

DNR RESPONSE TO PUBLIC COMMENTS
ON THE ARMY'S ALTERNATIVE FEASIBILITY STUDY FOR GROUNDWATER

The intent of the public comment period was to solicit comments and questions relevant to the DNR's preliminary determination on the Army's Alternative Feasibility study for groundwater. Approximately 160 sets of comments were submitted to the Department. Of those comments, about 60 were submitted as individual, unique documents and about 100 were in the form of a postcard prepared by Citizens for Safe Water Around Badger (CSWAB). Comments were submitted by individuals, organizations, and municipalities.

The public comments ranged from general statements of concern to detailed questions, such as those regarding groundwater contaminant concentrations at individual monitoring wells. The total number of comments is very large and speaks to the dedicated involvement of the local stakeholders. A best effort has been made to address relevant comments as thoroughly as possible, and a focus has been placed on those comments that are most meaningful to the Department's feasibility determination and the scope of the Army's proposal.

Because of the large volume of comments, it was necessary to categorize them according to general themes. In doing so, many of the longer and more organized submittals had to have the running dialogue split into different categories. As much as possible, the original context of those submittals has been preserved. As a consequence, some comments appear in multiple categories.

The categories of public comment include:

1. General comments about the proposed groundwater feasibility study and preliminary determination
2. The proposed municipal system; its cost, construction, establishment and operation
3. Private supply wells; questions about future use and effects on agricultural operations
4. The proposed phased shutdown of the groundwater treatment system (MIRM/IRM)
5. Protection of the Prairie du Sac municipal wells
6. Natural attenuation as a long-term remedial option
7. Soil cleanup and groundwater contaminant source controls
8. Downstream effects on wetlands, wildlife, and the Wisconsin River
9. Modeling and monitoring of the groundwater contaminant plumes
10. Socioeconomic issues
11. The GIS registry and off-site contamination
12. Main CSWAB comment document
13. Miscellaneous comments

The nature of the proposed project and the subsequent comments preclude the use of discrete stand-alone categorization. Some categories overlap, but they are treated separately to assure that the points most relevant to each specific topic are addressed. For instance, the establishment and operation of the municipal water supply will necessarily affect private water supply use, but questions specific to private water supplies have answers that are not necessarily relevant to the municipal system as a whole.

The main comment document submitted by CSWAB is 27 pages long and contains well over 100 questions. Because so many of the lines of inquiry and specific questions are unique, most of the CSWAB comments and questions are provided their own category.

Each category contains a brief description of the issues, followed by the individual comments (with author shown in parentheses), and the Department's response to the relevant issues. An asterisk (*) indicates a multiple comment entry, indicating that the contextual out-of-category comment is addressed elsewhere in this response. Some categories were further split out into sections, where appropriate.

DNR commentary and responses appear in italics.

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PETITION

EXHIBIT D

General Comments

A wide variety of stakeholders had general comments on the nature of the proposal. Comments include:

- *Tying the proposed municipal system with the plan for a phased shut-down of the treatment system and natural attenuation remedy.*
- *Making sure that every effort is made to protect groundwater and the affected resources.*
- *Assuring DNR requires the Army to fulfill its cleanup obligations at Badger.*

The alternative formulation should consider a combination of alternatives to include both the development of a municipal water system and retaining the IRM/MIRM system. (Chris Hanson)

The decision alternatives, as put forth by the Army, appear to unnecessarily limit the ability of the DNR to make a decision that combine one or more alternatives to protect the environment as well as municipal and rural water supplies. (Chris Hanson)

Don't allow the Army to "package" municipal water with the shutdown of the cleanup. They are two separate issues. Municipal water will not resolve all the issues facing this community. Cleanup must continue. Municipal water may be part of the answer, but it is not the total solution. (Ken Lins)

I don't think we should have to choose between clean water and an active clean-up. We need both. (Charles Wilhelm)

Kids deserve clean water and a healthy future – that's why we can't afford to abandon cleanup at Badger Army Ammunition Plant. Long after the Army is gone, contamination on the land will continue to migrate to our rivers and wetlands and to our groundwater. Metal pipelines and deeper wells can help but they are no replacement for a clean and healthy future free of military toxins. This is our last chance to really clean up Badger – let's do it right. (postcard from about 100 supporters of Citizens for Safe Water Around Badger)

As a Veteran, and a lifelong resident of Wisconsin, I would like to ask all of the people in this discussion, why is "good enough" Ok for Wisconsin groundwater? For anyone's groundwater? One hundred years from now our children will still be asking these questions. (Robert Sinclair)

I have served on the RAB board since it began and on the Town Board for the last 25 yrs. The Prairie du Sac Town Board will be quite involved with the final solution to this problem. I hope that all the affected people in the town end up satisfied with the final outcome and that the army doesn't leave us holding the bag. (Ron Lins)

I strongly support the DNR and the very important job done by the Department. Our legislators need to listen to staff that know what they are talking about and have educated themselves to do. (Mary Carol Solum)

It is very important that the DNR take a stand on doing whatever is feasibly possible to insure that the quality of life for residents around Badger is upheld. It is only fair that this quality of life, health, the environment, and value of our homes is not compromised. (Marge Hill)

Please let me call your attention to Value 2 of the Badger Reuse Plan which calls for the U.S. Army and/or the federal government to "complete the highest quality cleanup of the Badger property's contaminated land, water, building, and infrastructure in a timely manner and that any land transfers do not entail the transfer of unforeseen cleanup responsibilities or liabilities to any party other than the federal government." Value 2, Criterion 2.3 stipulates that "the final level of cleanup should not restrict future use and pose no risk to people or the environment, including soil, water, air, and biodiversity." (Wisconsin Wildlife Federation)

The installation of a public water system may be a necessary, temporary “band-aid”, but it does not address the deep festering wound underground. (Georgia Tufts Gomez-Ibanez)

This is the time for our DNR to stand tall and firmly protect the waters of our state. Water is essential to life. Most Wisconsin residents depend daily on groundwater. (Georgia Tufts Gomez-Ibanez)

I endorse the clean-up of the Badger Army Ammunition Plant and the feasibility study of groundwater. (Elayne Lastafka)

We (and future generations) need and deserve CLEAN and SAFE water. We have children and grandchildren who also use and bathe in our water. (Pamela Wilhelm)

'Straw Man Argument'

First, let me comment on the misused argument made by many "...there is no human effort that would completely clean up all remaining BAAP-related groundwater contamination - this goal is technically and economically infeasible".

Mr. Ackerman, this is what debaters and logicians refer to as "the straw man argument". One side misstates the other side's position (creates a 'straw man'). Then proceeds to easily refute it (knocks the 'straw man' down). Then claims victory in the debate (I knocked your argument down, so I win the argument).

Here, the Army/DNR/others are misstating my and CSWAB's position: 'completely clean up all remaining BAAP-related groundwater contamination'. This misstates our position. No one I know is requiring a 'complete (100%) clean-up'. All knowledgeable observers agree that is 'technically and economically infeasible'.

Instead, we will be satisfied with cleaning up to same standards as, say, DOT requires for highway clean ups. For example, if a Menard's lumber truck overturns, spilling lumber all over a public highway, neither the DOT, DNR, nor anyone requires a 'complete (100%) cleanup'. Instead, when Menard's cleans up, say, 99.9% of the spilled lumber, they are done. Meaning, after the cleanup, one could still find, say, a few wood splinters on the road/ditch.

Similarly, neither CSWAB/residents/I are requiring Army to 'completely (100%) cleanup' the poison they left at Badger. Like the hypothetical Menard's lumber highway spill, we will be satisfied when Army cleans up only 99.9% of their spill. Meaning, after the Army is done and goes home, one could still find, say, a few molecules of poison in the dirt. We say: "That's okay. Since we all agree a complete (100%) cleanup is technically and economically infeasible."

Thus, Mr. Ackerman, anyone who uses the statement a "complete cleanup is impossible" to justify a new public water supply should not be listened to, as they are starting with a misstated premise that no one is requiring. (Steven F. Weynand)

For residents and farmers near Badger Army Ammunition Plant, there is the singular solution that protects our quality of life, our health, our environment, our agricultural heritage, and the value of our homes and farms – it is clean groundwater.

It is difficult to advocate for anything less when the military's own Feasibility Study describes viable alternatives capable of fulfilling our collective responsibility and obligation to protect the State's groundwater, rivers, wetlands, and natural springs.

The Army's preferred choice, having the lowest cost to the military, is a public water supply system. However we live in a rural agricultural community – we need clean groundwater to sustain crop irrigation, livestock wells, agriculture, organic farming, healthy wetland ecosystems and healthy fisheries. We also need clean water for our homes.

While other aspects of this proposal may be debated, community members are unified and stalwart in their support for active environmental restoration, ill-content to allow contaminants to simply migrate from land to groundwater, moving under farm fields and family homes, and flowing for decades to our waterways and wetlands.

Badger Army Ammunition Plant, which long stood as a monument to our community's past, now holds both the challenge and the promise to serve as a future testament to accountability and responsibility – a place where we chose to finish the job we started and restore the damage that has been done, to the benefit of our community and the generations that will follow. (Citizens for Safe Water Around Badger)

Thank you for your consideration and I am hoping/expecting the WDNR will do the right thing for the state of Wisconsin. (Wendy Carlson)

Response

The Army's alternative feasibility study for groundwater includes three main components; 1) installation of a municipal water supply system to down-gradient users that could potentially be at risk from groundwater contamination, 2) submittal of a plan for a phased shut-down of the MIRM/IRM, and 3) submittal of a plan to evaluate natural attenuation as the final remedy for groundwater contamination associated with the plant.

MIRM/IRM shut-down and natural attenuation must be linked together, as it will not be possible for the Army to remediate all of the groundwater to the relevant Enforcement Standards. Monitoring of natural attenuation processes will be needed to assure that the contaminant plumes are stable or receding. Given the diminishing returns and expense of the MIRM/IRM, it is possible that the Army could pursue both a phased shut-down of the MIRM/IRM and natural attenuation without installation of the municipal water supply system. Similarly, a municipal water supply system could be installed without phasing out the MIRM/IRM. The Army proposes both these things and they accordingly appear within the same discussion of groundwater remedies for the site.

The cleanup of BAAP is regulated by DNR under the authority of the "spills law" (Statute 292) and the cleanup rules (Wisconsin Administrative Code NR700, et. seq.). Responsible parties are required to investigate the extent of contamination and mitigate the risks to human health and the environment. Contaminants shall be removed from the environment in as much as it is practicable. The statute recognizes that not all contamination can be removed and there are physical and financial limitations on the scope of any cleanup project.

In this case, as on all similarly regulated projects, the DNR will hold the responsible party accountable, so that reasonable means of protecting human health and the environment are undertaken.

Proposed Municipal Water System

Comments about the municipal system include statements and questions about:

- *Support or opposition of the proposed project*
- *Cost to users, both residential and agricultural*
- *The quality of the system particularly related to its length*
- *Accountability for future problems with the system*
- *Who will participate in the final decision making*

We are not willing to abandon our well for outdoor purposes. If we are forced to abandon our well, we want to be reimbursed for the cost of our well or have free water. We did not create this problem. (Ed and Virginia Krumenauer) (*)

Not for taking the freedom a private well provides away from the individual landowners. Did not move into the country to be on municipal water. (John and Mary Roth) (*)

Who is paying for this? How much per 1,000 gallons is water to cost? (John and Mary Roth)

I live in the Town of Merrimac but am not in the area of contamination. I feel it is up to those people effected to make the choice. (Mary Carol Solum)

While I agree that the Army should build a municipal water system for residents around the former Badger Army Ammunition plant in Sauk County, I strongly believe the Army should also achieve compliance with Wisconsin's Groundwater Enforcement Standards and Health Advisory Levels for Drinking Water. (Andrew Hanson)

The installation of a public water supply system that would serve potentially affected well owners down gradient of the BAAP facility is past due. Toxic plumes have migrated beyond the BAAP boundaries into groundwater that services these private wells. Municipal water is the best solution to provide safe, clean drinking/bathing water that is protective of human health. The Army, under the CERCLA "polluter pays principal", should pay all the costs to construct, hook-up and operate the public water system for 30 years. This precedence was set by the polluter, DuPont, in the Barksdale, Wisconsin community. It should not be acceptable that the Army be held to a lower level of accountability than private industry. (Leon and Joyce Hensen)

The area residents and farms should certainly be serviced by municipal water, at the Army's expense, but the proposal to then reduce the Army's involvement to Monitoring and Natural Attenuation is premature. (Mary Zenker)

We as landowners are in favor of Alternative option #3. We see it as a win-win solution for everyone unless the new water rates would somehow significantly increase beyond what is the norm for a municipal water system. (Paul Weum)

Badger/Army efforts have not been able to stop the plumes, in fact very little of the contaminants are being contained, etc., etc., so if nothing else can be done to stop the environmental hazards, why delay setting up the new municipal water system? (Paul Weum) (*)

The original cost of the well, tower and infrastructure to deliver the water are covered in the agreement? The ongoing costs to manage the system are unknown and many fear would become an increasing burden due to the scale of the project. The proposal looks like a medium size city in the length of the lines in combination with all the laterals, with a small number of households for a revenue base. While small cities and villages have municipal water supplies, this infrastructure is in a relatively small distribution network. This project would be up to five miles long, leaving the landowners at the periphery to experience low pressure and inadequate flow. Without the possibility of additional wells and towers along the route, the solutions are to boost pumps, again raising cost of operation. Will all the concerns of residents be addressed, or will the Army commit to maintain the system? Who will be the responsible party for the residents' concerns when the Army has vacated? Will the project have any legal recourse if the residents' needs are not met? (Robert Sinklair)

I spoke to the people who own the farm where I board my horses on Keller Road (very near Badger) and they are vehemently opposed to getting municipal water because (1) they do not want chlorinated/fluoridated water and (2) they fear the expense of filling two drinking tanks on an almost daily basis for the horses will be too expensive for them. (Wendy Carlson)

The Army's proposed municipal water system may partially solve the water contamination problems at Badger by providing drinking water while leaving other waters of the land contaminated. (Badger Oversight & Management Commission)

It could be quite expensive for the farms in the area and United Agronomy Center if we have to use public water for these operations. (Ron Lins)

I am greatly concerned with how the current remediation proposal will affect the farmers in the area that have cattle, which will drink the water. If cattle are drinking water pumped from the proposed public well, the costs to the farmers to pay for this would be an extreme burden and may essentially make it too expensive to raise cattle in this area. If cattle are going to continue to drink water from the private wells that may be safe now, but are no longer going to be tested, there runs the risk of continued spread of the contaminants to these wells. This contamination could then be consumed by the cattle and then end up in our food supply. (Roger Spear) (*)

I would suggest this newly proposed water supply would be absolutely free of charge indefinitely, as it currently is for owners of private wells, and not be subsidized by the local taxpayers. (Roger Spear)

Has extensive testing been done in the areas where the clean water source may be situated? Is the proximity of the northeast corner of Badger and the contamination (Which remains high) from the Deterrent Burning Ground, far enough from the possible well site at Eagle Point? (Which is SOUTH and EAST from the furthest corner of Badger) I am concerned, as my brother owned a home on the "Point" in Eagle Point and his water had a horrific odor and was not consumed at any time—he was transferred to Florida before water tests could be done. I am concerned that vicinity is not in a protective enough location from Badger's contamination. (John and Mary Koch)

Setting up the water district and its usage into the future, should not cause a financial burden on the homeowners, townships, or farmers, especially with their need for irrigation. If the Windings, or other areas near Prairie du Sac are annexed in, because of the extraterritorial zoning, this should not cause undue rise in taxation, as there should be funds to offset a rise in taxes due to the water district usage. Again, we did not cause the contamination and the need for a clean water system. In years to come, the water district will need repairs and upgrading. This again should not be a burden to the townships and their residents. An endowment should be set up by the Army to offset this financial possibility, in years to come. In Wauconda, IL, where numerous subdivisions needed a clean source of water brought to them, Senator Durbin and then Senator Obama, helped secure a \$750,000 Grant from the EPA's FY06 Appropriations Bill for the Village of Wauconda to extend the village water line to Wauconda Township residents. (John and Mary Koch)

The decision to have the municipal water should be up to the residents and not the town boards. We are the people who paid for the land, well, and pay our taxes. You must have more meeting with the people and let us vote for what will happen with our well, not a certain few people, which in some cases these town board people are not affected, and in turn may not reflect our concerns. (Ed and Virginia Krumenauer)

The quality of the water with the public system is also a concern. The size and length of the water lines could lead to stagnant water for some users. Maintenance costs for the upkeep of this system for the next 50 to 100 years and beyond need to be addressed for the board to make an informed decision. These costs for all the affected properties should never exceed what a private well would cost. The Army is responsible for this disaster and should not ever pass that cost on to the private properties involved in this remedy. (Town of Prairie du Sac)

Farming practices require large amounts of water, far beyond the average use of a household. Buying municipal water for farm use is not an economical or reasonable solution. (Ken Lins) (*)

If this remedy is ultimately approved, please be advised that the Village of Prairie du Sac is interested in serving a portion of the affected areas with municipal water from its public waters supply system. ... This additional well capacity can be utilized to serve areas outside of the Village without the need for additional well capacity to be immediately constructed beyond what is already planned. (Village of Prairie du Sac)

...recently, Sec. 66.1001, Wis. Stats, was enacted and requires certain municipalities to engage in "comprehensive planning" to address land use and other concerns resulting from development. The Village, along with the Town and the City of Sauk City adopted a joint "Sauk Prairie Comprehensive Plan" on November 16, 2005. The Comprehensive Plan calls for the Village, town and City to coordinate future land development with planned improvement to public water distribution system. (Village of Prairie du Sac)

