshall College, Lancaster, Pennsylvania. His ongoing research projects include an analysis of the spatial distribution of antibiotic resistant bacteria in Lancaster County, the use of ecological theory to analyze the insurgency in Iraq, and factors influencing the spatial population dynamics of painted turtles in an agricultural landscape. He earned a Ph.D. in Environmental Sciences from the University of Virginia, a M.S. in Conservation Ecology and Sustainable Development from the University of Georgia, and a B.S. in Natural Resource Management from Rutgers University.

Dr. Debra L. Wohl is an assistant professor of microbial ecology at Elizabethtown College, Elizabethtown, Pennsylvania. Her research focuses on microbial interactions in both aquatic and terrestrial environments, particularly on the relationship between species diversity and ecosystem function. Dr. Wohl is currently studying antibiotic resistant bacteria in the environment, gene transfer between microbes, and the natural reservoirs of pathogens such as Agrobacterium tumefacians and Erwinia amylovora (i.e., causal agents of Crown Gall and Fire Blight, respectively). She earned a Ph.D. in Ecology and a M.S. in Entomology from the University of Georgia and a B.S. in Biology from the University of Michigan.

******

The Relationship Between Channel Catfish Estrogenicity Index and the Density of Combined and Sanitary Sewer Overflows; Significantly Elevated Mercury and Selenium Concentrations in Channel Catfish Fillet From Kittanning PA Versus the Pittsburgh Pool

Conrad Daniel Volz, DrPH, MPH[1,2,3]

1. University of Pittsburgh Cancer Institute, Center for Environmental Oncology, Pittsburgh PA, USA. 2. University of Pittsburgh, Graduate School of Public Health, Pittsburgh PA, USA. 3. Scientific Director, Center for Healthy Environments and Communities, Pittsburgh, PA., USA.

Abstract 1:

Effluent from wastewater-treatment plants contains compounds that possess estrogenic activity. The southwestern Pennsylvania area has over 400 sewer overflows (SOs) that release untreated sewage. We sought to determine if the estrogenicity index (EI) of channel catfish from dense areas of SOs differed from catfish that are less impacted by SOs, using MCF-7 and BT-20 cell

cultures. The MCF-7 human breast cancer line is estrogen receptor (ER) positive, while the BT-20 line is ER negative. The EI is based on the ratio of MCF-7 proliferation from application of fish extract to the response achieved from physiological levels of estradiol. Catfish caught near dense concentrations of SOs had significantly higher MCF-7 EIs than catfish from areas of less dense SOs, ($p=0.02$). The ER negative BT-20 cell line exhibited no proliferative response. We hypothesize that fish caught in concentrated areas of SOs have bioaccumulated more xenoestrogens than fish caught in less SO impacted areas. River water from SO contaminated areas is the primary source of drinking water for Allegheny County residents, potentially exposing large population groups to xenoestrogens. Our data suggest that evaluation of the estrogenicity of fish should be incorporated into risk assessment paradigms. Estrogen-screen evaluation of channel catfish is proposed as one model for further development.

Abstract 2:
Fish can serve as biomonitors (sentinels) for source identification of aqueous metallotoxins. Additionally, there is evidence that local fishers and their families are exposed to metallotoxins through the consumption of river-caught fish. Our Community Based Participatory Research Project recruited local anglers to catch channel catfish ($n=63$) in legacy metals industry and sewer overflow contaminated areas of the Three Rivers Area (TRA) of Pittsburgh PA and upstream in angler-defined "cleaner water" at Kittanning PA, proximal to power plants. We wished to determine if fillet concentrations of mercury (Hg), arsenic (As), and selenium (Se) varied significantly by location of river catch as compared to store-bought.