The Village has been in contact with representatives of the Town of Prairie du Sac concerning the extension of water service; and the Town is in support of such extension. ... The Village is not willing to provide direct municipal water service to the affected areas within the Town of Merrimac, given their distances from the Village. (Village of Prairie du Sac)

Yes, the Army should build a public water system, but in addition should be forced to continue monitoring for any pollution and should also continue to be responsible for any treatment and clean-up in future!! (Susan Goldman)

At one time I lived at Water's Edge. We have a well for 2 houses. It is 260 ft deep. The water here is very good. We do not need a treatment system. The water at Water's Edge for 25 houses is fine. Used it for fifty years. From 1960's to now – no one got sick. (Gerard Miller)

If more wells and water towers come in big mess. Water pressures – repairs, bookkeeping, farm use....etc. (Gerard Miller)

The only bad wells are sand points – hand driven wells 40-60 ft ground water. A test of all wells by DNR will find a lot of good wells, some bad wells, but few. Why waste money for no good use for all. (Gerard Miller)

The water system that is proposed by the Army does nothing to aid in the clean-up of Badger. It ensures (as best we know) safe water for the people who live in the path of the plume but it also costs them money they shouldn't have to spend. I am not impacted and it should be the decision of the people who are to agree or not. Personally, I feel the Army should have to financially have to support the system. I realize its tax payer money but the munitions were used to save the whole country, not just Sauk County and the people in it. (Mary Carol Solum)

I think the municipal water system needs to be installed. We have gone too long with the uncertainty of what's in our water. I have two small grandchildren who do not drink our water, but have to use it for bathing, hand washing, etc. We have to get rid of the chance of contamination. (Charles Wilhelm)

Cost of water from rural system? (Charles Wilhelm)

We built our home in the Windings 31 years ago and spent \$10,000 on a well. We thought that would be the only major investment for our water supply. We do not need or want to pay monthly water bills. (Pamela Wilhelm)

Cost of clean water: We have already paid for our wells, which operate efficiently at very little cost to us. There should be NO cost to us for future water. I believe the Army owes us CLEAN and SAFE water forever. (Pamela Wilhelm)

...we need the Army to be accountable for future problems that may exist with our water and the environment and the cost that might incur. (Pamela Wilhelm)

If the Army wants to create a Sanitary District, let them. However, this should be a supplement to, not a substitute for, the Army's obligation to continue to clean up its toxic spills until they reach a, say, 99.9% (not complete 100%) standard. Meaning, after the new water supply system is installed, this should not give the Army permission to say, "Everyone has clean water. So we're done. Goodbye." (Steven F. Weynand)

As the years go by, if the Army has left, how will houses connected to the new public water supply know if their water is traveling through underground pipes now surrounded by old plumes moving since installation or new plumes unknown at time of installation? I.e., we will possibly be drinking water traveling through toxic poisons protected only by the water pipes. Said pipes can deteriorate/leak/fail in time, possibly allowing poisons into the pipes and contaminating our water. Wouldn't it be better to simply remove the toxic poisons in the first place, to a 99.9% standard, not 100% which we agree is impossible? (Steven F. Weynand)

Nobody should be forced to hookup - the new water supply system should be 'opt in' only. Mr. Ackerman, at the two Devil's Head's Open Houses I attended, I noticed many DNR officials had offices, and probably homes, in Dane County. So, let me make an argument for "no forced hookups" in terms they will understand. Isn't Dane County famous for preaching to the rest of the state: "You should be tolerant of 'diverse life styles'? They continually preach "Discrimination against 'alternative life styles" should be illegal. I say, okay, we'll take you at your word. Dane County (workplace/home of most DNR workers at the Devil's Head's meetings and where mailing came from): Practice What You Preach: be tolerant of our 'diverse life style'. Our 'alternative life style' is bathing/drinking/cooking in water we pump from our own wells in our own backyards. This 'alternative life style' doesn't spread disease, is legal, doesn't raise taxes, doesn't impose on others, doesn't use eminent domain to steal other people's land, and is much cheaper for us than any proposed new public water system (since we've already incurred the huge initial startup costs and now only pay for minimal electricity to pump our own water from our own backyard wells). So, don't force us to hook-up if we don't want to--as you say, that would be discriminating against 'alternative life styles'. Discrimination which you say should be illegal. Thus, apply your own principles of toleration and nondiscrimination of 'alternative life styles', i.e. don't force anyone to hookup to the new public water supply if they prefer to pump their own water from their own private backyard wells, a non-harmful 'alternative life style'. (Steven F. Weynand)

Further creating a large and expensive rural water system is a poor use of taxpayer dollars when most households do not have a problem at this time. The huge maintenance cost of this system will have to be passed on to local residents at some point creating an unwarranted financial burden into the future. In my opinion it would be more cost effective to install new wells for the homes with contamination as needed rather than spend \$40,000,000 plus on a large system that will serve households that don't need it or want it. (Bart Olson)

Response

The Army has proposed the municipal system to limit potential human exposure to groundwater contamination originating on the facility. The Army proposes to pay for the initial system installation, supply well abandonments, and five years of municipal system operation. Initial estimates provided by the Army indicate and operating cost of about \$90,000 per year, which averages out to about \$300 per household. The Army has not committed to long-term operation and maintenance of the system. The Army's website cleanwaterwelldone.com states that "Additional funding could be set aside to assist with the future maintenance expenditures, so the long-term system operation is affordable."

Local acceptance of the need for the municipal system and its rate structure will be critical in establishing the system. The affected public is encouraged to participate in the discussions regarding the logistical details of the proposed system. The final decision(s) will most likely be made by the local municipalities, in conjunction with the Army. Local municipalities involved in the decision should include the Town of Merrimac, the Town of Sumpter, the Town of Prairie du Sac, and the Village of Prairie du Sac. The affected municipalities will also need

to ensure that the proposed water supply system is installed in compliance with any comprehensive planning agreements.

The engineering details of the proposed system and the quality of the water provided will be regulated by the DNR's Drinking Water and Groundwater program according to NR 809 and NR 810, Wis. Adm. Code. Compliance with these regulations should assure a high-quality water supply that is consistent with State and Federal standards. Any exceedences of drinking water quality standards must be promptly addressed.

The Department acknowledges the agreement at the DuPont Barksdale ammunition site, wherein the responsible party agreed to pay for thirty years of operation of a local water supply system. However, this agreement is not seen as binding on the Army.

Private Wells

Comments about the fate of private supply wells include:

- The cost of wells
- The independence of having a private supply well
- The need for abandonment of safe wells
- Continued non-potable use
- Livestock use
- Irrigation
- Testing of existing wells

Abandonment/Continued Use

Will we be able to continue using our well water for lawn watering only? (Dick Hemberger)

We are not willing to abandon our well for outdoor purposes. If we are forced to abandon our well, we want to be reimbursed for the cost of our well or have free water. We did not create this problem. (Ed and Virginia Krumenauer) (*)

Our well is tested every 3 months, and why would you want to abandon it. The Army could test occasionally to see if the pollutants are moving. It seems to us if they seal the well, they won't know what is going on, and to stop the threat of future lawsuits. (Ed and Virginia Krumenauer)

I own and operate my farm on County Road Z one half mile from BAAP. It is a grain farm and has hog facilities that can consume large amounts of water. I also have a bedrock well that is located directly above the PBG plume. It has never shown any contamination in the quarterly samples that the army has taken since 1990. This well is directly in line with the Village of Prairie du Sac's well and could give a forewarning of problems with the bedrock aquifer if it were continued to be sampled in the future instead of abandoning it. (Ron Lins) (*)

Not for taking the freedom a private well provides away from the individual landowners. We did not move into the country to be on municipal water. (John and Mary Roth) (*)

How do homeowners go about having their water tested? Cost? Are there currently labs available? What tests should be done? How often? (anonymous)

Irrigation and Farm Use

When the pump & treat systems are shut down, what will that do to irrigated crops south of the plant? Do those pumps then pull the contaminants to those crops, and on to animals & humans who use these crops? (Charles Wilhelm)

What happens when our area farmers irrigate their fields. Will they be spraying contaminants in the air? What will they be spraying on their crops that we and other animals consume? (Pamela Wilhelm)

Protect and prevent contamination of existing and future livestock and irrigation wells (BAAP Restoration Advisory Board)

Protect and prevent contamination of existing and future livestock and irrigation wells. (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

The municipal water system won't solve the problems of farmers needing to water livestock or irrigate crops. VOCs would expose the farmer to air pollution while irrigating, among other problems. (Wendy Carlson)

Farming practices require large amounts of water, far beyond the average use of a household. Buying municipal water for farm use is not an economical or reasonable solution. (Ken Lins) (*)

Our farm is in the path of the Propellant Burning Ground plume. We have a substantial amount of money invested in irrigation equipment. There have been questions about the release of VOCs into the atmosphere by irrigation water. The termination of the cleanup at BAAP will prolong this release into the air. Keep in mind that the village of Prairie du Sac strategic plans include growing north toward our farm, which will concentrate more people within close proximity. (Ken Lins)

This army proposal also puts restrictions on the installation of any new wells. What would happen if one of our irrigation wells were to fail? (Ken Lins)

Value 9 of the Badger Reuse Plan specifies that "uses and activities at the Badger property contribute to the area's economic stability and sustainability and have a positive impact on local municipalities." (*) The groundwater contamination solution should protect and prevent contamination of existing and future livestock and irrigation wells. (Badger Oversight & Management Commission)

I also irrigate this property and recently a neighbor expressed concern about the irrigation in the area with contaminated water. (Ron Lins)

Livestock exposure

There is no analysis of the effect of the contaminants on agricultural animals that will likely ingest some degree of them through shallow stock watering wells. It is not clear if there is any bioaccumulation of any of the contaminants through this vector that could enter the human food chain. (Chris Hanson)

I am greatly concerned with how the current remediation proposal will affect the farmers in the area that have cattle, which will drink the water. If cattle are drinking water pumped from the proposed public well, the costs to the farmers to pay for this would be an extreme burden and may essentially make it too expensive to raise cattle in this area. If cattle are going to continue to drink water from the private wells that may be safe now, but are no longer going to be tested, there runs the risk of continued spread of the contaminants to these wells. This contamination could then be consumed by the cattle and then end up in our food supply. (Roger Spear) (*)

Response

Private water supply wells that are located within an area that is served municipal water are regulated by the municipal water supplier. Section NR 810.16, Wis. Adm. Code requires municipal water systems to implement a local well regulation program that regulates wells which are not part of the municipal water system and are located on premises served by the municipal water system. The regulations are required to prevent unused, unsafe and noncomplying wells from acting as vertical conduits for aquifer contamination or as sources of unsafe water that could enter the public water system through cross connections. The local well regulation program and ordinance must include:

- Provisions for a well operation permit that will allow retention and operation of wells which are safe and in compliance with ch. NR 812 with the limitation that the well shall be functional and the owner shall demonstrate a need for use. The permit shall require: that a minimum of one safe sample be taken prior to issuing or reissuing the permit to establish that the water is bacteriologically safe; that the well and pump system be evaluated by a licensed well driller or pump installer and certified to comply with ch. NR 812 subch. IV, prior to issuing the initial permit and no less than every 10 years afterwards; prohibition of unapproved cross-connections between any private well and pump installations and the municipal water system; written documentation of the well and pump inspection indicating compliance with ch. NR 812 requirements using standardized forms provided by the Department of Natural Resources.
- A requirement that all water supply wells that do not have a valid operational permit from the municipality, that are not routinely used, that are not in noncompliance with ch. NR 812, and wells which test bacteriologically unsafe, shall be properly sealed and abandoned in accordance with ch. NR 812 by an established date not to exceed one year from date of connection to the public system, or date of discovery or construction.

DNR is responsible for ensuring that the municipal water system complies with the requirements for a local well regulation program as identified above. DNR is not requiring abandonment of private supply wells as part of this feasibility determination.

It is the Department's understanding that the Army proposes to have most private supply wells abandoned as part of their remedy for groundwater contamination at the facility. However, those decisions are not part of this determination; they will be made as part of the municipal water district and the creation of the local well regulation program. The affected public is encouraged to participate in the planning discussions regarding future well use.

DNR encourages the Army, local officials, and affected residents to work cooperatively to assure that any restrictions on the use of private supply wells are carefully evaluated.

Livestock wells:

As part of the municipal water supply plan, the Army has proposed bulk rates for farmers to offset the cost of high-volume users. If this becomes the final agreement for the system, the concern for BAAP-related contaminants in the livestock wells becomes a non-issue. If the final agreement on the municipal system makes an exception for continued use of livestock wells, a water quality testing program should be established based on the known and/or suspected susceptibility of the well to contamination. The Army could be responsible for this testing, per the requirements of ch. NR 716, Wis. Adm. Code.

Regarding irrigation wells:

Irrigated agriculture is common in sandy setting across Wisconsin and there is irrigated agriculture in the proposed municipal water supply service area. It is likely that at least one irrigation well is drawing water from the propellant burning ground plume, and that water may contain dinitrotoluene and carbon tetrachloride, with carbon tetrachloride showing the highest concentration. The primary concern is volatilization of carbon tetrachloride when the water is used for irrigation, and most of the carbon tetrachloride would likely volatilize into the air. Based on a high-concentration scenario of 70 parts per billion of carbon tetrachloride over a 40-acre field, one inch of irrigation water would account for less than one pound of carbon tetrachloride per

application. This amount of contamination appears to be below levels of regulatory concern and is not thought to represent a threat to human health or the environment.

Regarding testing of existing wells:

The Army has tested groundwater from water supply wells and monitoring wells located at different depths within the sand and gravel aquifer. The testing has shown three groundwater plumes. The plume locations are shown in the Alternative Feasibility Study. If your well is not near one of these plumes, it is unlikely to be affected. If your well is near one of the plumes, testing may be performed to gain more certainty about the groundwater quality.

Per s. NR 716.11 (9), Wis. Adm. Code, the Army is required to make a good faith effort to sample public or private water supply wells as part of a regular monitoring program and/or to determine the extent of groundwater contamination. Private and public water supply wells to be sampled include those wells that are known or suspected to be affected by groundwater contamination and other wells that the Department determines have the potential to be affected by groundwater contamination.

For other well owners that are interested in having their water tested, samples may be submitted to a commercial lab. Testing for volatile organic compounds (VOCs) and all six isomers of DNT is recommended for screening the primary groundwater contaminants from BAAP. Many commercial labs and the Wisconsin State Lab of Hygiene can test for VOCs. Many commercial labs can test for 2,4-dinitrotoluene and 2,6-dinitrotoluene and several breakdown products, but no DNR-certified commercial labs that can test for all six isomers of DNT. Lists of DNR-certified labs can be found at <http://dnr.wi.gov/org/es/science/lc/pw/lablists.htm>

Proposal for the MIRM/IRM Shutdown

Most public comments were in opposition to the shutdown of the MIRM/IRM groundwater treatment system.

I would like to express my opinion that the Army must continue the cleanup of soil/water contamination at Badger, regardless of whether or not a municipal water system is installed. (Wendy Carlson)

Continue operation of the current system for at least 15 years. (Friends of Lower Wisconsin Riverway)

Abandoning the massive groundwater pump-and-treat system that captures toxic pollutants at the plant boundary is premature and should not be tied to the new drinking water system. The ability of the Army to predict what will happen to the groundwater plumes is not well supported by the history of the site. When my own neighborhood was found to be contaminated with DNT the Army told us they didn't know where the contamination was coming from. Only after the installation of monitoring wells in the area was the central plume discovered and identified in 2004. (Leon and Joyce Hensen)

Local farming and municipalities need to be protected long term. Therefore, shutting down the IRM/MIRM pump and treat does not seem to be an advisable choice. The people of this community deserve to be protected and depend on the DNR for that to happen. (John and Mary Koch)

I am writing to strongly urge the Wisconsin Department of Natural Resources to reject the Army's proposal to abandon its groundwater pump-and-treat system designed to capture toxic pollutants at the boundary of the old Badger Army Ammunition Plant and install a public water system instead. (Georgia Tufts Gomez-Ibanez)

Even though the Badger Environmental Board of Advisors pushed for more extensive cleanup, the Army chose partial excavation, leaving the majority of the contaminated soil on site. We were told that a cap combined with a pump and treat system would clean up the water to DNR standards. Discontinuing the cleanup at this site will fall

far short of this. In a few years, the Army will be gone, but the impacts of partial cleanup will be felt by the surrounding communities for years. (Ken Lins) (*)

I think it is very premature to consider shutting down the water treatment system. There are too many unanswered questions about conditions we don't know enough about yet. Once the Army leaves it would be relatively impossible to get them back! My lack of faith and trust is because of the historical background and my years on the RAB. I am a clean-up person, not a cover-up person. So is what it is, and we need more study, more research for this contaminated piece of property. And our regulators - DNR, Health, EPA need to regulate and follow the laws we have established. We also don't have enough knowledge of degradation and what some chemical combinations become when they degrade as toxic stew. (Mary Carol Solum) (*)

I think the military needs to take responsibility for their actions and maintain the groundwater treatment systems. (Jeremy Batson)

My second concern is that we don't have enough information to warrant the cessation of groundwater cleanup. The three contaminated groundwater plumes are not well defined and therefore should not be allowed to naturally attenuate. Hydrogeologist Peter Taglia explained at a March public meeting hosted by Citizens for Safe Water Around Badger that the Army should do more testing of the plumes as they travel to and reach the Wisconsin River, and that they should also test the natural springs near the river. He also suggested that the northeast plume should never be allowed to attenuate naturally since there is a small risk that it could contaminate the new groundwater well for the proposed water district. (Michele Hopp) (*)

I strongly advocate for the continuation of groundwater cleanup. Please consider the effect your decision will have on local residents, and thank you for the opportunity to voice my concerns. (Michele Hopp)

I am writing in hopes that you will not let the Army get away with not treating the water at Badger Ordinance Works. The US military is supposed to fight other countries not weasel out of cleaning up the messes it makes. The Army whining that cleanup is difficult to do and costly, shouldn't get them off the hook. It doesn't matter what it costs to treat the water: *If the taxpayers (via the military budget) don't pay for cleaning up the groundwater contaminants now, we will be paying a much higher amount in our taxes for the many generations of future Wisconsin citizens who will suffer from medical problems caused by the contaminants irresponsibly left at Badger. Children will be the most susceptible. We will also be dealing with the decontamination of wildlife and fish in the area and in all areas downstream in the Wisconsin River and will be saddling the local farmers with yet another hardship. There is no cheap fix.* (Marc Thwaites)

In kindergarten we learned to clean up after ourselves, don't you think the DNR has the obligation to force the Army to at least be as responsible as a 4 year-old child? If we bend to pressure, we are lost. Wisconsin will have become a state totally without hope. (Marc Thwaites)

I support the continuation of the currently approved groundwater cleanup remedy. I strongly recommend that you don't allow discontinuation of the pump and treat system. The Army needs to continue clean up until the groundwater is no longer contaminated however long that may take. (Bart Olson)

The data and analyses presented in the AltFS are not sufficient to approve a final remedy for groundwater contamination at Badger. The request for a final remedy should not be approved until additional information is provided that can provide greater confidence that the remedy selected will be protective of human and environmental health. (for Citizens for Safe Water Around Badger by Peter Taglia)

Response

The groundwater treatment system has been in operation for 22 years. The contaminant removal rate has dropped substantially over that time, and according to the Army, has reached the point of diminishing returns. Consequently, the Army believes it is no longer practical to continue operating the system as it is currently configured.

The shutdown of the MIRM/IRM will most likely occur in phases. DNR and Army will need to agree on a plan for the shut-down that includes assurances that the shut-down will not cause adverse long-term effects to down-gradient water quality. For instance, the recovery wells on the north (upgradient) end of the plume could be turned off first, so there is still time to capture any unforeseen increases in contamination. However, the Army has yet to provide details of the proposed shutdown, so it is impossible to comment on the specifics of the shutdown. The final approved plan will need to comply with the applicable rules and law.

Prairie du Sac Municipal Well(s)

Commenters expressed concern that the contamination at the site could eventually reach the Prairie du Sac municipal wells, especially Well #3.

This board will be very involved in the process if public water for the affected properties is the final solution. The extent of the contamination at Badger and what will happen in the future remains unclear. That is why providing public water should not be tied together with discontinuing cleanup at Badger. Natural attenuation of the propellant burning ground plume could leave the Village of Prairie du Sac's water system in jeopardy. (Town of Prairie du Sac) (*)

The Village requests that the sampling and testing that is consistent with the requirements of the quarterly groundwater sampling program continue for all Village municipal wells. (Village of Prairie du Sac)

Data reviewed indicates the capture zones for the PDS Wells No. 3 and No. 4 extend to the northwest, toward the groundwater contaminant plumes at BAAP. (Strand Associates for the Village of Prairie du Sac)

The recommended remediation plan for the BAAP involves shutting down the groundwater pump and treat system and increase municipal water service in the area. The PDS water service area may increase under this proposed remediation plan. Therefore, that remediation plan should look closely at whether or not the existing PDS wells will be able to provide safe drinking water into the future. (Stand Associates for the Village of Prairie du Sac)

Secondly, the underground plume of contaminated water is close to the Prairie du Sac's well #3. What would happen if this well should become contaminated because the army is no longer running its system to capture at least some of the contaminants? Prairie du Sac has expressed interest in being the municipal water supplier for The Windings subdivision and Merrimac. (Wendy Carlson)

Protect and prevent contamination of existing and future municipal water wells (BAAP Restoration Advisory Board)

Protect and prevent contamination of existing and future municipal water wells (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

Without numerous monitoring wells close to Prairie du Sac, how can it be determined that some of the 3 plumes' contamination has not reached there? Prairie du Sac's Well #3 at 553ft. had a .25 detection of 1,1,1,2-Tetrachloroethane in 2008. If the proposal to eventually shut down the IRM/MIRM after clean water is brought to area homes, what will happen to Prairie and Sauk's wells? Contamination is already past Badger's southern fence, as monitoring wells south of Badger's fence verify. (John and Mary Koch)

While we can't see the contaminated groundwater moving underground, we do know that it is moving towards the groundwater supplying the municipal water to Prairie du Sac. The Army itself predicts that the contaminated plume will head towards Prairie du Sac well #3 if its groundwater treatment system is abandoned. (Georgia Tufts Gomez-Ibanez)

The Alternative FS does not clearly demonstrate that the Village of Prairie Du Sac municipal well #3 would not be affected if the IRM/MIRM is "phased out". The burden of proof should rest with the Army to reasonably demonstrate that no potential for contamination of public drinking water exists for the recommended alternative.

- There is a lack of geologic control along the axis of A-A' between the monitoring cluster north of the Village of Prairie Du Sac and municipal well #3.
- There is no discussion about the zone of influence or cone of depression in the water table from municipal well #3
- There is no correlation shown from the lithologic logs of municipal well #3 and the control wells along the A-A' axis that demonstrates the aquitard referenced to the north actually still exists in this area. Furthermore, the report states on Page 9 that "The sand and gravel aquifer and the Eau Claire are unconfined to semi-confined and possibly hydraulically connected." This contradicts the conclusion that there is no potential health and safety issue relative to public water supply
- Figures #23 and #25 don't appear to correlate where the A-A' and D-D' axis meet. The figure for the A-A' axis shows the PBG contamination plume extends into the top of the Eau Claire sandstone while the figure at the D-D' axis shows it does not at the same point of intersection.
- There is no modeling of what the PBG plume would look like under a natural attenuation approach with the IRM/MIRM turned off.
- There is no timeline associated with the "phased shut-down" of the IRM/MIRM and no criteria identified under which the shut-down plan would be evaluated. (Chris Hanson)

A thorough investigation of the risk of contaminated groundwater from the Propellant Burning Grounds entering the Prairie Du Sac well #3 is needed to ensure that human health is not threatened by this pathway. (for Citizens for Safe Water Around Badger by Peter Taglia)

Response

The closest BAAP-related groundwater contamination to the Village of Prairie du Sac is the propellant burning ground plume. Additional monitoring will be performed to check for trends in plume behavior and concentrations. The adequacy of the monitoring network, especially as it relates to the Prairie du Sac municipal wells will be evaluated as part of the natural attenuation monitoring plan.

Natural Attenuation

Comments on natural attenuation indicated that the public is not confident in natural attenuation as a remedy, is uncertain about the evidence demonstrating natural attenuation, thinks that natural attenuation will take too long, and feels that natural attenuation does not meet the Army's responsibilities for an adequate cleanup.

Public Acceptance

This board will be very involved in the process if public water for the affected properties is the final solution. The extent of the contamination at Badger and what will happen in the future remains unclear. That is why providing public water should not be tied together with discontinuing cleanup at Badger. Natural attenuation of the propellant burning ground plume could leave the Village of Prairie du Sac's water system in jeopardy. (Town of Prairie du Sac) (*)

I understand that the military proposes to build a rural water system, but only if it is allowed to abandon a massive groundwater pump-and-treat system that captures toxic pollutants at the Badger Army Ammunition Plant. This is a great way for the Army to evade its duty and “sweep the dust under the rug” so to speak – if only it were simply dust! (Margaret Welke)

Thirdly, it is just plain WRONG to leave so much contamination in place. I think deep down we all know that. (Wendy Carlson)

I want clean up, not cover up. A day's worth of war in Iraq is far more than what would cost to do the proper cleanup. (Mary Carol Solum)

Monitored Natural Attenuation: I do not believe this is a feasible alternative for decades. We need to know what is happening with the "plumes", the ground water and the aquifer. How long would it be before the "plume" reaches the Prairie du Sac wells? (where we would most likely be getting our "clean" water from) There are still too many contaminants entering Lake Wisconsin and the environment. These need to be monitored and controlled. (Pamela Wilhelm) (*)

I am not in favor of the abandonment of the current toxic treatment system because this does not “clean up” the site!! While it does create a remedy for those who will receive their water from the new public system, it still allows the current pollution to continue unchecked. Pollution can continue to adversely affect local communities such as Prairie du Sac, the Lower Wisconsin River, and other rural areas and wetlands for miles around the plant. (Susan Goldman)

It would be a travesty of the highest order if we are willing to “settle” for a new water system while allowing the pollution problem to pass unchecked into the future, possibly causing further, irreparable harm. (Susan Goldman)

Uncertainty and Evidence

I think it is very premature to consider shutting down the water treatment system. There are too many unanswered questions about conditions we don't know enough about yet. Once the Army leaves it would be relatively impossible to get them back! My lack of faith and trust is because of the historical background and my years on the RAB. I am a clean-up person, not a cover-up person. So is what it is, and we need more study, more research for this contaminated piece of property. And our regulators - DNR, Health, EPA need to regulate and follow the laws we have established. We also don't have enough knowledge of degradation and what some chemical combinations become when they degrade as toxic stew. (Mary Carol Solum) (*)

I have little faith in capping (Sauk Co. landfill) and feel a 5-yr inspection schedule is way too long between inspections. We assume this technology is safe but it hasn't been used long enough to consider it the safe solution as far as I am concerned. I do not like ugly surprises. There are too many areas left with institutional controls (skull and crossbones) – signs and fences. Our land was pristine when the Army arrived – it should be left that way. So it is their responsibility to clean it up in every sense of the word. We spend more daily on our wars than it would cost to do a proper cleanup and that's a sad reality. (Mary Carol Solum) (*)

Do not accept the premature offer from the Army that would trade a municipal system for shutting down other groundwater cleanup remedies. There are too many unknowns – cost of water to farmers, future migration of the plumes. Too little, too soon. (Margaret Lahti)

Badger/Army efforts have not been able to stop the plumes, in fact very little of the contaminants are being contained, etc., etc., so if nothing else can be done to stop the environmental hazards, why delay setting up the new municipal water system? (Paul Weum) (*)

It appears that natural attenuation may be the best alternative for the Deterrent Burning Ground and Central plumes, but it is not clear to me from the data in this report, that the municipal water supply for the Village of Prairie Du Sac is protected under the same scenario and hence, an alternative that would allow the Army to reduce/eliminate monitoring on the northeast and east areas while retaining the IRM/MIRM until further analysis of the southern area should be considered. (Chris Hanson)

My additional comment is related to the information that was shared with the Restoration Advisory Board (RAB) at its most recent meeting on April 2, 2012 regarding the DNR's criteria for closure when the DNR is considering Monitored Natural Attenuation (MNA) as an approach to contamination resolution. At that meeting, it was stated that a "stable or receding plume" is a criteria for closure when MNA is being considered. In reviewing the revised Alternative FS, it is apparent that there is no modeling of what the propellant burning ground (PBG) plume would look like once the IRM/MIRM is turned off. Given that there is no characterization of how that plume would act in the future, it does not appear that the DNR can meet the "stable or receding" criteria for closure of those areas affected by the PBG plume. I would recommend that the DNR request the Army conduct some modeling to characterize the stability and movement of the plume after the IRM/MIRM are turned off before making a final decision regarding the feasibility of the Groundwater Remedial Strategy. (Chris Hanson) (*)

In addition I think it is far too early to make this decision as the Army is not sure of exactly where the plumes are migrating off the plant. (Bart Olson)

What assurances do we have that attenuation is actually occurring and that concentrations will decline once treatment has been terminated? A review of groundwater monitoring data suggests either attenuation or dilution based on declining maximum and mean concentrations of trichloromethane, trichloroethylene and tetrachloromethane from Well PBM-9903C to Well SWN-9103C to Well PBM-9001D closest to the river. However, the proposed trend of attenuation is questionable at Well PBM-9903C (Figure 4) due to cyclical fluctuations (poor fit) and unlikely at Well SWN-9103C (Figure 2) and at Well PBM-9001D (Figure 3) with some contaminants apparently increasing. This point was actually acknowledged in the "Revised Alternative Feasibility Study Groundwater Remedial Strategy" document on pages 26 and 27. (Friends of Lower Wisconsin Riverway)

I also question where this natural attenuation is supposed to occur. To the river way or the Village of Prairie Du Sac municipal water system? The Wisconsin River, Lake Wisconsin and Gruber's Grove Bay are already on an "Impaired Waters" list with metals, mercury, elevated phosphorus and PCBs affecting aquatic quality/toxicity and contaminating fish tissue. (Leon and Joyce Hensen)

How the plumes of contamination currently behave and how they will behave once remediation ends is not well understood. (Mary Zenker)

Based on a review of the AltFS, the Army does not provide justification for selecting MNA as an appropriate final remedy for groundwater contamination at Badger and, in addition, too much uncertainty remains regarding potential threats to human and environmental health to select a final remedy at this time. (for Citizens for Safe Water Around Badger by Peter Taglia)

Selection of MNA as a final remedy for groundwater contamination can be an appropriate approach that recognizes natural processes can reduce human and environmental exposure, but the key question posed by the AltFS is whether MNA is appropriate for Badger. Based on the criteria used by the DNR and described in the AltFS (quotations below), the answer in this case is no, for the following reasons:

"Are the contaminant plumes stable and does the potential exist for the environmental conditions that influence plume stability to change over time?" The plumes at Badger are not stable and insufficient evidence has been

presented to evaluate the potential that environmental conditions at Badger identified in previous investigations will not influence the plumes in the future.

“Could human health, drinking water supplies, other groundwater, surface waters, ecosystems, sediments, air, or other environmental resources be adversely impacted as consequence of selecting MNA as the remediation option?” The selection of MNA as the remediation option may adversely impact human and environmental health in a multitude of ways at Badger and, again, insufficient evidence has been presented to demonstrate that current contaminant plumes are not impacting environmental resources, much less the potential future impacts from these unstable plumes. (for Citizens for Safe Water Around Badger by Peter Taglia)

The AltFS admits that the plumes are only “relatively” stable and “fluctuations in the concentrations of contaminants within the plumes occur,” but still incorporates MNA into all three alternatives presented for final remedies of groundwater contamination at the site. The AltFS also claims that “all three of the sources of the contaminant plumes have been adequately investigated and remediated,” a finding directly contradicted by the correction and clarification letter from the Army dated February 2, 2012 that revised the estimated quantity of DNT in the soil beneath the PBG cap upwards by a factor of 10 (a total estimated mass of 34,810 pounds instead of 3,481 pounds), indicating that the estimated mass of DNT remaining in the source area is approximately 50 times greater than the estimated mass in the current plume instead of five times greater. Given the variable concentrations of the DNT plume from the PBG, with high concentrations still present in groundwater below the source area, and the insufficient investigation of the ultimate fate of this plume (including but not limited to the lack of surface water discharge sampling, lack of a thorough evaluation of the risk of PBG groundwater contaminants entering the shale zones at the top of the Eau Claire formation and the uncertain risk to Prairie Du Sac municipal well 3), MNA is not an appropriate final remedy to address this contaminant plume. (for Citizens for Safe Water Around Badger by Peter Taglia)

What isomers of DNT were analyzed under what laboratory detection limits to produce the source area soil and groundwater analytical results presented in the AltFS? Both recent (2010) and historical data is presented in the AltFS to establish the appropriateness of monitored natural attenuation, but the information does not clearly identify what DNT isomers were used to calculate “total DNT” concentrations or the limits of detection and quantification from the laboratory performing the analyses, and how these limits changed over time. Page 22 of the AltFS notes that “SpecPro laboratory’s current limit of detection (LOD) for all DNT isomers is 0.015 µg/l” but does not indicate the earlier LOD. This data is important to assess if the proposed final remedy of monitored natural attenuation is appropriate. (for Citizens for Safe Water Around Badger by Peter Taglia) (*)

Why are there no graphs of the concentrations of DNT over time in the propellant burning grounds where concentrations are currently highest? The concentration data from the source area such as the different depth intervals at the PBN-8202 nest do not show consistent trends. Graphs, data and interpretation for this and other wells in the propellant burning grounds are needed to evaluate if the criteria for MNA are met for DNT. (for Citizens for Safe Water Around Badger by Peter Taglia)

What are possible explanations for the high concentrations of DNT found in the source area at the deterrent burning ground as shown on Figure 34? There also may be evidence of pulses of higher concentrations resulting from changes in the hydrology. In either case, this data raises questions about the long-term continuation of this plume. (for Citizens for Safe Water Around Badger by Peter Taglia)

The selection of MNA as a final remedy is not justified under the criteria presented. MNA is not appropriate as a final remedy at Badger because the groundwater plumes are not stable, source areas are not fully characterized and the ultimate fate of the groundwater plumes has not been shown to be protective of environmental resources either currently or in the future. (for Citizens for Safe Water Around Badger by Peter Taglia)

Responsibility

Pursuant to State Statute 292.12(1)(d), a "Remedial action" means action that is taken in response to a discharge of a hazardous substance and that is necessary to restore the environment to the extent practicable and to minimize the harmful effects of the discharge to the air, lands, and waters of this state. Pursuant to Administrative Code 700.03 (48), "Remedial action" means those response actions, other than immediate or interim actions, taken to control, minimize, restore or eliminate the discharge of hazardous substances or environmental pollution so that the hazardous substances or environmental pollution do not present an actual or potential threat to public health, safety or welfare or the environment. The term includes actions designed to prevent, minimize, stabilize or eliminate the threat of discharged hazardous substances, and actions to restore the environment to the extent practicable and meet all applicable environmental standards. Examples include storage, disposal, containment, treatment, recycling or reuse, and any monitoring required to assure that such actions protect public health, safety and welfare and the environment. Does the preferred remedy meet the all requirements of a "remedial action"? If not, what are the potential implications? Are there other alternatives that could better meet the requirements of a remedial action? (Citizens for Safe Water Around Badger) (*)