There were no significant differences in Hg, As, or Se concentrations among the TRA catch, thus we combined these data. Unexpectedly, significantly higher levels of Hg and Se were found in Kittanning-caught catfish compared to those caught in the TRA (both $p<0.0001$). The store-bought fish were significantly lower in mercury and selenium than those caught in the TRA (both $p<0.0001$). Kittanning and TRA fish had 19 and 3.1 times, respectively the mercury as store-bought fish; 23% of samples from Kittanning had mercury levels over the 0.3-ppm EPA flesh criterion. The As concentrations from the TRA and Kittanning catches were significantly higher than store-bought (both $p=0.0001$). Contaminant levels in catfish from Pittsburgh rivers varies significantly by location and can aid in identifying sources of pollution particularly deposition of emissions from coal-fired power plants. Fish consumption advisories should be based on location-specific fish concentrations and actual consumption rates.

Dr. Conrad Daniel Volz has 30 years of experience in water, air and soil environmental contaminant human and ecological exposure and risk assessment, fate and transport analysis, environmental remediation projects and hazard communication. Dr. Volz has performed environmental consulting services for private industry, the federal government, foreign governments and NATO in 24 different countries on 5 continents. Dr. Volz is on the faculty of the University of Pittsburgh, Department of Environmental and Occupational Health. He is the Scientific Director of the Center for Healthy Environments and Communities at the Graduate School for Public Health (GSPH); he is also Co-Director, Division of Environmental Assessment, Monitoring and Control at the University of Pittsburgh Cancer Institute's, Center for Environmental Oncology.

Dr. Volz's research interests are primarily focused on how point and non-point source water toxins and carcinogens are taken up in fish and eaten by humans and what risk of disease this poses to the population. He is especially interested in how contaminants move through the environment to surface and ground water and how to block this movement. Dr. Volz is the Principal Investigator for projects to measure the amount of heavy metals, including mercury, as well as estrogenicity in fish in the Three Rivers Area. He was Director of the 2004 Amchitka Expedition in the far western Aleutian Island Chain to determine radionuclide concentrations in marine plants and animals and the risk to commercial fishing operations from underground nuclear test shots fired on the island during the Cold War. At GSPH he is also a Co-Investigator in the new Centers for Disease Control, Environmental Public Health Tracking-Center of Excellence.

Research news from top universities

Fracking waste may pollute water for years

by Jennifer Matthews-Penn State July 17th, 2017

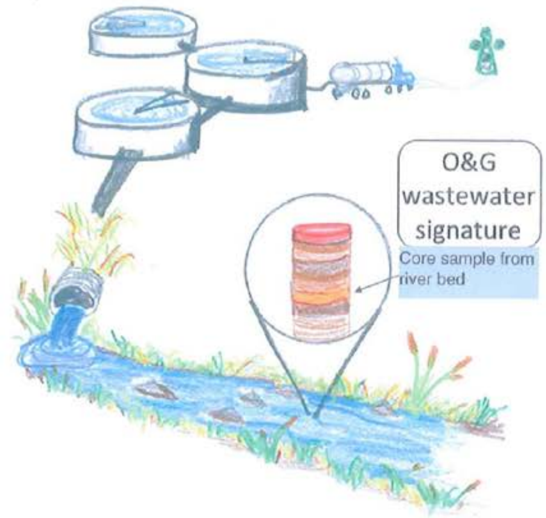


Diagram: Environmental Science and Technology

Researchers have found that the polluting effects of releasing treated wastewater from hydraulic fracturing (fracking) may last much longer than previously thought. According to the US Energy Information Administration, hydraulic fracturing accounted for more than one-half of US oil production and two-thirds of US gas production in 2015. That percentage is expected to rise as more states begin to adopt the practice.

Although studies show that hydraulic fracturing does produce less greenhouse emissions than older technologies like coal, it does come with other environmental concerns. At the top of that list is the wastewater it produces, which contains a multitude of potentially hazardous contaminants. In 2015 alone, Pennsylvania's unconventional gas wells produced nearly 1.7 billion gallons of wastewater. While there are facilities dedicated to treating the wastewater before its release, they provide only limited treatment, leaving many of the pollutants intact.