Please make sure the Army continues to monitor the water quality. The groundwater modeling reports have been inconsistent, so we can't predict what will happen. We cannot assume anything. (Rick and Cindi Kekula)

Please make sure the Federal Government cleans up the pollution regardless of the water wells or municipal water. Private sector would be required to do this. (Rick Kekula)

Municipal water is one solution to clean drinking water, I believe that the Army still has a definite duty and responsibility to comply with groundwater standards. Continued active cleanup is necessary both to protect human health and property value, and to restore groundwater resources that sustain our wetlands, springs, fisheries, and surface water in accordance with the requirements of NR 720.11 and NR 720.09 of the Wisconsin Administrative Code. (postcard received from nine people) (*)

The Army should not be let off the hook, until the groundwater is mediated to the compliance levels as set by the EPA for safe levels for drinking. As with the mining bill...Wisconsin's environment should be more important than \$\$ dollars. Take a stand and make the Army continue the cleanup. (C. Hamm)

I feel very strongly that the WDNR needs to take a stronger stance on groundwater issues and consider the importance of their regulatory responsibility. It is time to set higher standards on groundwater quality and to protect the health of humans and wildlife. The military should be held accountable for the contaminated groundwater at the Badger Army Ammunition Plant and keep in place the groundwater treatment system to restore groundwater and prevent contamination from entering rivers, wetlands and natural springs regardless of costs. It is important for the military to take their responsibility seriously and clean up and solve the environmental problems that their actions have caused. Solvents and explosives need to be removed from the groundwater and not allowed to flow into the lower Wisconsin riverway. Monitoring contaminated plumes from the site is quite a low standard; lets clean up the mess and set a model for future groundwater issues around the state. (Jeremy Batson)

Just because it's the Army they need to be held at the same high standard anyone else would be. (Mary Carol Solum)

Politics should not enter in. The laws are the laws and the Federal Government should be setting the example – Badger is not the only Army/Military contaminated mess – maybe the worst, but not the only one. We need to see the highest standard for cleanup possible and insist on it! (Mary Carol Solum) (*)

Achieve prompt compliance with all federal and state environmental regulations, including Wisconsin's Groundwater Enforcement Standards and Drinking Water Health Advisories, and discourage exemptions and non-compliance (BAAP Restoration Advisory Board)

I want to make sure that cleanup achieves compliance with Wisconsin's Groundwater Enforcement Standards and Health Advisory Levels for Drinking Water. (Margaret Welke)

Cleaning up the groundwater contamination is the only long-term solution to ending increased or ongoing discharges to the Lower Wisconsin Riverway, wetlands, springs, other surface water, homes and farms. (Andrew Hanson)

The DNR should require the Army to BOTH comply with groundwater quality standards AND provide clean drinking water to protect human health and the environment. (Leon and Joyce Hensen)

I really think that the DNR needs to hold the Army's feet to the fire to continue cleaning the ground water and monitoring the plumes even after building the safe water system. Since no one really knows everything that has been dumped on the area, I think that it is important that this situation be monitored to understand what is happening. I would hate to see further major issues arise in 5-10 years after the Army has walked away. I think that this is especially important as it appears that everyone agrees that the plume eventually hits the Wisconsin River and could have major impact on that resource should contamination continue or escalate. (Roger Heidenreich)

I just don't understand why the Federal Government isn't held to the same standards as what a private sector party would be. (Ronald and Andrea Grosse)

The DNR issued an order for further remediation and then apparently withdrew the process and is now taking this public comment, after being aware that this DNT can cause Kidney problems along with other health related issues, I am gravely concerned for my son's health, as he must live with us as caretakers and he has had Two Kidney transplants to date and now the second one is failing, his health is a Major concern for our family and this could ultimately cause us to move from the area which we truly love, As standards are developed I don't understand why there not enforced? (A very concerned parent) (*)

I want to express my support for the position of CSWAB regarding Badger pollution. I live on Lake Wisconsin, east of the ground water pollution. I should add that I am a conservative and very mindful about wasting government money.

I believe that the government (army) should be held to the same standards as the citizens. When my elderly mother needed to enter assisted living I was tasked with selling her home. One of the first questions the realtor asked was if there were any buried oil tanks on the property. The home was heated with gas, but I recalled that as a child an oil truck arrived regularly to fill a tank. After some probing I located the tank. I called a plumber friend of mine to dig it up and dispose of the tank. He explained that this could only be done by a certified removal specialist in the presence of a state inspector. Moreover, if the tank had leaked (considered likely) my mother would be liable for the removal of contaminated soil, even if the contamination extended under a neighbor's garage. My mother had very limited assets, but the liability was unlimited. Fortunately the tank had not leaked. Fortunately for the state as well. My mother was able to retain enough of her assets to pay for assisted living and never had to apply for state welfare.

I think it's entirely fair and reasonable that the Army be held to the same standard of liability that applied to my elderly and helpless mother. (Thomas McWilliams)

Eliminate Risks to People and the Environment

Value 2, Criterion 2.3 of the Badger Reuse Plan stipulates that "the final level of cleanup should not restrict future use and pose no risk to people or the environment, including soil, water, air, and biodiversity."

The groundwater contamination solution should:

- prevent potential human exposures to groundwater contaminants through ingestion, inhalation, and dermal contact
- protect and prevent contamination of existing and future municipal water wells
- prevent further contamination of lakes, streams, rivers, wetlands, natural springs, and aquatic ecosystems
- prevent the movement of contaminants to groundwater
- achieve prompt compliance with all federal and state environmental regulations and public health standards, and discourage exemptions and non-compliance
- and will not compel the public and affected residents to choose between the offer of municipal water and environmental quality where they live, work and play. (Badger Oversight & Management Commission)

...achieve prompt compliance with all federal and state environmental regulations, including Wisconsin's Groundwater Enforcement Standards and Drinking Water Health Advisories, and discourage exemptions and non-compliance (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

I believe the Army is going to walk away from the responsibilities of a complete cleanup and is thumbing their nose at the state, the written environmental laws, environmental ethics, and the safety of Wisconsin. This would not be a first. Consider the many times the Army has said things are now 'OK' and that was not the case. (Donna Schmitz)

If the DNR is to accept the natural attenuation approach, it is necessary to condition the approval such that the monitoring criteria are clear and the consequences (i.e. regulatory action) based on the feedback from the monitoring are identified to the Army and the public. (Chris Hanson)

The DNR's February 13, 2012 preliminary determination of feasibility appears to focus primarily on its regulatory obligation to public drinking water safety but does not address the broader responsibility to minimize environmental degradation. (Chris Hanson)

I believe deeply that the Army has a responsibility to clean up the contamination at Badger completely enough to comply with Wisconsin's Groundwater Enforcement Standards and Health Advisory Levels for drinking water. I am asking the DNR to require the Army to do so. (Georgia Tufts Gomez-Ibanez)

I am appreciative of the Army being concerned about our drinking water, but we are concerned about more than just that. What about all the groundwater that is being used for other things than drinking? (Marge Hill)

Time Frame

The Alternative FS references that natural attenuation will remediate the groundwater within a "reasonable period of time" in several places, but does not provide a model or estimate of what that time actually is. In addition, the DNR has stated it would require additional monitoring of the natural attenuation approach, but does not specify the nature of that monitoring nor the criteria that would be used to evaluate the monitoring results. Based on the transport equations in the report, it would take approximately 60 years for a molecule of contaminant to move from the PBG area to the Wisconsin River, but the report does not estimate the total flushing time anticipated under the natural attenuation approach, given the variables in soils, geology, etc. Based on my past experience and the likelihood that DNT would be the slowest to move, total flushing time for contaminants from the PBG could be at least 100 years. (Chris Hanson)

If the pump and treat system is shut down at the P.B.G. contaminated water will continue to flow under my land for generations to come. My grandchildren might live long enough to see the end of the problem. (Ron Lins)

It is very important that the DNR does whatever it can to enforce active environmental restoration at Badger within reasonable means. The Army needs to take responsibility to clean up the mess it has created. Our future generations should not have to live with the effects of this contamination whether it be in the surface water, ground water, soil, or air. There needs to be a long-term solution before the Pump and Treat system is shut down. (Marge Hill)

If you consider when Badger stopped production, natural attenuation, has been in process for between 45 and 65 years---AND if it worked throughout that length of time, why do we still have so much contamination at the levels it is still being found? In readings from Los Alamos and the University of Iowa, they mention bioremediation being done at Badger for DNT contamination—that is the only way to break it down once it is below the surface and especially in water, where it is easily carried along without naturally breaking down. The Iowa study indicates the start of the project at Badger in 2001....and the results are still alarming in 2012 with high concentration of total DNT still existing at Badger. (John and Mary Koch)

Response

The use of natural attenuation at this site will follow the same regulatory pathway that has been successfully used at other cleanup sites in Wisconsin. The groundwater plumes will need to meet the requirements of ch. NR 726, Wis. Adm. Code for the site to be considered for case closure. The Department will assure, and the Army will have to demonstrate that natural attenuation, as a final groundwater remedy, is protective of human health and the environment. The Army must have a work plan approved in order to monitor and demonstrate natural attenuation at, and down-gradient of, the site. That plan is expected to be submitted by Army to DNR within the coming year.

Soil Cleanup and Contaminant Source Control

Comments on soil cleanup and source control measures are related to the probable success of natural attenuation as a final remedy.

NR716.11 (3) (a), Wisconsin Administrative Code, states that responsible parties must “Determine the nature, degree and extent, both areal and vertical, of the hazardous substances or environmental pollution in all affected media.” (Wisconsin Wildlife Federation)

Prevent the movement of contaminants from soil to groundwater (BAAP Restoration Advisory Board)

Prevent potential human exposures to groundwater contaminants through ingestion, inhalation, and dermal contact (BAAP Restoration Advisory Board)

Are the remedies at the PBG and DBG working and stopping subsurface soil contamination from moving to groundwater? (Citizens for Safe Water Around Badger email)

What percentage of subsurface contamination has reached groundwater already and what percentage remain (at DBG and PBG)? (Citizens for Safe Water Around Badger email)

How high might groundwater contaminant levels rise (worse case scenario) at DBG and at the PBG in the future? (Citizens for Safe Water Around Badger email)

Prevent the movement of contaminants from soil to groundwater (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

Prevent potential human exposures to groundwater contaminants through ingestion, inhalation, and dermal contact (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

I don't think the water system should stop the clean-up of the pollutants to the river or the chance that it will affect the village of Prairie du Sac's water wells. During the late 60's I worked at BAAP and I don't think the Army has identified all of the sources of contaminants in the plant. (Charles Wilhelm)

DNT'S (dinitrotoluenes) - Consistent with the Badger Reuse Plan, we are writing to support the WDNR's September 15 request for actual field data and a science based assessment of ecological and environmental health risks posed by all six forms of the carcinogenic explosive DNT found in soils at Badger Army Ammunition Plant. (Wisconsin Wildlife Federation)

According to the Wisconsin Division of Public health, DNT can affect the blood, nervous system, liver, kidneys, and male reproductive system in both humans and animals, and is a suspected human carcinogen. The 2,3-DNT isomer has not been shown to biodegrade and no studies have been conducted to demonstrate that 3,4-DNT, 3,5-DNT, or 2,5-DNT will biodegrade in soils or groundwater, according to scientists with the U.S. Air Force research laboratory. (Wisconsin Wildlife Federation)

To date, soil testing at Badger has included only two out of the six isomers of dinitrotoluene (DNT): 2,4-DNT and 2,6-DNT. Soil testing for all six isomers of DNT, where DNT is a contaminant of concern, will help assure that the Army determines the nature, degree and extent of hazardous substances or environmental pollution in all affected media. This additional testing requirement will aid in the evaluation of potential direct contact risks by humans, fish and wildlife. It will also identify possible sources of leaching of DNT to groundwater, and will verify the relative ratios of DNT isomers in soil at the facility. (Wisconsin Wildlife Federation)

We do not find it necessary for WDNR to wait for the establishment of EPA guidance on appropriate DNT levels at Badger. This only unnecessarily delays the obvious need to check Badger lands for all forms of DNT contamination. It may take EPA more than a year to provide a report with guidance on this matter and in the meantime the Army may conclude its job is done and leave. There is a clear need to require the Army to act now. (Wisconsin Wildlife Federation)

If the additional isomers of DNT are detected in soils, we believe that the Army should be required to develop cleanup standards that are protective of human health, fish and wildlife and all anticipated future uses at Badger including grazing, camping, hunting and fishing, agriculture, hiking, and all other land uses consistent with the Badger Reuse Plan. (Wisconsin Wildlife Federation)

The DNR issued an order for further remediation and then apparently withdrew the process and is now taking this public comment, after being aware that this DNT can cause Kidney problems along with other health related issues, I am gravely concerned for my son's health, as he must live with us as caretakers and he has had Two Kidney transplants to date and now the second one is failing, his health is a Major concern for our family and this could ultimately cause us to move from the area which we truly love, As standards are developed I don't understand why they are not enforced? (A very concerned parent) (*)

I have little faith in capping (Sauk Co. landfill) and feel a 5-yr inspection schedule is way too long between inspections. We assume this technology is safe but it hasn't been used long enough to consider it the safe solution as far as I am concerned. I do not like ugly surprises. There are too many areas left with institutional controls (skull and crossbones) – signs and fences. Our land was pristine when the Army arrived – it should be left that way. So it is their responsibility to clean it up in every sense of the word. We spend more daily on our wars than it would cost to do a proper cleanup and that's a sad reality. (Mary Carol Solum) (*)

Politics should not enter in. The laws are the laws and the Federal Government should be setting the example – Badger is not the only Army/Military contaminated mess – maybe the worst, but not the only one. We need to see the highest standard for cleanup possible and insist on it! (Mary Carol Solum) (*)

In addition to providing insufficient justification for the selection of MNA as a final remedy for the groundwater plumes at Badger, the AltFS also fails to justify the statement that “all three of the sources of the contaminant plumes have been adequately investigated and remediated,” a pre-requisite for selecting any final remedy, with or without MNA. Despite a multitude of investigations over many decades, the public has been unwittingly exposed to groundwater contamination from Badger that was not expected under the conceptual model of groundwater flow used by the Army and therefore the Army must provide a particularly high level of confidence that the source, extent and fate of groundwater contaminants are well known at Badger before asking for a final remedy. This level of confidence is not justified based on the data and analysis in the AltFS. The conceptual model of groundwater flow at Badger still does not confidently describe the current behavior or the future predicted behavior of the three groundwater plumes. The central contaminant plume was only identified in 2004 after the Army thought that the full extent of groundwater contamination was already known. During the time the source areas for the three plumes were evaluated, methods of analyzing all isomers of DNT and characterizing the toxicity of these isomers has progressed, yet the AltFS does not adequately describe the conceptual model of groundwater flow from the DNT source areas based on the most recent science. Finally, the wide variation in observed groundwater levels and flow direction at Badger have not been adequately evaluated to justify a final remedy, particularly for the Northeast portion of the site and groundwater flow in the shale at the top of the Eau Claire formation. (for Citizens for Safe Water Around Badger by Peter Taglia)

What isomers of DNT were analyzed under what laboratory detection limits to produce the source area soil and groundwater analytical results presented in the AltFS? Both recent (2010) and historical data is presented in the AltFS to establish the appropriateness of monitored natural attenuation, but the information does not clearly identify what DNT isomers were used to calculate “total DNT” concentrations or the limits of detection and quantification from the laboratory performing the analyses, and how these limits changed over time. Page 22 of the AltFS notes that “SpecPro laboratory’s current limit of detection (LOD) for all DNT isomers is 0.015 µg/l” but does not indicate the earlier LOD. This data is important to assess if the proposed final remedy of monitored natural attenuation is appropriate. (for Citizens for Safe Water Around Badger by Peter Taglia) (*)

Response

The soil remedies for propellant burning ground and deterrent burning ground were approved on March 17, 2008 and October 14, 2002, respectively. Additional remedial actions on individual parcels are reviewed by DNR’s regional case closure committee for compliance with the NR700 series cleanup rules. No additional evaluation of the previously-approved soil remedial actions is planned at this time. If natural attenuation does not prove to be an adequate final remedy, the source area controls and past remedial actions will be reexamined.

Wetlands/Wildlife/Wisconsin River

There were many comments and questions about the down-gradient effects of the groundwater contamination.

Municipal water is one solution to clean drinking water. I believe that the Army still has a definite duty and responsibility to comply with groundwater standards. Continued active cleanup is necessary both to protect human health and property value, and to restore groundwater resources that sustain our wetlands, springs, fisheries, and surface water in accordance with the requirements of NR 720.11 and NR 720.09 of the Wisconsin Administrative Code. (postcard received from nine people) (*)

Prevent contamination of lakes, streams, rivers, wetlands, natural springs, and aquatic ecosystems (BAAP Restoration Advisory Board)

Very high numbers of endangered, threatened and special concern fish and invertebrate species reside in the river section close to where the PBG plume discharges into surface water (see Table 4). FLOW members are concerned about the potential impacts of the existing contaminated groundwater plume on endangered resources and other important aquatic ecosystem species and whether concentrations of toxic chlorinated ethenes and halogenated methanes will actually increase if the wastewater treatment system is abandoned. The diverse rare and common benthic species could be exposed to contaminated groundwater continuously or during early life history stages for other species. (Friends of Lower Wisconsin Riverway)

The United States Department of the Army currently holds a WPDES permit for the discharge of treated contaminated groundwater and that permit includes water analysis and bioassays. Have the United States Department of the Army or regulatory agencies conducted bioassays on contaminated groundwater that flows into the Lower Wisconsin River? Most bioassays do not involve environmentally sensitive species but rather common species such as fathead minnows (*Pimephales promelas*) or *Ceriodaphnia dubia* that probably will not reflect the environmentally sensitive and endangered species found in the Lower Wisconsin River. Bioassays should include environmentally sensitive species native to the river including perhaps the river darter (*Percina shumardi*) and Iowa darter (*Etheostoma exile*). Since there is currently no data available on concentrations of volatile organic compounds reaching the river, a conservative approach is to consider the chronic toxic levels of tetrachloromethanes discussed on page 38 (Revised Alternative Feasibility Study Groundwater Remedial Strategy). Concentrations of certain halogenated methanes and chlorinated ethenes also exceed Canadian water quality guidelines for protection of aquatic life: particularly for both trichloromethane and tetrachloromethane. The Canadian guidelines for tetrachloromethane (13.3 ug/l), trichloromethane (1.8 ug/l) and 1,1,2-trichloroethene may be appropriate given the unusually high numbers of endangered, threatened and special concern species that inhabit the Lower Wisconsin River near the contaminated plume. On page 23 of "Revised Alternative Feasibility Study Groundwater Remedial Strategy, the authors acknowledged that the fate of volatile organic compounds at the confluence of groundwater discharge and surface waters are poorly understood, much less impacts to resident aquatic life. (Friends of Lower Wisconsin Riverway)

Have the United States Department of the Army and regulatory agencies considered the potential synergistic effects of multiple contaminants on aquatic life? Bioassay testing rarely involves multiple contaminants that are found in the contaminated groundwater plume that reaches the Lower Wisconsin River. The toxic synergism may involve degradation products that can be more toxic than the parent compounds. As mentioned above, the tests also do not involve the relevant species. (Friends of Lower Wisconsin Riverway)

Has the Antidegradation analysis been performed since the Lower Wisconsin River is classified ERW and background water quality criteria are required? The concentrations of various chlorinated ethenes and halogenated methanes found in Well PBM-9001D already exceed the WPDES effluent limits for discharge to a Warmwater Fish and Aquatic Life classified waterbody that is less restrictive than ERW. Lacking surface water data on contaminant levels, an argument can be made that the increasing contaminant levels in Well PBM-9001D violates NR 207 without adequate justification and the increases do not adequately protect the public trust and unique aquatic life in the Lower Wisconsin River. (Friends of Lower Wisconsin Riverway)

Are there any plans to document current impacts of the contaminated groundwater plume to the Wisconsin River at the area of confluence to include surface water testing for volatile organic compounds and surveys of aquatic communities? As mentioned above, there is currently no information on the concentrations and fate of contaminants entering the Lower Wisconsin River and what those impacts potentially are. A reference site for monitoring would be desirable as well. (Friends of Lower Wisconsin Riverway)

Have the US Fish and Wildlife Service and WDNR Bureau of Endangered Resources been consulted about the possibility of a Federal or State Incidental Action as a result of the current proposal? A violation of the Federal Endangered Species Act and the State Endangered Species Law (Section 29.604, Wis. Stats.) could occur if a

proper finding does not occur on whether listed species could be impacted from the current proposal. (Friends of Lower Wisconsin Riverway)

The Army should be made responsible to stop increased or ongoing toxic discharges and not further contaminate by allowing pollutants to migrate with groundwater and flow into the Wisconsin Riverway, wetlands, springs and other surface waters. (Leon and Joyce Hensen)

There is concern that the discharge to the river below the dam has not been adequately studied and measured. (Mary Zenker)

Protect Cultural Resources – Value 7, Criterion 7.4 of the Badger Reuse Plan states that “future uses should not adversely affect the visual quality of the restored landscape or result in damage to natural or cultural resources.” The groundwater contamination solution should protect surface and subsurface cultural resources and medicinal plants. (Badger Oversight & Management Commission)

Protect Plant and Animal Populations – Value 7 of the Badger Reuse Plan emphasizes that “uses of the Badger property will protect and enhance the natural landscape, geological features, biological communities, plant and animal populations, and ecological processes of the property and surrounding properties.” The groundwater contamination solution should prevent exposure of wildlife and domestic animals to groundwater contaminants in surface water resources used for drinking (Badger Oversight & Management Commission)

Prevent contamination of lakes, streams, rivers, wetlands, natural springs, and aquatic ecosystems (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

The movement of the DNT components from the central plume are likely discharging to the Wisconsin River system around the Prairie Du Sac dam and not into Gruber’s Grove Bay. (Chris Hanson)

There is an insinuation, based on the statement on Page 9, that the DNT from the central plume discharges into Gruber’s Grove Bay. However, it is more likely, based on the hydrogeology as depicted in Figure 37, that it discharges closer to or below the Prairie Du Sac dam. Hence, this discharge is more likely to affect downstream water quality than to be captured in the sediments of Lake WI. (Chris Hanson)

The report states that SVOC’s and VOC’s don’t bioaccumulate and therefore, eating the fish should not be a problem, but the report is silent about any affects to fish reproductive rates, benthic organisms or aquatic habitat. Further, I saw no analysis about the potential impact of DNT on fish and aquatic populations. (Chris Hanson)

It’s not only the residents surrounding the Badger Property that will be affected by this contamination. All of the residents and users along the WI River will be affected as the water plumes migrate to the river with this contamination. We need to protect the Lower WI Riverway and all the wetlands and springs along it. The DNR has an obligation to protect the State’s groundwater, rivers, wetlands, land springs. (Marge Hill)

I am formally requesting testing of contaminants in the many seeps along the Wisconsin River below the Prairie du Sac Dam. These are apparent on both shorelines especially during average water levels. Most are located on the West shoreline. If you need direction to the seeps, I will be glad to show them to you... (Donna Schmitz)

Three Plumes - It is a known fact that there are presently three plumes of contaminated water migrating towards the Wisconsin River. The northeast plume is reaching a wetland that is part of the Wisconsin River ecosystem. The Federation is concerned about the level of contamination reaching the wetlands and the river and its possible contamination of fish and wildlife. We are asking WDNR to require the Army to prevent all contaminants from reaching the wetlands and Wisconsin River ecosystem. Once prevention measures have been taken WDNR should also require the Army to test and verify that contaminates from Badger are no longer reaching the wetlands

or the Wisconsin River. WDNR needs to make sure these contaminants do not pose a health hazard to people who may use the river to swim, boat, or fish and to fish and wildlife that may be consumed by the people who hunt or fish along or in the river. (Wisconsin Wildlife Federation)

Contaminants are currently discharging into wetlands and springs in Weigand's Bay, Gruber Grove Bay along the Wisconsin River! This is all clearly unacceptable! (Georgia Tufts Gomez-Ibanez)

I am further asking the DNR to require the Army to continue its efforts to stop ongoing contaminated discharges to the Lower Wisconsin Riverway, including its wetlands and springs. (Georgia Tufts Gomez-Ibanez)

The Army's proposal does not provide sufficient assurances that these (water) ecosystems will be protected and it is therefore UNACCEPTABLE. (Margaret Welke)

Did the Army look at how much, if any, contamination is in the springs and seeps below the Dam? I worked at the Hydro Plant for 36 years and I know they are there. (Charles Wilhelm)

Our families boat and swim in Lake Wisconsin. How safe is that? (Pamela Wilhelm)

Monitored Natural Attenuation: I do not believe this is a feasible alternative for decades. We need to know what is happening with the "plumes", the ground water and the aquifer. How long would it be before the "plume" reaches the Prairie du Sac wells? (where we would most likely be getting our "clean" water from) There are still too many contaminants entering Lake Wisconsin and the environment. These need to be monitored and controlled. (Pamela Wilhelm) (*)

... the Army to continue to monitor the ground water and test wells and continue active ground water treatment and stop the discharges of contaminants into the lake, river way, wetlands, springs and other surface water and our environment. (Pamela Wilhelm) (*)

Because, even if everyone has clean well water, that doesn't solve the remaining problems: won't there still be some toxic plumes eventually reaching Wisconsin River (yes), won't there still be toxic poisons underground, at least some rising up to the grass/trees/vegetation on the ground-being eaten by domestic/wildlife animals(yes), won't there still be danger of new plumes starting underground we currently know nothing of(yes) Once the Army is gone, who will be responsible for 'cleaning up' these remaining toxic poisons? Who will even monitor their underground movement? (Steven F. Weynand)

My second concern is that we don't have enough information to warrant the cessation of groundwater cleanup. The three contaminated groundwater plumes are not well defined and therefore should not be allowed to naturally attenuate. Hydrogeologist Peter Taglia explained at a March public meeting hosted by Citizens for Safe Water Around Badger that the Army should do more testing of the plumes as they travel to and reach the Wisconsin River, and that they should also test the natural springs near the river. He also suggested that the northeast plume should never be allowed to attenuate naturally since there is a small risk that it could contaminate the new groundwater well for the proposed water district. (Michele Hopp) (*)

Please make sure that a complete wildlife and aquatic inventory is part of the Department's decision-making process. (Citizens for Safe Water Around Badger)

Additional investigation and analysis is needed to characterize the environmental impacts of contaminated groundwater discharge to surface water and springs before selection of a final remedy at Badger. (for Citizens for Safe Water Around Badger by Peter Taglia)

Response

Additional evaluation of the down-gradient effects of the groundwater plumes will be required as part of this approval. The Army will need to assure that the plume concentrations are stable, and will need to estimate the mass of groundwater and groundwater contaminants discharging to surface water. Part of this evaluation could include testing of groundwater discharge points, like the known seeps and springs.

At the present time, and based on the available data, the Department does not anticipate negative effects to human health or the environment as a result of the discharge of the groundwater contaminants to the Wisconsin River or Lake Wisconsin. Additional evaluation is needed to test the validity of this conclusion.

Human-health related values for two primary groundwater contaminants, carbon tetrachloride and 2,4-dinitrotoluene, are 2.5 ug/L and 0.51 ug/L respectively (NR 105, Wis. Adm. Code). The lowest Predicted No Effect Concentrations for wildlife for these compounds are 7 ug/L (Euro Chlor Risk Assessment for the Marine Environment, February 1999) and 2 ug/L (SCHER Opinion on Risk Assessment Report on 2,4-Dinitrotoluene, Environmental Part), respectively. Based on this evaluation, the human-health related concentrations are the most restrictive.

The highest concentrations in the propellant burning ground plume, downgradient of the facility, shown on cross-section A-A' are 75.9 ug/L for carbon tetrachloride (SWN-9103B) and 4.443 for 2,4-dinitrotoluene (PBN-9902C). Much lower concentrations are found in the remainder of the plume. However, these numbers are used to create a conservative estimate of the amount of dilution needed for concentrations to meet the surface water values. Based on these values, the necessary dilution to meet the values are 31 times for carbon tetrachloride and 9 times for 2,4-dinitrotoluene.

We estimate dilution of the propellant burning ground plume, after mixing with the Wisconsin River to be 1,000 times or more. Assumptions include plume parameters of 1600 feet wide, 100 feet thick, 25% porosity, 1 foot per day travel, and Wisconsin River flow rate of 28,000 cubic feet per second. This evaluation of plume dilution is conservative because only a small cross-section of the plume is at the higher concentrations cited above.

Modeling/Monitoring/Data Presentation

Several commenters inquired about the past numerical modeling efforts, the future of groundwater monitoring, and the quality of the data presentation. These topics are inter-related and have been grouped together.

Modeling

Groundwater modeling that was not carried forward in the final document indicated that the PBG plume over time could move closer to Village Well #3. This is a big deal in terms of risks to public health. In this case, the public needs to know if modeling was not carried forward because the conclusions were completely invalid (science) or because it didn't support the Army's preferred alternative (not science). In cases where earlier information contradicts later submittals, we expect and rely on the Department to decide which information and data are reliable and pertinent. In the same way, it is reasonable to expect that affected residents and communities will ask about circulated drafts that contain information indicating a risk to public health and the environment. I think folks deserve an answer. (Citizens for Safe Water Around Badger email)

Additional modeling simulations should be completed to predict plume migration and plume concentrations with and without the BAAP pump and treat system operating and including current and projected pumping from private and municipal supply wells. (Stand Associates for the Village of Prairie du Sac)

My additional comment is related to the information that was shared with the Restoration Advisory Board (RAB) at its most recent meeting on April 2, 2012 regarding the DNR's criteria for closure when the DNR is considering Monitored Natural Attenuation (MNA) as an approach to contamination resolution. At that meeting, it was stated

that a "stable or receding plume" is a criteria for closure when MNA is being considered. In reviewing the revised Alternative FS, it is apparent that there is no modeling of what the propellant burning ground (PBG) plume would look like once the IRM/MIRM is turned off. Given that there is no characterization of how that plume would act in the future, it does not appear that the DNR can meet the "stable or receding" criteria for closure of those areas affected by the PBG plume. I would recommend that the DNR request the Army conduct some modeling to characterize the stability and movement of the plume after the IRM/MIRM are turned off before making a final decision regarding the feasibility of the Groundwater Remedial Strategy. (Chris Hanson) (*)

Monitoring

Have there been test wells and testing to the north of Badger, for example around Devil's Lake? I am concerned about the "plume" changing course and heading north to my well. (C. Hamm)

...continue to monitor the ground water and test wells and continue active ground water treatment and stop the discharges of contaminates into the lake, river way, wetlands, springs and other surface water and our environment. (Pamela Wilhelm) (*)

Protect groundwater quality by documenting the fate and transport of subsurface contaminants as goals and monitoring compliance with those goals (BAAP Restoration Advisory Board)

(We recommend) regularly testing all the private wells on Spear Road. (Citizens for Safe Water Around Badger email)

(We suggest) Continue to monitor Central Plume, DBG and PBG and replace wells that may be impacted. (Friends of Lower Wisconsin Riverway)

(We suggest) Expand monitoring and evaluation of potential impacts to the Lower Wisconsin River and endangered resources. (Friends of Lower Wisconsin Riverway)

The greatest concern is that all 6 forms of the DNT isomers be tested and continue to be tested far into the future. (Mary Zenker)

How will monitoring continue? (Charles Wilhelm)

Future work and monitoring of water and wells can be done and is a good investment of conservation. (Elayne Lastafka)

Protect groundwater quality by documenting the fate and transport of subsurface contaminants as goals and monitoring compliance with those goals. (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

I own and operate my farm on County Road Z one half mile from BAAP. It is a grain farm and has hog facilities that can consume large amounts of water. I also have a bedrock well that is located directly above the PBG plume. It has never shown any contamination in the quarterly samples that the army has taken since 1990. This well is directly in line with the Village of Prairie du Sac's well and could give a forewarning of problems with the bedrock aquifer if it were continued to be sampled in the future instead of abandoning it. (Ron Lins) (*)

Data Presentation

A report evaluating the vertical extent of groundwater contamination from the BAAP and the risk and the likelihood of the groundwater contamination extending to or below the Eau Claire formation should be prepared.

The report should evaluate the depth, thickness, integrity, continuity, and characteristics of the Eau Claire formation, the construction of the PDS Well No. 3. (Stand Associates for the Village of Prairie du Sac)

Where is Prairie Du Sac well #3 on the area and cross-section figures for the propellant burning ground plumes? Only Figure 19 shows this well. (for Citizens for Safe Water Around Badger by Peter Taglia)

What is the magnitude of the increased groundwater withdrawal by this well in relation to the expanded pumping associated with the expanded water supply? (for Citizens for Safe Water Around Badger by Peter Taglia)

How does the groundwater modeling parameters used to calculate the zones of contribution to Prairie Du Sac well #3 compare with those used in previous groundwater modeling at Badger and in the conceptual model of groundwater flow presented in the AltFS? (for Citizens for Safe Water Around Badger by Peter Taglia)

What data points were used to draw Figure 5, the bedrock surface map for BAAAP and the surrounding environment? Well construction and geology information is presented elsewhere in the AltFS for cross-sections, including the top of the Eau Claire Formation (Figures 9 and 10) but the areal extent of the bedrock surface in relationship to the groundwater contaminant plumes is not clearly described. This information is particularly relevant to evaluating the continuity of the shale that is described in the conceptual model of groundwater flow in the AltFS as an aquitard that prevents the movement of contaminated groundwater from the unconsolidated aquifer to the bedrock aquifer that is the source of drinking water for Prairie Du Sac well #3. (for Citizens for Safe Water Around Badger by Peter Taglia)

What is the variability in vertical and horizontal groundwater gradients observed at BAAAP during the various groundwater investigations? The AltFS provides a description of the hydrogeology based on 2010 data and this interpretation appears to be included in the conceptual site model for groundwater flow that is then used to request a final remedy of monitored natural attenuation for the contaminant plumes. The availability of previous groundwater investigation reports are referenced in the text but the large variability in groundwater levels and flow directions are not presented and described in relationship to the conceptual site model. For example, the groundwater levels in the unconsolidated aquifer in the Northeast portion of the site varied by 5 feet between 1991 and 1995 and changed the dominant groundwater flow directions. Examples of the full range of vertical and horizontal groundwater flow at BAAAP (i.e., select figures from previous reports and/or a summary table), the observed range of precipitation for BAAAP in Section 4.3 and an interpretation of this range would be useful in evaluating the AltFS and the three alternatives presented. (for Citizens for Safe Water Around Badger by Peter Taglia)

Which private wells have had detections of the groundwater contaminants illustrated in the isoconcentration maps? The figures show what wells were used to construct the isoconcentrations (in red), but the addition of one or more colors or shapes for private wells in aerial view which have had either detections, PAL or ES exceedences are needed to evaluate plume stability and consistency necessary to apply MNA as a remedy. In particular, representations of wells with detections of contaminants in the area around the Dam Heights and Windings of Wisconsin neighborhoods will be helpful in assessing the proposed final remedies for the propellant burning grounds and central plumes. (for Citizens for Safe Water Around Badger by Peter Taglia)

What are possible explanations for the variation in the behavior of the different contaminants in the source area of the PBG? Source area DNT concentrations in the propellant burning grounds appear to have an inverse relationship to the MIRM influent concentrations (i.e., when pumping increases the concentrations go down) while this behavior does not hold true for the other contaminants. (for Citizens for Safe Water Around Badger by Peter Taglia)

Modeling

Modeling presented in earlier versions of the feasibility study was not carried forward into the final submittal. The groundwater modeling was not used in making this feasibility determination. Although complete model verification was not performed, inaccuracies in the water balance of the model were noted, which made the predictive results questionable.