Like a straw in a Slurpee

To gain a better understanding of the impact of these contaminants on the environment, Bill Burgos and his colleagues studied sediment samples collected from a reservoir in western Pennsylvania.

"There wasn't a water keeper who was sitting in these rivers collecting these samples at a great continuous clip, so in a way, a lot of information just flowed by," says Burgos, an environmental engineering professor at Penn State.

"But in certain reservoirs, where sediments collect over time, there are layers of sediment that are like rings of a tree; you can look into the sediments and capture time and spatially composite samples," he says.

The objective of the study was to use the sediments that had built up to reconstruct the industrial oil and gas activity that was happening during the boom of the Marcellus Shale development in Pennsylvania, from roughly 2008 to 2015, in order to gain a better understanding of the historical impact of oil and gas wastewater disposal.

"You need a lake or a reservoir that allows sediments to lay down undisturbed in those layers," says Burgos. "The words we use are a 'coherent temporal record.' You only get a coherent temporal record if it's a lake that continuously accumulates sediments and isn't subject to a flood or scour."

Xiaofeng Liu, assistant professor of civil engineering, developed a computer model to reconstruct the layers of sediment in order to identify the best sampling location. The researchers chose the Conemaugh River Lake in western Pennsylvania. This site offered high wastewater concentration and low wastewater dilution, as well as a dam-controlled reservoir.

Microbes differ downstream from fracking wastewater

Once the location was decided, the team began collecting samples.

"We inserted a tube in the sediment like you would put a straw in a Slurpee or a slushy," Burgos says. "You put your thumb over the straw, and you pull it out."

In this case, they used agricultural drainpipe, plastic caps, and tape, rather than a straw and a thumb, to collect the sediment samples, which were immediately frozen to preserve the content and then brought back to the Kappe Environmental Engineering laboratory.

Once in the lab, the researchers pushed out the samples like a push-up ice pop, cutting them into slices.

"We split them up into different sections so that we could run different analyses on them," says Nathaniel Warner, assistant professor of environmental engineering and coauthor of the study.

Warner says the researchers looked for high radioactivity signatures and measured the pore water and the radioisotopes to determine the age of the sediments. They also tested the major mineralogy, particle size, and grain size, in an effort to develop a full profile.

The results determined that the discharge of oil and gas wastewater did impact water quality and sediment quality on a larger scale than previously thought. Large quantities of oil and gas wastewater with high loads of chloride, barium, strontium, radium, and organic compounds left high concentrations in the sediments and pore water.

'Unknown, unquantified risk'

Specifically, two important types of organic contaminants were found: endocrine disrupting chemicals (nonylphenol ethoxylates) and carcinogens (polycyclic aromatic hydrocarbons). The highest concentrations coincided with sediment layers deposited five to 10 years ago, during the peak of Marcellus Shale activity.

"The isotopes confirm these are unconventional oil and gas wastes," says Burgos.

Some isotope ratios, such as strontium and radium, are rather unique to the Marcellus formation. A previous study conducted by Warner found that radium levels immediately downstream from one plant were roughly 200 times greater than in sediments located upstream of the facilities. This current study demonstrates that elevated levels were found as far away as 12 miles downstream from the treatment plants.

"These are contaminants that passed through these centralized waste treatment plants, and they can be transported great distances," Burgos says.

Migraines, fatigue spike near fracking sites

Though the findings show long-term contamination of Pennsylvania watersheds, the researchers say the effects on the environment and human health are still unknown and difficult to assess.

"It's kind of an unknown, unquantified risk," Burgos says. "The thing that you don't know is the synergistic effect of all of these things together, the combined effect of radium and lead and surfactants and salt, all together. Does the combined effect of those things ratchet up the toxicity?"