Graphical and tabular presentation of the geology, water elevation data, and contaminant concentration trends were used to evaluate the hydrogeology of the groundwater contaminant plumes and the feasibility of the proposal.

Monitoring

The Army follows a monitoring program for evaluation of groundwater and drinking water concentrations. Changes to the proposed monitoring plan are anticipated in the Army's plan for natural attenuation monitoring. The concerns noted above will be considered during DNR's review of that plan.

We believe that the presentation on the locations and flow direction of groundwater contamination plumes demonstrates no risk to private wells to the north of the facility.

Data Presentation

This site is complex and illustration of the groundwater conditions is challenging. The Department requested a revised submittal from the Army in April 2011 because of data presentation methods. In response, the Army provided a substantially improved document as its final submittal. The scope of the data presentation within the final submittal was adequate for DNR to make this determination.

Socioeconomic issues

Prevent undue economic hardship to local farmers and area residents. (BAAP Restoration Advisory Board)

Promote farmland preservation as consistent with town plans and zoning. (BAAP Restoration Advisory Board)

Extend municipal water from Prairie du Sac to private drinking water wells impact at the south end of BAAP. Extension of municipal water should be consistent with the Comprehensive Plans of the Village, and the Towns of Prairie du Sac and Sumpter. In other words, the water system should not facilitate future growth and development that is inconsistent with existing land use plans. (Friends of Lower Wisconsin Riverway)

The economic health of our school district is also at risk. If the plumes continue to spread, more and more properties will be put on the G.I.S. registry. Being a part of that registry could very well hurt property values. Currently, that area has some of the highest property values in the Sauk Prairie School District. If those values go down, everyone else in our district will have to pay higher taxes or our district will have to make do with even less money than the current budget constraints have caused. (Mary Zenker) (*)

Foster Economic Stability

Value 9 of the Badger Reuse Plan specifies that "uses and activities at the Badger property contribute to the area's economic stability and sustainability and have a positive impact on local municipalities." (*)

The groundwater contamination solution should prevent undue economic hardship to local farmers and area residents. (Badger Oversight & Management Commission)

Promote Farmland Preservation

Value 8, Criterion 8.1 of the Badger Reuse Plan states: "Land uses and activities at the Badger property should not foster residential and commercial development in the Baraboo Hills or other parts of the surrounding rural landscape. Land use at Badger should be consistent with, or more restrictive than, existing town plans and zoning."

The groundwater contamination solution should promote farmland preservation as consistent with town plans and zoning. (Badger Oversight & Management Commission)

Prevent undue economic hardship to local farmers and area residents (J Peter Mullen, in support of the BAAP Restoration Advisory Board)

The report does a very good job of assessing and discussing physical impacts, but is very weak with regard to socio-economic and biological impacts. The report focuses on regulated issues and minimizes impacts to non-regulated issues such as stock watering wells and agricultural water use. (Chris Hanson)

There is no analysis of socio-economic impact associated with this report to address issues such as land values due to deed restrictions from contamination, change in development potential, effects on zoning. This will need to be addressed by the Army to comply with the National Environmental Policy Act (NEPA) of 1970 prior to the Army's final decision and commitment of Federal resources. (Chris Hanson)

The proposed water supply system is a proposed mitigation measure for the known groundwater contamination at BAAP, and the decision on its feasibility falls within DNR's jurisdiction. Decisions regarding land development associated with the installation of a new water supply system are not within the scope of this decision, and should be made at the local level.

GIS registry/Off-site Contamination

The DNR's Geographic Information System (GIS) based registry shows properties with residual soil contamination. Many people felt that possible registry listings associated with the BAAP are not needed, not fair, and may affect property values.

Questions were also asked about off-site owners taking on liability for the groundwater contamination.

How does the GIS Registry Work?

Please advise as to which properties might be listed on the GIS registry (of contaminated sites). (Craig Hamilton)

I have several questions regarding listing property on the GIS registry:

- 1) Why would this be done if the Army provides drinking water via a community well? ...there would be no concern about contaminated drinking water.
- 2) If they do list my property on the GIS Registry is there a possibility that the DNR or Federal Government might come after me individually to clean up the mess that is in my groundwater?
- 3) What properties will be listed?
- 4) What impact does having my property listed on the GIF Registry have on my future ability to sell my home? What are the implications for this seriously devaluing my home? (Roger Heidenreich)

Are any of properties currently listed on the registry in the Towns of Merrimac, Sumpter, and Prairie du Sac located outside of the BAAP boundaries? (Town of Merrimac)

Are there any properties in the Towns of Merrimac, Sumpter, and Prairie du Sac located outside of the BAAP boundaries that would be added to the registry as a result of the municipal water system being constructed? (Town of Merrimac)

If there are any properties in the Towns of Merrimac, Sumpter, and Prairie du Sac located outside of the BAAP boundaries that would be added to the registry as a result of the municipal water system; what would be the logical consideration for doing so? (Town of Merrimac)

If a municipal water supply is conditioned to prevent the construction of private wells, would it not "quarantine" the water supply? This would make such a designation irrelevant and unnecessarily and effectively destroy the property value for the property owner. (Town of Merrimac)

It would seem more practical that a municipal water system would allow for the removal any properties in the proposed district from the Groundwater Registry. (Town of Merrimac)

Off-site Property Values / Fairness

Will landowners be required to disclose contaminated water quality upon sale of their residence? Many of the properties in the district were owned before BAAP came into existence. If I moved to a parcel next to you and permanently fouled the ground water, I would be liable for the damage that occurred. Can the agreement compensate the affected landowners to the same standard that they would be held to? Property owners didn't make this mess, the ARMY made the mess. Many of the issues we face today were unknown at the time. We are smarter now on both sides of the equation. (Robert Sinklair)

...property values with contaminated property listing? (Charles Wilhelm)

When the cleanup at Badger is discontinued and the property is turned over to the State of Wisconsin the private properties affected by the contamination will be listed on the GIS registry. The Town board has concerns about the effect that will have on property values. This could cause a reduction of the assessments on these properties and put more of a tax burden on the rest of the Town's residents. Also the board does not want to be overwhelmed at the next Board of Review. Continued cleanup could keep that from happening. (Town of Prairie du Sac)

The economic health of our school district is also at risk. If the plumes continue to spread, more and more properties will be put on the G.I.S. registry. Being a part of that registry could very well hurt property values. Currently, that area has some of the highest property values in the Sauk Prairie School District. If those values go down, everyone else in our district will have to pay higher taxes or our district will have to make do with even less money than the current budget constraints have caused. (Mary Zenker) (*)

At this point our property values are affected negatively because at some point our private well may become unsafe – so far our well has not been affected. We are not overly concerned about being listed on a water contamination registry, as our property would have access to safe drinking water with the new municipal system. (Paul Weum)

After talking with some bankers who are experienced in real estate, the listing of our farm on the GIS Registry will have a negative impact on its future value. (Ken Lins)

What financial recourse would the owner have and how would the municipalities make up for the loss of equalized value? (Town of Merrimac)

It is not prudent for the DNR to allow the Army to install a suitable well for drinking water and then being allowed to "walk away" from any future responsibilities, if it means that the value of my property will decline and/or become unsellable. (Roger Heidenreich)

Having my property listed on the GIS Registry does not sit well with me either. I did not contribute to this contamination and I don't think my property values and the investment I have in my farm should suffer because of it. (Ron Lins)

Finally adding resident's properties to the GIS database of contaminated properties because the Army has contaminated the groundwater under those properties thus lowering the property values is not fair to the property owner. The Army needs to be held responsible for that reduction in value. (Bart Olson)

The residents around Badger have been dealing with contamination issues for 22 years. Giving us a clean source of water and then adding that our property may be placed on the GIS Registry for contaminated property, and if so, then will have limitations placed on said property, all seems ethically wrong. Those property owners did not cause the contamination, but yet will be penalized because of it. Ownership of the responsible thing to do with all of this belongs to the Army and the DNR. Why were homes allowed to be built around Badger and still are? (John and Mary Koch)

Our family should not be put in limbo because the Army did not properly address the contaminated plumes which are flowing off base. (Ken Lins)

Even though the Badger Environmental Board of Advisors pushed for more extensive cleanup, the Army chose partial excavation, leaving the majority of the contaminated soil on site. We were told that a cap combined with a pump and treat system would clean up the water to DNR standards. Discontinuing the cleanup at this site will fall far short of this. In a few years, the Army will be gone, but the impacts of partial cleanup will be felt by the surrounding communities for years. (Ken Lins) (*)

I support the continuation of the currently approved groundwater cleanup remedy. I strongly recommend that you don't allow discontinuation of the pump and treat system.

My first concern is the negative effect that turning off the pump and treat system would have on our neighbors' property quality and value. If the groundwater under a land owner's property meets certain criteria, the property will be listed on a GIS database. This listing, in turn, will probably make the property less valuable. This simply isn't fair because the groundwater pollution is not the fault of the land owner. (Michele Hopp)

I was shocked to learn from Linda Hanefeld, DNR, at our April 2nd RAB meeting that a land owner who is placed on the GIS database and wants to be removed from it has to prove – at his or her own expense through groundwater testing – that their groundwater is no longer contaminated above the enforcement standard. This will be no easy feat if municipal water is installed, because the land owner's existing well will be abandoned, so in theory, he or she would have to pay for the construction of a new monitoring well on their property, and pay for groundwater testing. This makes no sense to me because the land owner didn't cause the groundwater contamination. If the Army is allowed to turn off the pump and treat system, I would expect them to be responsible for paying for a monitoring well and groundwater tests for any land owner who wants to try to be removed from the GIS database. (Michele Hopp)

I was further shocked to learn at our meeting that although Ron and Ken Lins' private drinking wells currently do not have contaminated groundwater above the enforcement standard, because they have allowed the Army to install monitoring wells on their properties to help define the extent of the propellant burning ground plume, their properties may be listed on the GIS database because their monitoring wells have contaminated water above the enforcement standard. Had they not cooperated with the Army's request to have monitoring wells placed on their properties, they might not have been threatened with being added to the GIS database. Once again, this just isn't fair, as Ron and Ken have been trying to do the right thing to help the Army address their groundwater pollution problem. Now they are being penalized for being good neighbors. (Michele Hopp)

At our RAB meeting we also discussed the insurance industry concept of "making whole" after causing harm. In my opinion, the DNR is not asking the Army to "make whole" if they allow them to turn off the pump and treat system because this will cause additional harm to area land owners. (Michele Hopp)

Response

Wisconsin State statute 292.12 (3) requires that the DNR maintains the database of contaminated sites and makes the database available to the public. This geographic information system (GIS) registry can be found at <http://dnrmaps.wi.gov/imf/imf.jsp?site=brtts2>. The registry shows properties with residual contamination. Currently, there are no off-site contaminated properties related to BAAP listed on the registry.

Near BAAP, the off-base registry listings will be for properties with groundwater contamination, which will be documented through testing or interpolation of test results. The GIS listing will include a limitation on the property with language substantially similar to:

"DNR approval prior to well construction or reconstruction is required for all sites shown on the GIS Registry, in accordance with s. NR 812.09(4) (w), Wis. Adm. Code. To obtain approval, complete and submit Form 3300-254 to the DNR Drinking and Groundwater program's regional water supply specialist. This form can be obtained on-line at <http://dnr.wi.gov/org/water/dwg/3300254.pdf> or at the web address listed below for the GIS Registry."

If a proposed GIS listing appears technically invalid, the landowner may petition the DNR to not list the case on the registry. This must be done within 30 days of receiving formal notice (from the Army) that the property will be placed on the registry. GIS listings are typically made at the time of case closure.

Modification to a registry listing is allowed through ss. 292.12 (6). Requests for modification of the registry listing must include the necessary data to support compliance with the groundwater standards at the property and the established DNR review fee, which is currently \$500.

Damages for property devaluation due to contamination or other claims associated with a GIS listing might be contested as a civil matter, which would be outside of DNR's authorities.

Off-site Contamination

Per s. 292.13, Wisconsin Statute, a person is usually exempt from liability for groundwater contamination originating at an off-site property. The exemption from the cleanup requirements generally applies when the landowner in no way caused the discharge or made the problem worse, and the landowner allows the DNR or the responsible party access to investigate the contamination. If landowners deny access for investigation of groundwater contamination, they may be named as responsible parties for the contamination on their land.

Army will remain responsible for any off-site BAAP-related contamination.

Property Values

DNR cannot predict the effect of the GIS registry listings on property evaluations or tax rolls. However, the requirements imposed by the GIS listing will not be burdensome. The listing will require DNR permission before installing a supply well (as discussed above).

A likely factor in the property value is the presence or proximity of contamination to the parcel. Residential real estate disclosure law (State Statute 709) requires disclosure of defects such as contaminated groundwater. The GIS listing is a mandated public notice of known contamination and not a property defect in and of itself.

Main CSWAB Comment Document

Many of the comments from CSWAB are in the form of questions. WDNR has made as much of an effort as possible to respond to those questions pertinent to the GW alternative feasibility study proposal. If a comment or

question noted below is outside the scope of the proposal, we note that, and we also note those situations in which the subject of one of these comments will be addressed at some time in the future in separate regulatory actions.

Pursuant to State Statute 292.12(1)(d), a "**Remedial action**" means action that is taken in response to a discharge of a hazardous substance and that is necessary to restore the environment to the extent practicable and to minimize the harmful effects of the discharge to the air, lands, and waters of this state. Pursuant to Administrative Code 700.03 (48), "Remedial action" means those response actions, other than immediate or interim actions, taken to control, minimize, restore or eliminate the discharge of hazardous substances or environmental pollution so that the hazardous substances or environmental pollution do not present an actual or potential threat to public health, safety or welfare or the environment. The term includes actions designed to **prevent, minimize, stabilize or eliminate the threat of discharged hazardous substances, and actions to restore the environment to the extent practicable** and meet all applicable environmental standards. Examples include storage, disposal, containment, treatment, recycling or reuse, and any monitoring required to assure that such actions protect public health, safety and welfare and the environment.

Q: Does the preferred remedy meet the all requirements of a "remedial action"? If not, what are the potential implications?

Yes, particularly considering all of the remedial actions that have been completed by the Army at all known groundwater contamination sources.

Q: Are there other alternatives that could better meet the requirements of a remedial action?

Not necessarily, after considering remedial actions that were completed and considering technical and economic feasibility as required in the NR 700 series administrative codes.

Clean Water Act. The Clean Water Act, 33 U.S.C. ss 1251 et seq., was enacted by Congress to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Id. ss 1251(a). Wisconsin has an EPA-approved NPDES permitting program, and the WDNR is the agency that issues NPDES permits to point-source dischargers within the State.

The topic of these questions is beyond the scope of the proposal and approval. These questions will be considered prior to closure of the case of groundwater contamination.

Q: What are the effluent limitations of the WPDES permit for the discharge of treated groundwater to Lake Wisconsin from Badger?

Q: Shouldn't these same effluent limitations apply to the discharge of contaminated groundwater to all surface water near Badger?

Q: Is the discharge of contaminated groundwater to wetlands regulated by the Clean Water Act?

Q: Is the discharge of contaminated groundwater directly to wetlands via springs regulated by the Clean Water Act?

Q: Weigand's Bay is directly connected to Lake Wisconsin. What additional protections are afforded to wetlands that are not isolated?

Q: Flow from the wetlands Weigand's Bay to Lake Wisconsin is restricted by a culvert. Could this restriction limit dilution and movement of groundwater contaminants being discharged to these wetlands? If so, what are the implications?

Q: Is the discharge of contaminated groundwater to natural springs regulated by the Clean Water Act?

Q: Does groundwater discharge to the river through "seeps" in the river bank? If so, does this constitute a "direct discharge" under the Clean Water Act? Will WDNR require a WPDES permit? Could EPA require a NPDES permit with effluent limitations?

Trichloroethylene (TCE) is a pervasive contaminant of concern in groundwater at and near Badger. It is sold under about fifty different trade names. Some of these products contain additives used as stabilizers, which make up as much as two percent of the total weight. These stabilizers are numerous and they are often not considered when developing strategies for natural attenuation. One stabilizer, used in both TCE and TCA (trichloroethane), known as 1,4-dioxane, is a problem at many sites. It is a probable carcinogen, is mobile in the environment, and "has not been shown to readily biodegrade in the environment" (USEPA 2009). Additionally, impurities of TCE include vinyl chloride, dichloroethene (DCE), perchloroethylene (PCE), carbon tetrachloride, and acetone. If the line of evidence that is used includes the presence of daughter products of TCE, such as vinyl chloride and DCE, to persuade agencies that **natural attenuation** is occurring, there is a possibility that this may be misleading. Source: <http://www.cpeo.org/techtree/ttdescript/natatt.htm>

Q: What are the implications of the above at Badger?

TCE is found primarily within the groundwater contaminant plume associated with the Propellant Burning Ground at levels near the Enforcement Standard or below. No TCE breakdown products, which include DCE and VC, were detected in the March 2012 groundwater monitoring round. This is to be expected because TCE biodegrades only in an anaerobic environment which is largely absent in the aquifers under BAAP.

Q: What are the known or potential additives, stabilizers, and impurities associated with the solvents and explosives found at Badger?