The study did show a significant drop in the amount of contaminants released into surface waters following the voluntary ban on discharge of Marcellus waste requested by the Pennsylvania Department of Environmental Protection, which began in 2011, suggesting that tighter regulations of wastewater do help.

The researchers now want to use the materials they've collected to measure the biological toxicity of sediment layers throughout time. They also plan to test sediment samples at locations farther downstream toward Pittsburgh to see how far the contamination has spread and to what extent.

"Maybe they never make it to Pittsburgh," Burgos says. "But the thing is, you look at a map and there are other plants upstream of Pittsburgh on the main stem of the Allegheny River and there's no reason to suggest that these plants aren't contributing the same thing."

The study appears in the journal **Environmental Science & Technology**. Additional contributors are from Penn State, Dartmouth College, and Colorado State University.

The US Geological Survey, the Penn State Institutes of Energy and the Environment, the School of Global Environmental Sustainability and Water Center at Colorado State University, the Fulbright Program in Colombia, and the Universidad Pontifica Bolivariana provided funding for this study.

Source: **Penn State**

Original Study DOI: 10.1021/acs.est.7b01696

environmental engineering and coauthor of the study.

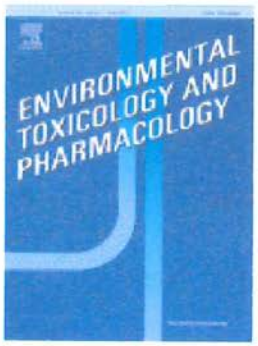
ACS Publications
Most Trusted. Most Cited. Most Read.

Environmental Science & Technology

Combining horizontal drilling with high volume hydraulic fracturing has increased extraction of hydrocarbons from low-permeability oil and gas (O&G) formations across the United States; accompanied by increased wastewater production. Surface water discharges of O&G wastewater by centralized waste treatment (CWT) plants pose risks to aquatic and human health. We evaluated the impact of surface water disposal of O&G wastewater from CWT plants upstream of the Conemaugh River Lake (dam controlled reservoir) in western Pennsylvania. Regulatory compliance data were collected to calculate annual contaminant loads (Ba, Cl, total dissolved solids (TDS)) to document historical industrial activity. In this study, two CWT plants 10 and 19 km upstream of a reservoir left geochemical signatures in sediments and porewaters corresponding to peak industrial activity that occurred 5 to 10 years earlier. Sediment cores were sectioned for the collection of paired samples of sediment and porewater, and analyzed for analytes to identify unconventional O&G wastewater disposal. Sediment layers corresponding to the years of maximum O&G wastewater disposal contained higher concentrations of salts, alkaline earth metals, and organic chemicals. Isotopic ratios of $^{226}Ra/^{228}Ra$ and $^{87}Sr/^{86}Sr$ identified that peak concentrations of Ra and Sr were likely sourced from wastewaters that originated from the Marcellus Shale formation.

ELSEVIER Environmental Toxicology and Pharmacology

Volume 13, Issue 3, April 2003, Pages 175–179



Heavy metals in soil, vegetables and fruits in the endemic upper gastrointestinal cancer region of Turkey

1 M.Kürsad Türkdoğan[a], Fevzi Kilicel[b], Kazim Kara[c], Ilyas Tuncer[a], Ismail Uygan[a]

2 [a] School of Medicine, Division of Gastroenterology, Yüzüncü Yil University, Tip Fakultesi İç Hastaliklari ABD, 65200 Van, Turkey

3 [b] Faculty of Science, Department of Chemistry, Yüzüncü Yil University, Van, Turkey

4 [c] Faculty of Agriculture, Department of Biometry and Genetics, Yüzüncü Yil University, Van, Turkey