TCE is a common groundwater contaminant at numerous sites across Wisconsin and is one of a long list of volatile organic compounds, including degradation compounds, that are monitored in all groundwater samples when VOCs are compounds of concern. Additives, stabilizers, and impurities are not commonly monitored at BAAP or as part of monitoring at other Wisconsin sites. See also the answer to the question above.

Q: Are the above found in groundwater at and near Badger?

See the answers above. 1,4-dioxane is not monitored in BAAP wells.

Q: What are the trends in concentrations of known or potential additives, stabilizers, and impurities associated with the solvents and explosives in and near Badger? What are the implications of these trends?

See the answers to the above questions.

Explosions.

The topic of these questions is beyond the scope of the proposal and approval.

Q: Are the explosions at Badger compromising the integrity of groundwater monitoring wells?

Q: Are the explosions at Badger compromising the integrity of groundwater extraction wells, systems and associated infrastructure?

Q: Are the explosions at Badger compromising the integrity of nearby drinking water wells?

Q: Is the detonation of explosions at Badger a potential source environmental contamination?

Q: Could explosions cause or change preferential pathways for groundwater contaminant movement, soil vapor movement, or pose other risks?

Final Creek, Settling Ponds and Spoils Disposal Areas.

Final Creek, the Settling Ponds, and the Spoils Disposal Areas will be the subject of a separate submittal, review, and approval process; these questions should be submitted during at that time.

Q: Is contamination from Final Creek, the Settling Ponds and Spoils Disposal Areas affecting groundwater?

Q: Could the discharge of treated wastewater and storm water to Final Creek and Settling Pond #1 drive soil contaminants to groundwater? If so, who is the responsible party?

Q: If wastewater from the Sanitary Treatment System is diverted to another outfall in the future, who will be responsible for any residual contamination, investigations, and cleanup at Final Creek and Settling Pond #1?

Q: Should discharge of treated wastewater be discontinued, is the required level of soil cleanup at Final Creek and the Settling Ponds protective of human health, wildlife and grazing livestock?

Q: What is the source of the groundwater contamination that is detected at and downgradient from the Settling Ponds (between the PBG plume and the Central Plume locations identified in the Alt FS)? Is soil contamination at the Settling Ponds a possible contributing source? What contaminants are detected in groundwater in this area and what are the trends in contaminant concentrations?

DNT. Dinitrotoluenes are formed in the second step of toluene nitration during TNT synthesis, yielding higher percentages of 2,4 and 2,6-DNT with only a much smaller percentage of other isomers produced. However, Badger Army Ammunition Plant was a recover/recycle facility and did not manufacture DNT or TNT. As a result, the relative ratio of DNT isomers cannot be assumed and is unknown.

Because analysis is conducted for all six DNT isomers in all groundwater monitoring samples where DNT analyses are conducted, many of the questions below are essentially beyond the scope of the proposal and approval. Answers are provided for those that are pertinent.

Q: What is the relative ratio all six isomers of DNT found in soils at Badger?

Q: Do you need to accurately measure the volume of Total DNT (all six isomers) in soils to accurately calculate the risk to groundwater for Total DNT?

The WDNR's Remediation and Redevelopment Program has for many years relied far more heavily on (empirical) groundwater data to assess contamination sources rather than on models to predict risk.

Q: What soil analysis has been conducted to characterize DNT wastes in source areas for the six different forms of DNT?

Q: If soil analysis has not been conducted for all six forms of DNT, what are the potential implications and outcomes?

Q: What are all of the potential degradation and biotransformation products of DNT?

The Army has reported that the following are DNT degradation compounds that have been detected in groundwater at BAAP:

<i>2-Nitrotoluene</i>	<i>3-Nitrotoluene</i>	<i>4-Nitrotoluene</i>
<i>2-Nitroaniline</i>	<i>3-Nitroaniline</i>	<i>4-Nitroaniline</i>
<i>Nitrobenzene</i>	<i>2,4-Diaminotoluene</i>	<i>2,6-Diaminotoluene</i>
<i>2-Methyl-3-nitroaniline</i>	<i>2-Methyl-5-nitroaniline</i>	<i>2-Methyl-6-nitroaniline</i>
<i>4-Methyl-2-nitroaniline</i>	<i>4-Methyl-3-nitroaniline</i>	<i>5-Methyl-2-nitroaniline</i>
<i>2-Amino-4,6-dinitrotoluene</i>		

Other identified DNT breakdown products are:

<i>Carbon dioxide</i>	<i>Nitrite</i>	<i>Benzofuran</i>
<i>3-Methylbenzofuran</i>	<i>5-Methylbenzofuran</i>	<i>3-Methyl-2-nitroaniline</i>
<i>3-Methyl-4-nitroaniline</i>	<i>3-Methyl-5-nitroaniline</i>	

Q: Are the Village of Prairie du Sac wells being regularly tested for all the potential degradation and biotransformation products of DNT?

Prairie du Sac well #3 is regularly monitored for some of these compounds by the Army.

Q: Are residential, livestock wells, and irrigation wells in the remedy area being regularly tested for all the potential degradation and biotransformation products of DNT?

The residential wells and USDA Dairy Forage Research Center livestock wells that are monitored are regularly monitored for some of these compounds. WDNR is not aware of any monitoring of irrigation wells.

Q: Is it possible for degradation or biotransformation products of DNT to be present in a well in the absence of DNT? Why is this important?

Q: Some of the degradation and biotransformation products of DNT have Health Advisory Levels for Drinking Water but not Groundwater Enforcement Standards. Will the WDNR establish enforceable remedial goals for groundwater contaminants having HALs as consistent with the State of Wisconsin DNR Manual Code 4822.1?

The responsibility for establishing enforcement standards resides with the Groundwater Section of the Bureau of Drinking Water and Groundwater and is done as part of the revision process of ch. NR 140, Wisconsin Administrative Code.

Q: What are the potential environmental and human health benefits to testing groundwater monitoring wells outside the immediate source areas for all the potential degradation and biotransformation products of DNT?

The Department will consider monitoring for additional DNT degradation products as part of the process of revising the groundwater monitoring plan.

Q: What are the potential environmental and human health benefits to testing drinking water wells in the remedy area for all potential degradation and biotransformation products of DNT?

The meaning of "the remedy area" is unclear in the question. Otherwise, see the answer above.

Q: Dinitrotoluene (mixed isomers) CAS No. 25321-14-6 is regulated as a Hazardous Substance pursuant to 40 CFR 302.4 and as a Toxic Substance pursuant to 40 CFR 372.65(a) – what are the concentrations of total DNT in subsurface soils at Badger?

Q: How much total DNT is still present in subsurface soils at the DBG and PBG? How much has moved to groundwater? How much could move to groundwater? Can something more be done at the source area to prevent this?

Defining the impact of soil contamination on groundwater quality is a significant purpose of groundwater monitoring. The beneficial effect of the remedial actions at the DBG can be seen in contaminant concentrations in groundwater nearer to the source. Defining these effects similarly for the PBG, especially of the groundwater extraction and treatment (IRM and MIRM) systems will be the subject of future proposals from the Army and review by WDNR.

Q: What and how much non-DNT contamination is still present in subsurface soils at the DBG and PBG? How much has moved to groundwater? How much could to move to groundwater? Can something more be done at the source area to prevent this?

See the answer above.

Q: Where is the source of the Central Plume? How can natural attenuation be accurately predicted when the source area has not been fully characterized?

The Army has the responsibility to demonstrate that natural attenuation is occurring, rather than predicting it. This question, and many of the following questions, should be answered as part of the natural attenuation monitoring plan and evaluation.

Q: What factors limit biodegradation of DNT in the vadose zone in all source areas? What are the implications of these factors?

Similarly, the emphasis must be on the demonstration of natural attenuation processes by assessing the empirical evidence; that is, groundwater quality data.

Q: Have the lesser isomers of DNT been shown to biodegrade? What are the potential implications of this?

Q: Are higher concentrations of DNT in source areas inhibiting or toxic to bacteria? If so, what are the potential implications?

Q: Could high concentrations of 2,4-DNT inhibit degradation of DNT? If so, what are the potential implications?

Q: Which areas at Badger have high concentrations of nitrite and/or nitrate in groundwater? Could high concentrations of nitrite and/or nitrate inhibit degradation of DNT?

Q: What trends are present in pH in groundwater? How could pH affect degradation of groundwater contaminants?

Q: According to soil column studies at Badger, without intervention (i.e. nutrient addition), the dominant process leading to the loss of DNT from soils will be the dissolution into waters percolating through the vadose zone into groundwater systems. If these studies are correct, what are the potential implications?

Because of the caps placed over the contaminated soil columns at the DBG and PBG, percolating water from precipitation has been minimized or eliminated at both of these source areas.

Q: What is the contingency plan if the MIRM is inoperable or removed and contaminant levels in groundwater increase?

The plan approval modification will include conditions that will have implications for any plans to shut down the IRM and MIRM systems.

Contaminant plumes.

Q: Is contamination moving from subsurface soils at the Deterrent Burning Grounds to groundwater?

Installing cap/cover systems over contaminant source areas (for example, at landfills and contaminated soil sites) has been common for many years to significantly reduce the amount of infiltrating water moving through the contaminated mass. Groundwater data associated with the DBG, an indicator of system performance, implies that contaminant concentrations near and down-gradient are lower because of the cap and other remedial actions completed at this site. But the existence of contaminants held in the saturated soil beneath and down-gradient of the DBG may account for some or much of the remaining contaminant concentrations in groundwater nearby.

Q: What happened to the passive bioremediation system at the DBG? Was it working? Could this or something similar help improve the remedy at the DBG? What steps could be taken at the DBG to improve the remedy, i.e. better control the source area?

The Army decided to terminate the operation of this system several years ago. While WDNR would have preferred to have been notified before this action was taken, the Army appears to be in compliance with the conditions of the plan modification approval for the remedial action. See also the answer above.

Q: Are the landfill caps at the DBG and PBG supposed to stop subsurface contamination from moving to groundwater? Are they doing this?

Yes; see answer two questions above.

Q: If contamination is moving to groundwater in plume source areas, doesn't this mean that the remedy is failing? If yes, why doesn't the Department require the Army to re-evaluate and fix the remedy?

Much of the contamination in the aquifers below the known major source areas (PBG and DBG) may not be currently originating from the soil of the source areas because of the very significant reduction of infiltration of surface water accomplished by the installed caps. The remedy appears to be working at the DBG. Future proposal submittal and regulatory review will result in the evaluation of remedial actions at the PBG.

Q: Are the landfill caps at the plume source areas (DBG and PBG) meeting all the required performance criteria? Can WDNR enforce non-compliance with these criteria?

See the answers above. If a remedial action is ineffective in controlling a contaminant source, WDNR has the authority to require additional actions.

Q: In an earlier facility-wide RI/FS, the Army proposed a pump and treat system to address groundwater contamination at the NE corner of the plant. Is this a possible remedy? What are the advantages to this remedy?

Groundwater extraction and treatment systems are commonly used to control the migration of a contaminant plume but have been shown to be ineffective, in many cases, in controlling and reducing the effects of a contaminant source. To be considered, such a system would have to be technically and economically feasible and the benefits would have to outweigh the costs.

Q: Is contamination moving from subsurface soils at the Existing Landfill to groundwater?

March 2012 groundwater samples collected from monitoring wells immediately down-gradient of Landfill #5 (formerly known as Existing Landfill) had no contaminant detections.

Q: Is contamination moving from subsurface soils at the Coal Ash disposal area (near the DBG) to groundwater?

Because this disposal area is located adjacent to the DBG, differentiating impacts to groundwater from the coal ash disposal area versus the DBG is difficult. The stable or decreasing trends of concentrations in this area are discussed elsewhere in this response document.

Q: Is contamination moving from subsurface soils at the Propellant Burning Grounds to groundwater?

This question has been answered in previous responses.

Q: Is it possible that the groundwater contaminant plumes are not as neatly defined as the drawings and could they have "fingers"? Could additional "fingers" develop over time? Could turning off the MIRM increase the potential for formation of "fingers"? What are the implications of this potential?

In reality, the plume boundaries may be more irregular than the smooth boundaries depicted. However, advective groundwater flow in the sand and gravel aquifer beneath BAAP results in contaminant plumes that generally follow the direction of that flow.

Q: What and where is the source of the VOC groundwater contamination that is detected upgradient of the PBG?

The question is unclear about the location of the VOC contamination being referred to.

Q: What is the source of TCE that is consistently detected in groundwater at the western boundary of Badger?

It is assumed that this question is referring to the trichloroethene detections in recent years in monitoring well BGM-9103. TCE concentrations in this well have fluctuated over time, between below the enforcement standard to above 20 ug/L. Because this is the only well in that area that has had TCE detections, a possible source is to the northwest off of BAAP property. And because of the significant TCE concentration fluctuations, WDNR decided not to investigate the location of the source and to not require the Army to do so unless concentrations were consistently and significantly above the enforcement standard.

Q: Bluffview's back-up well is located inside Badger. What are the implications for this community? What are the potential risks to this well?

Currently, the well is not used, but if it is at some time in the future, it would be subject to the monitoring requirements of the federal Safe Drinking Water Act and WDNR Drinking Water and Groundwater Program's administrative codes.

Q: In reviewing many past environmental studies for Badger, groundwater contour maps for the NW corner of Badger vary greatly – from due south to due west. Is there a good dependable map showing this? (Important for Bluffview.)

This question should be posed to the Army. This applies also to the following five questions.

Q: DNTs in groundwater at the NE corner of Badger are not universally co-located with other contaminants. Where is a map showing the current and projected lateral and vertical location of the VOC plume at the NE corner of Badger?

Q: DNTs in groundwater at the NE corner of Badger are not universally co-located with other contaminants. Where is a map showing the current and projected lateral and vertical location of the sulfate plume/s at the NE corner of Badger?

Q: DNTs and VOCs at the PBG and south of Badger are not universally co-located with the nitrite/nitrate plume. Where is a map showing the current and projected lateral and vertical location of the nitrite/nitrate plume/s downgradient from the PBG and south of Badger?

Q: DNTs in groundwater south and southeast of Badger are not universally co-located with other contaminants. Where is a map showing the current location and projected location of the VOC plume from the PBG?

Q: Is there a plume of ethyl ether? Is there a map showing the lateral and vertical location of this plume?

Q: How do seasonal and long-term water table fluctuations at the NE corner of Badger affect the possible movement, path and surface water discharge location for sulfates, VOCs, and DNTs?

This and the following question are outside of the scope of the proposal.

Q: The Alt FS shows “pulses” of contamination in groundwater. What are the ages of these pulses? For example, is the solvent pulse for each of the three identified plumes from WWII, the Korean War, the Vietnam War, or later?

Q: Is the State’s groundwater standard for TCE expected to be lowered in response to new toxicity information from EPA? If so, what the implications of this expected change?

No specific plans to revise ch. NR 140, Wis. Adm. Code, have been announced.

Q: What are the potential implications of the flat groundwater gradients at the northeast corner of Badger?

This question must be clarified before it can be answered.

Surface Waters.

The topic of contaminant discharges to the Wisconsin River will be the subject of future WDNR discussions with the Army and are beyond the scope of the current proposal and WDNR review. The following questions will be considered in the future during other review processes.

Q: Could contaminant discharge to the river negatively affect aquatic organisms and systems? Fisheries? Endangered species? What studies have been done?

Q: Where is groundwater discharging to the Lower Wisconsin Riverway? How big is the area? What discharge limitations will the Army be required to meet? How and where will this be measured?

Q: If there is no MIRM (groundwater capture system), how will the Army prevent excessive discharges to the river?

Q: Will there be discharge limitations to groundwater and surface water even if municipal water is installed? What will they be?

Q: Will the Army be required to comply with groundwater standards even if municipal water is installed?

Yes.

Q: What is the ultimate fate and transport of groundwater contaminants in nearby surface water, wetlands, and springs? How will or could this change in the future?

Q: What are the ecological risks to aquatic systems and organisms associated with the current and future discharge of groundwater contaminants to the Wisconsin Riverway including the Lower Wisconsin Riverway, Gruber’s Grove Bay and Weigand’s Bay including all associated springs and wetlands in all areas?

Q: Where are the spawning areas, springs, wetlands, or other particularly sensitive areas near Badger?

Q: Could groundwater plume discharge areas negatively affect spawning areas and/or are springs or wetlands that are particularly sensitive?

Q: Will the WDNR require compliance with state and federal surface water quality standards including those regulations and protections specific to the Lower Wisconsin Riverway?

Q: Will the Army's proposal meet the "background" discharge requirements for Endangered Water Resources designation for the Lower Wisconsin Riverway? How will this be measured and monitored over time?

Q: Will the proposed remedy be as protective as the lower effluent limitations for other Badger outfalls such as those found in the existing WPDES permit for discharge of groundwater to Lake Wisconsin? Please explain.

Q: What are the potential risks associated with exposure to groundwater contaminants in surface water both for adults, children and expectant mothers through dermal contact, inhalation, ingestion, and the human food chain?

Q: Will there be an environmental assessment and opportunity for public comment BEFORE the Department makes any further determinations or decisions?

Vapor Intrusion.

Q: What are the current risks of exposure from vapor intrusion? How might these change in the future?

Because of the low concentrations of VOCs in groundwater associated with BAAP and because of the significant depths to groundwater (generally about 100 feet), the risk of vapor intrusion into buildings at the surface is low. However, the Army did reportedly conduct a subsurface vapor study recently, but WDNR has not yet received a report on this study.

Q: The Army reportedly conducted soil vapor testing 40 feet above the water table rather than just above the water table. What are the disadvantages to the Army's test method? Did Army consult with the WDNR on the scope of the study prior to initiating it, as consistent with Conditions found in the Infield Conditions Approval?