5 Received 29 May 2002. Accepted 27 October 2002. Available online 7 December 2002.

6 http://dx.doi.org/10.1016/S1382-6689(02)00156-4, How to Cite or Link Using DOI

Abstract

The environmental exposure to heavy metals is a well-known risk factor for cancer. We investigated levels of seven different heavy metals, (Co, Cd, Pb, Zn, Mn, Ni and Cu) in soil, fruit and vegetable samples of Van region in Eastern Turkey where upper gastrointestinal (GI) cancers are endemic. Heavy metal contents of the samples were determined by flame atomic absorption spectrometer. Four heavy metals (Cd, Pb, Cu and Co) were present in 2- to 50-fold higher concentrations whereas zinc levels were present in 40-fold lower concentrations in soil. The fruit and vegetable samples were found to contain 3.5- to 340-fold higher amounts of the six heavy metals (Co, Cd, Pb, Mn, Ni and Cu) tested. The volcanic soil, fruit and

vegetable samples contain potentially carcinogenic heavy metals in such a high levels that these elements could be related to the high prevalence of upper GI cancer rates in Van region.

PubMed

Format: Abstract

Food Addit Contam. 2006 Jan;23(1):36-48.

Uptake of heavy metals by vegetable plants grown on contaminated soil and their bioavailability in the human gastrointestinal tract.

Intawongse M[1], Dean JR.

Author information

Abstract

Lettuce, spinach, radish and carrot were grown on compost that had previously been contaminated at different concentrations of Cd, Cu, Mn, Pb and Zn. Control plants of each vegetable were also grown on unadulterated compost. The experiment was carried out under greenhouse conditions. Mature plants were harvested and their roots and leaves collected. Soil samples from each growing pot and plant materials were acid digested and analysed to determine total metal concentration. Flame-Atomic Absorption Spectroscopy (FAAS) was employed to determine metal concentrations in soil and plant samples (Mn and Zn), while Cd, Cu and Pb in plant materials were analysed by Differential Pulse Anodic Stripping Voltammetry (DP-ASV). Soil (BCR 146R and GBW 07310) and plant (tea leaves, INCT-TL-1) certified reference materials were used to assess accuracy and precision. The edible part of plants, i.e. the leaves of lettuce and

spinach and the roots of radish and carrot, were also extracted using an in vitro gastrointestinal (GI) extraction to assess metal bioavailability. The results showed that the uptake of Cd, Cu, Mn and Zn by plants corresponded to the increasing level of soil contamination, while the uptake of Pb was low. Soil-to-plant transfer factor (TF) values decreased from Mn >> Zn > Cd > Cu > Pb. Moreover, it was observed from this investigation that individual plant types greatly differ in their metal uptake, e.g. spinach accumulated a high content of Mn and Zn, while relatively lower concentrations were found for Cu and Pb in their tissues. From the in vitro gastrointestinal (GI) study, results indicate that metal bioavailability varied widely from element to element and according to different plant types. The greatest extent of metal releasing was found in lettuce (Mn, 63.7%), radish (Cu, 62.5%), radish (Cd, 54.9%), radish (Mn, 45.8%) and in lettuce (Zn, 45.2%).

PMID: 16393813 DOI: 10.1080/02652030500387554
[Indexed for MEDLINE]

Publication type, MeSH terms, Substances

LinkOut - more resources

PubMed Commons

PubMed Commons home

0 comments

How to join PubMed Commons

Polyacrylamide, used to wash frac sand, is not safe - here is important health and safety information from a PhD Horticulturist (she researched the material since it is used as a water holding aid in gardens). In addition to falling apart, the industrial grade is allowed to have up to 5% of the neurotoxin monomer in it when delivered.

Linda Chalker-Scott, Ph.D., Extension Horticulturist and Associate Professor,
Puyallup Research and Extension Center, Washington State University

The Myth of Polyacrylamide Hydrogels:
"Polyacrylamide hydrogels are environmentally safe substances that reduce irrigation needs"

The Myth

With a significant drought looming on the horizon for the Pacific Northwest, those of us whose business or pleasure includes landscape plants are understandably concerned with water issues. In response, the dot-com websites are full of products promising to reduce water usage in the landscape. Prominent among these products are hydrogels, which have been used successfully by the landscape industry to reduce transplant shock and increase containerized plant growth. These hydrogels, sometimes referred to as root watering crystals or water retention granules, swell like sponges to several times their original size when hydrated. Water is then released slowly to the surrounding soil, reducing the need for irrigation.

Once considered to be a professional nursery product, hydrogels are increasingly popular with homeowners who add them to vegetable gardens, container plants, annual beds, lawns, and perennial landscapes. The most commonly available are polymers of acrylamide and potassium acrylate. These polymers have a longer functional life, perhaps up to five years, compared to other organic hydrogels composed of starch, gelatin or agar. These latter hydrogels are commonly used in cosmetic surgery; polyacrylamide gels are not used for this purpose.

The Reality

My initial concern with hydrogel usage is the public perception that it is a permanent fix. Hydrogels are routinely touted as pH-neutral, non-toxic, environmentally friendly compounds, which they are in their polymerized form. The fact remains that after five years virtually all hydrogel will be depolymerized through natural decomposition processes. The rate of degradation is increased especially in the presence of fertilizer salts (and no, it doesn't make any difference if these are synthetic or organic fertilizers). One is then left with the original soil conditions; in a permanent landscape, this can be problematic unless other water-conserving steps are then implemented.

My second, and probably greatest, concern occurred when I discovered that hydrogels are constructed of acrylamide units. When hydrogels break down, they release potassium acrylate and acrylamide. Acrylamide is a lethal neurotoxin and has been found to cause cancer in laboratory animals. It readily passes through the skin and can be inhaled as dust. Unfortunately, the chemical data sheets on hydrogels do not mention the fact that within a few years they will be composed entirely of these acrylamide units. Since polyacrylamide is defined as "not readily biodegradable" (less than 10% is degraded after 28 days), some sellers of hydrogels actually promote their products as "nonbiodegradable!"

Who is at risk to acrylamide exposure? Workers in the nursery and landscape industry who routinely use hydrogels may become exposed to them as they degrade and become toxic. Homeowners who add hydrogel-containing potting mix to their landscapes or compost piles are exposed. Dogs, cats, and wildlife that come in contact with these substances are at risk. On a larger scale, entire ecosystems are at risk as acrylamide is water-soluble and can easily enter watersheds.

One of the greatest pleasures of gardening is getting your hands into good, rich soil and breathing in its aroma. I believe that the increased, and indiscriminate, use of polyacrylamide hydrogels is an extremely serious hazard to human health and to the environment.

The Bottom Line

- Hydrogels are organic compounds that will degrade after 2-5 years; they are not a long-lasting solution to droughty conditions
- Exposure to fertilizer salts will increase the degradation rate of hydrogels
- When hydrogels degrade, one of the byproducts is acrylamide, a deadly neurotoxin and potential carcinogen
- Acrylamide can be absorbed through the skin or by inhaling; people who have a likely risk of exposure to this compound absolutely require safety clothing and dust masks
- There are safe (albeit shorter-lived) alternatives to polyacrylamide hydrogels, including starch-based gels and others currently used in cosmetic surgery
- There are other environmentally sound ways to reduce water usage and improve water retention of soils than through hydrogels

For more information, please visit Dr. Chalker-Scott's web page at http://www.theinformedgardener.com.

Linda Chalker-Scott, Ph.D http://puyallup.wsu.edu/wp-content/uploads/sites/403/2015/03/hydrogels.pdf
and http://puyallup.wsu.edu/wp-content/uploads/sites/403/2015/03/hydrogels-2.pdf
http://www.theinformedgardener.com is also? http://puyallup.wsu.edu/lcs/

AND THIS from wisair.wordpress.com - Pat Popple's site

ANOTHER TACTIC OF SAND MINERS

At a town meeting this past week, a mining company official made statements directed at proving that comments, made by persons of opposing view point were false. He claimed that these persons had no verifiable studies done by experts that proved that polyacrylamide easily and readily breaks down (into acrylamide, which is a lethal neurotoxin, and compounds such as formaldehyde). Apparently, he missed their reference to "Linda Chalker-Scott Ph.D., in her article "The Myth of Polyacrylamide Hydrogels". His basic statement was that the break down of polyacrylamide does not have formaldehyde as one of its end products. His contention is that since formaldehyde is used to make polyacrylamide, you therefore cannot reverse this reaction. His analogy was that if it were so, then the internal combustion engine could burn gasoline and discharge oil out the exhaust pipe. To everyone who is not up on his/her science, it might seem plausible; but in reality nature can reverse even the by- products from an engine. THE RETURN OF POLYACRLYAMIDE TO ITS ORIGINAL [AND TOXIC] CHEMICALS IS VERY LIKELY TO HAPPEN. Factors to consider are:

1) Is it exothermic or endothermic?
2) What is its "free energy" gradient; (or said another way "Potential Energy")?
3) What can start the reaction?
4) Is the reaction reversible and what does it take to accomplish?

Exothermic means it gives off heat (energy) when the reaction occurs; endothermic means it requires energy (heat) to make the reaction occur. An internal explosion in one of the cylinders of a tractor is an example of an exothermic reaction; the forming of a polymer from acrylamide is an example of an endothermic reaction. The "free energy" of the piston explosion has a very steep positive gradient (gives off a lot of energy), while the polymerization of acrylamide has a medium negative gradient. For the explosion to occur, it takes but a small spark; for the polymerization to occur it will require considerable heating and/or electrolysis. While all chemical reactions are usually reversible, the explosion will require mother-nature and millions of years to reverse the combusted products back to oil, but it can be done. On the other hand, acrylamide that has been polymerized, is now potentially an exothermic reaction, reversible to mono- acrylamide, waiting only for sunlight to initiate the reaction. This assumes that no contaminates are in the solution with the polyacrylamide.

In other words, it is likely that the reverse process of polymerization will result in some formaldehyde as an end product of polyacrylamide. To state that the endothermic reaction (which created polyacrylamide) is not reversible is to deny scientific facts and observations.

Whether there is formaldehyde or not is insignificant; it is the toxic chemicals formed when polyacrylamide combines with pesticides and herbicides in the real world environment that is the real issue. This mining official's cowardly attempt to discredit persons of opposing view, (who are well versed in their field) either out of ignorance and/or malice, should be cause for great concern.

Ben Burnt June 16, 2012

FROM Communities At Risk: Frac Sand Mining in the Upper Midwest A Report by Boston Action Research (*a project of Civil Society Institute*)

Adverse Impacts to Water Quality

Adverse hydrological impacts may occur at each phase of the frac sand mining process (Figure 1). At some sites dredging occurs and sand is removed below the groundwater table. Dredging is especially harmful from the standpoint of shallow groundwater contamination (Parsen, 2012).

According to the WI DNR, the concentration of the polyacrylamides used in the frac sand washing process is often unknown or may vary substantially. Polyacrylamide levels must be continuously monitored, because although polyacrylamide is itself nontoxic, unpolymerized acrylamide is a known neurotoxin and can occur in low concentrations within sand washing solutions (Daughton, 1988). The Environmental Protection Agency (EPA) has a Maximum Contaminant Level Goal (MCLG) of zero for acrylamide in public drinking water sources. According to the WI DNR, "people who drink water containing high levels of acrylamide over a long period of time could have problems with their nervous system or blood, and may have an increased risk of getting cancer (Wisconsin Dept of Natural Resources, January 2012)." The issue of acrylamides becomes particularly significant when considering wastewater discharge and recharge practices occurring on site. As piles of processed sand dry, acrylamide-laden water can percolate down into the groundwater (Wisconsin Dept of Natural Resources, January 2012) (Parsen, 2012).

Surface and groundwater may also be negatively impacted by land use changes related to increased road networks (Wisconsin Dept of Natural Resources, January 2012) (Parsen, 2012).

Just as the initial step of overburden recharge affects local hydrological patterns, infilling of completed mine sites, choice of fill, and attention paid to preexisting geological conditions and drainage process dictate the long term level of impact during the reclamation process (Wisconsin Dept of Natural Resources, January 2012).

In addition to complex underground aquifer systems, Wisconsin and Minnesota are home to plentiful streams and lakes. No frac sand mine location is far from such surface water resources. Surface water impacts are most directly felt when sand is removed from the surface water locations themselves. Among the environmentally harmful impacts are siltation, erosion, increased turbidity, and degraded aquatic and riparian habitat. Ongoing mining operations in these areas can adversely impact the chemical makeup of local waterways. Thermal impacts (unnaturally warm or cool waters) have also been noted as a potential concern, but few studies exist to validate the significance of such impacts (Wisconsin Dept of Natural Resources, January 2012).

The primary wastewater streams at frac sand mining operations are wash water generated during processing as well as excess precipitation and/or groundwater removed during pit dewatering. Contamination of natural waterways occurs via seepage or direct discharge to surface waters. The major pollutant of the wastewater discharge that is regulated and/or permitted is the suspended sediment. While suspended sediment is generally non-toxic, it can choke sensitive habitats if exposure is chronic (Wisconsin Dept of Natural Resources, January 2012).

Fishery impacts in Wisconsin and Minnesota are of particular concern to many local citizens as their livelihood and recreational interests are attached to the fishery industry. Long-term fishery impacts are still unknown, due to the exponential expansion of the frac sand mining industry. Citizens have detailed many concerns of detrimental impacts as a result of frac sand mining. The WI DNR details the following as specifically pointing to runoff causing turbidity and affecting trout reproduction, runoff causing sedimentation, thermal increases causing cold-water aquatic life to disappear, decreased stream flow from groundwater withdrawals, entrapment of fish, and realignment of stream channels (Wisconsin Dept of Natural Resources, January 2012).

An emerging and potentially highly damaging water pollution problem is the issue of acid mine runoff that could contaminate groundwater and surface water. Acid mine runoff is normally associated with mineral mining. However, WI DNR data of heavy metal content in sand wash ponds adjacent to mines obtained by Midwest Environmental Advocates demonstrate the same issue arises in frac sand mining.[7] The more acidic water allows heavy metals at toxic levels to leach into water supplies, such as arsenic, cadmium, aluminum, lead, manganese, copper. This water contamination problem extends to reclamation processes that use sand from formations located near frac sand formations (the Tunnel City sandstone formation). Moreover, groundwater contamination can occur as a result of farming on such reclaimed land. (Midwest Environmental Advocates, 2014) Full report can be found here: http://www.civilsocietyinstitute.org/media/pdfs/092514%20CSI%20BAR%20frac%20sand%20mining%20report%20FINAL2%20-%20EMBARGOED.pdf

7!WI DNR sand wash pond data can be found on the MEA website at: http://midwestadvocates.org/assets/resources/Frac%20Sand%20Mining/2014h9h 12_storm_water_sampling_results_page_1_FINAL.pdf! http://midwestadvocates.org/assets/resources/Frac%20Sand%20Mining/2014h9h 12_storm_water_sampling_results_page_2_FINAL.pdf!

"In!this (Chippewa!Sands)!permit! application!(for!a!frac!sand!mine),! there!is!no!mention!of!the! retention!ponds,!the!amount!of! water!used!to!fill!the!ponds,!how! they!will!dispose!of!the!chemicalh laced!slurry,!what!plan!of!action! will!be!taken!in!the!event!of!a!spill! or!the!level!of!pollution!in! these! ponds.!!I!feel!these!ponds!are! highly!toxic!due!to!the!signs! posted!next!to!the!ponds...."!!!