Because WDNR has not received a report on this investigation, no response can be provided here. No, the Army did not consult with WDNR about this study before conducting it.

Q: Has the remedy area been surveyed for any potential preferential subsurface pathways? What was found?

See the answer above. In addition, it should be noted that the Army has installed vast numbers of soil borings and monitoring wells in the past several decades that have provided an understanding of the soil characteristics in many areas of BAAP.

Risks to Expectant Mothers, Infants, and Children.

In light of what is now known about the greater susceptibility early in life to some stressors, Executive Order 13045 -- Protection of Children from Environmental Health Risks and Safety Risks -- was issued in 1997. This Executive Order directs that all federal agencies, including EPA, shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and shall ensure that their policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. To assist scientists in assessing risks specifically to children, EPA has developed *A Framework for Assessing Health Risk of Environmental Exposures to Children* along with specific guidance to risk assessors including *Guidance on Selecting Age Groups for Monitoring and Assessing Child-*

Hood Exposures to Environmental Contaminants and Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens.

(More information is available on line at: http://www.epa.gov/risk_assessment/health-risk.htm)

These appear to be questions for EPA, but are outside the scope of the proposal and WDNR response. Note that WDNR implements the Safe Drinking Water Act and ch. NR 140 requirements, in coordination with the Wisconsin Department of Health Services.

Q: Does the Alt FS fulfill Executive Order 13045?

Q: Are calculations of risks consistent with guidance documents issued by the EPA?

Q: Does the Alt FS provide separate and appropriate calculations for newborns, expectant mothers and children?

Antifreeze. Ethylene glycol was used at Badger as an anti-freeze in vehicles and also as an anti-freeze in water systems. It was used in many water main lateral rises processed for long-term storage during the 1970's and 1980's.

Q: Are contaminants associated with antifreeze present in groundwater at Badger?

In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. WDNR is not aware of evidence of a release of ethylene glycol that has not been cleaned up.

Persistent Bioaccumulative Toxins.

Road oil refers to any heavy petroleum oil that is used as a dust suppressant and surface treatment on roads and highways.¹ The use of road oil has declined in recent years because of reductions in the proportion of unpaved roadways, the presence of highly toxic contaminants in used oils (PCBs, dioxins, furans), competition from other used oil end uses (re-refining), and new environmental regulations.² Used mineral-based crankcase oil (used motor oil or used engine oil) contains polycyclic aromatic hydrocarbons (PAHs) and may contain metals such as aluminum, chromium, copper, iron, lead, manganese, nickel, silicon, and tin.³

U.S. Army records confirm that road oil was stored at Badger – and in extremely large quantities. A July 1983 report published by the U.S. Department of Army documents that Badger had a 52,000-gallon above ground tank that was used for storing road oil.⁴ (A 1977 building inventory by the U.S. Army identified the same facility as “road oil storage.”⁵) By comparison, other used oil storage tanks at Badger hold only 500 to 1,000 gallons.

¹ County of Santa Barbara Planning and Development Energy Division, Oil and Gas Glossary, undated.

² United Nations Environment Programme, Secretariat of the Basel Convention, Basel Convention Technical Guidelines on Used Oil Re-Refining or Other Re-Uses of Previously Used Oil, Basel Convention on the Control of Transboundary Movements on Hazardous Wastes and Their Disposal, September 1995.

³ U.S. Army Toxics and Hazardous Materials Agency, Public Health Statement for Used Mineral-based Crankcase Oil, September 1997.

⁴ Department of the Army, Headquarter, United States Army Armament, Munitions, and Chemical Command, Environmental Assessment for Total Plant Operations, Badger AAP, July 1983.

⁵ U.S. Army Toxics and Hazardous Materials Agency, Installation Assessment for Badger Army Ammunition Plant, May 1977.

Badger Army Ammunition Plant has an extensive network of more than 130 miles of roads.⁶ While many of the roads in the core industrial area are paved, the majority of outlying roads at Badger are unpaved.

“During the late 1960’s and early 70’s, Wisconsin Power and Light, at the Prairie du Sac hydro plant, changed the water-cooled transformers over to air-cooled. When these transformers were scrapped, WP&L was left with thousands of gallons of insulating oil. At the same time, the State came out with a program to control certain weeds. Counties, farmers, and businesses were mandated to do spraying. The herbicides of the day were mixed with oil and sprayed along roads and fence lines. Trucks from Badger Army Ammunition Plant, along with the County, came and picked up the excess oil from the transformers at the dam. They did not realize at the time that this oil contained PCBs. The contaminated oil was sprayed along roads and fence lines through the county and inside of Badger. Badger also used it to control weeds around the Production Buildings. Some of the oil was poured on the gravel roads to keep the dust down. It wasn’t until into the 1980’s that people realized that the PCB-contaminated oil was a hazard. After that WP&L used the proper methods of disposal.”⁷

PCB bulk waste. FOSTs for land parcels at Badger indicates that the Deed will include asbestos and lead-based paint warnings and covenants. Non-paint sources of PCBs and PCB bulk product include building materials such as caulking, coatings, sealants, insulation materials, foam rubber, wool felt, grout, components in electric cable, roofing, adhesives, mastic, etc.

PCBs in Paints. PCB bulk product includes paint containing PCBs greater than 50 ppm. Paint samples were taken by Plexus Scientific from certain surfaces at Badger in September 2002. Concentrations of PCBs were detected as high as 22,000 parts per millions, exceeding the regulatory limit of 50 parts per million.⁸ According to Army officials at Badger, subsequent PCB paint data has been gathered and most of the database is being linked to the GIS website so it is already technically available to Army personnel.⁹ To date, this information has not been made available to the public.

PCB Spills. Environmental releases of PCBs are regulated under the Toxics Substances Control Act. An example of a major PCB spill occurred at the East Rocket Production Area. Inspectors found oil leaking out of the large hydraulic presses and into the sewers. Approximately 9,500 gallons of PCB-contaminated oil was removed from 51 buildings. The work was completed in 1995.¹⁰

These questions are generally outside the scope of the Army’s current proposal and WDNR’s review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Are PCBs present in groundwater at Badger?

Q: Are PAHs present in groundwater at Badger?

⁶ General Services Administration, Preliminary Highest and Best Use Analysis, Badger Army Ammunition Plant, May 15, 1998.

⁷ C. Wilhelm, written submittal to CSWAB in its entirety for inclusion in comments on the Finding of Suitability for Transfer for Badger AAP, received February 5, 2008.

⁸ *Determination of Polychlorinated Biphenyls (PCBs) in Paint*, Badger Army Ammunition Plant, Baraboo, Wisconsin, undated.

⁹ M. Sitton, U.S. Army, Badger Army Ammunition Plant, e-mail correspondence to L. Olah, CSWAB, October 25, 2006.

¹⁰ Infrastructure Remedial Environmental Study, Badger Army Ammunition Plant, Volume I of III, Pages 26, December 1996.

Q: Are dioxin or furans present in groundwater at Badger?

Q: Is mercury present in groundwater at Badger?

Storm Sewers. The Rocket Paste Area is an example of an area with storm sewers that drained through historical production areas and contained hazardous wastes. Floor drains from the paste production buildings were connected directly to the storm sewer. Inspection of these sewers found “large volumes of rocket paste, particularly in the demolished west area.”¹¹

This question is generally outside the scope of the Army’s current proposal and WDNR’s review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Are storm sewers a known or potential source of groundwater contamination at Badger? Have any investigations been conducted to look into this?

Vanadium and Vanadium Compounds. Vanadium Pentoxide serves as the catalyst for the conversion of SO₂ to sulfur trioxide.¹² According to Army officials at Badger, Vanadium Pentoxide was used as a catalyst in acid production at the old acid area and may have been used in the laboratory.¹³

In 1994, 6,830 pounds of Vanadium Pentoxide wastes were generated at Badger.¹⁴ In 1995, more than 5,000 pounds of Vanadium Pentoxide wastes were generated from Badger.¹⁵

The August 1998 Environmental Baseline Survey for Badger notes that Vanadium Pentoxide was contained in equipment or may have been used in the manufacturing process at the New Acid Area.

While the historical use, handling, and disposal of Vanadium Pentoxide wastes is well documented at Badger, a review of environmental investigations referenced in the FOSTs did not find this inorganic compound included in selected test methods. Wisconsin’s Groundwater Enforcement Standard for Vanadium is 30 micrograms per liter.

Just as mercury was later found to be a pervasive pollutant in and around Badger, follow-up investigations may be necessary to assure that Vanadium and Vanadium compounds are not a potential ecological or environmental health contaminant of concern at Badger.

This question is generally outside the scope of the Army’s current proposal and WDNR’s review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an

¹¹ Infrastructure Remedial Environmental Study, Badger Army Ammunition Plant, Volume I of III, Page 33, December 1996.

¹² U.S. Army Environmental Hygiene Agency, Water Pollution Aspects of Explosives Manufacturing, page 56, August 1985.

¹³ Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

¹⁴ U.S. Army, Badger Army Ammunition Plant, Feasibility and Plan of Operation Report for Small Storage Facility, Section E – Waste Characterization, Table E-1, circa 1986-1988.

¹⁵ Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Are vanadium and vanadium compounds present in groundwater at Badger?

Tetrahydrofuran and other hazardous wastes. Tetrahydrofuran is reported in groundwater at concentrations as high as 300 ug/l (micrograms per liter) in the 1981 Contamination Survey of Badger, exceeding Wisconsin's Groundwater Enforcement Standard of 50 ug/l. The highest concentration was detected in groundwater near the Deterrent Burning Grounds.

In reviewing subsequent environmental studies, it appears that this organic solvent and other detected contaminants were not always carried forward (pursued) in subsequent environmental investigations. Some historical accounts suggest that certain parameters were dropped, even when detected, if a clear and concise connection to historical Army operations was not found.

In the case of Tetrahydrofuran, this may be a significant oversight. When released into the soil, Tetrahydrofuran is expected to quickly evaporate¹⁶ so its detection in groundwater at such high concentrations suggests that the source of this contamination is likely significant.

On February 13, 1996, more than 150 pounds of waste flammable liquids containing Methyl ethyl ketone and Tetrahydrofuran was generated by Badger, confirming the presence of this solvent at the facility.

Follow-up investigations may be necessary to assure that the Tetrahydrofuran is not a potential ecological or environmental health contaminant of concern at Badger.

Other hazardous wastes generated at Badger included DDT (insecticide), Dichloromethane (laboratory solvent used in soil and groundwater analysis), Diethylphthalate (used in the manufacture of rocket propellant), Ethyl Ether (used in the manufacture of single-based propellants and in laboratories as an extractant), *o*-Toluidine (42 pounds in 2002), *p*-Benzoquinone (5 pounds in 1993), Potassium Cyanide (6 pounds in 1989), and Sodium Azide.¹⁷

This question is generally outside the scope of the Army's current proposal and WDNR's review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q. Are tetrahydrofuran and other hazardous wastes mentioned above present in groundwater at Badger?

Pentachlorophenol, Copper-Arsenate, and Impurities (Dioxins and Furans). Pre-1970's lumber used to construct Badger is presumed to contain Pentachlorophenol.¹⁸ Post-1980's treated reconstruction lumber at

¹⁶ Mallinckrodt Baker, Inc., MSDS Sheet, Tetrahydrofuran, November 11, 2006.

¹⁷ Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

¹⁸ WDNR, Analysis and Preliminary Determination and Draft Plan, Explosive Decontamination and Demolition at Badger Army Ammunition Plant, Pages 25, February 25, 2003.

Badger is presumed to contain copper-arsenate.¹⁹ Pentachlorophenol solutions consist primarily of chlorinate phenols and heavy petroleum oils. Methylene Chloride and liquid petroleum gas were historically used as solvents in pentachlorophenol solutions.

Pentachlorophenol is released to the air by evaporation from treated wood surfaces. Exposure may also result from touching wood treated with preservatives containing Pentachlorophenol²⁰ Many, but not all, of the harmful effects associated with exposure to Pentachlorophenol may be due to impurities present in commercial mixtures.²¹ Common impurities include dichlorophenol, trichlorophenol, hexachlorobenzene, dioxins, and furans.

Pentachlorophenol has been detected in groundwater monitoring wells at Badger, particularly near and beyond the southern plant boundary. According to the May 2001 Groundwater Narrative Summary (page 154), Pentachlorophenol was detected in groundwater monitoring well PBM 9001D at 14.1 ug/l (micrograms per liter), exceeding Wisconsin's Groundwater Enforcement Standard of only 1 ug/l. The May 2003 Groundwater Narrative Summary Report notes that Pentachlorophenol was detected at 6.9 ug/l in monitoring well SWN 9104D.

This question is generally outside the scope of the Army's current proposal and WDNR's review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Are Pentachlorophenol, copper-arsenate, and other wood preservatives present in groundwater at Badger?

Radioactive wastes. On January 30, 2001, a radioactive material shipment of U-238 Uranyl Acetate 1 pound and Uranyl Zinc Acetate of 500 grams is recorded by the Army from Badger.²² A possible waste source suggested by the Army was "laboratory storage area cleanup of unused materials".²³

Uranyl Zinc Acetate is highly toxic by both inhalation and ingestion. Cumulative effects are also probable with the target organs being the liver and kidneys. It is toxic to aquatic organisms, and may cause long-term adverse effects in the aquatic environment. As with all compounds of uranium, even depleted uranium, it is radioactive to a degree that is dependent on its isotope ratios.

"U-238 Uranyl Acetate" is not a recognized term in the scientific literature. Depleted Uranium (DU) is uranium primarily composed of the isotope uranium-238. Uranyl Acetate contains a radioactive isotope which may produce cancer and genetic mutation.²⁴ Primary routes of exposure are inhalation, skin absorption, and ingestion.

¹⁹ WDNR, Analysis and Preliminary Determination and Draft Plan, Explosive Decontamination and Demolition at Badger Army Ammunition Plant, Pages 25, February 25, 2003.

²⁰ Gemini Group, Gemini Group Health Effects Directory, *Pentachlorophenol*, undated.

²¹ Gemini Group, Gemini Group Health Effects Directory, *Pentachlorophenol*, undated.

²² Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

²³ Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

²⁴ Ted Pella, Material Safety Data Sheet, Uranyl Acetate, Dihydrate, Material Safety Data Sheet, September 4, 2002. http://www.tedpella.com/msds_html/19481msd.htm

Additional research is recommended to identify other potential sources of radioactive wastes and the historical use, handling, and disposal at Badger. As a matter of record, it should be noted that Olin Corporation, a previous operating contractor at Badger, has been awarded numerous federal contracts to manufacture depleted uranium (DU) munitions.

The information included here contains insufficient evidence of the possibility of a release of radioactive waste at BAAP. In addition, the Army has not submitted to WDNR any information about a possible release of such material.

Q: Are elevated levels of radionuclides present in groundwater at Badger?

Creosote. The Alt FS should discuss the potential ecological and environmental health implications of creosote as a wood preservative in buildings and infrastructure at Badger. Creosote is obtained from high temperature distillation of coal tar (itself a mixture of hundreds of organic substances), and over 100 components in creosote have been identified. It was used as a fungicide, insecticide, miticide, and sporicide to protect wood and is applied by pressure methods to wood products, primarily utility poles and railroad ties. EPA is currently reassessing creosote as part of its re-registration program for older pesticides.²⁵

According to the Army at Badger, creosote was not manufactured at Badger but was “commonly used at Badger as a wood preservative”. It was applied to barricades and poles throughout the installation.²⁶ Creosote can cause skin cancer with prolonged contact and irritation to the lungs and throat when vapors are inhaled.²⁷

This question is generally outside the scope of the Army's current proposal and WDNR's review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Is creosote or degradation products of creosote present in groundwater at Badger?

Pesticides. In 1983, a facility-wide Hazardous Materials and Pesticide Management/Control Study was recommended by the Army. In accordance with Army Regulations 200-1, the Army recommended a special study to “define sources of pollution and develop remedial measures”. The basis for the study was that “during normal operations and agricultural leasing over the past forty-plus years, many potential toxic and/or hazardous chemicals and/or pesticides have been used with Badger AAP's boundaries”. The Army notes that “no accurate records exist as to type or quantities that may have found their way into the environment.” The Statement of Work recommends a “systematic soil sampling and analysis study” for “all areas at Badger AAP”.²⁸ The

²⁵ U.S. Environmental Protection Agency, Pesticides: Topical & Chemical Fact Sheets, Creosote And Its Use As A Wood Preservative, August 2007. http://www.epa.gov/opp00001/factsheets/chemicals/creosote_main.htm

²⁶ Joan M. Kenney U.S. Army, Badger Army Ammunition Plant, letter to Robert Egan, U.S. Environmental Protection Agency Region V, Subject: Wastes Generated at Badger AAP, September 21, 2006.

²⁷ Infrastructure Remedial Environmental Study, Badger Army Ammunition Plant, Volume I of III, Page 17, December 1996.

²⁸ Department of Army, Headquarters, United States Army Armament, Munitions, and Chemical Command, Environmental Assessment for Total Plant Operations, BAAP, Exhibit II-R, July 1983.

responsibility for the use, control, and disposal of pesticides at Badger, including but not limited to insecticides, herbicides, and rodenticides, is the responsibility of the U.S. Army Armament Material Readiness Command.²⁹

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulates the registration and use of pesticides. Pesticide management activities are subject to federal regulations in 40 CFR 162, 165, 166, 170, and 171. Enacted in October 1972, the Federal Environmental Pesticide Control Act regulates the manufacture and sale of pesticides. Soils contaminated by the storage, mixing, or handling (but not application) of pesticides and herbicides are a special waste and may be a RCRA hazardous waste because of the characteristic of toxicity.³⁰

The November 1992 Site Screening Inspection Report for Badger (page 4-14), identifies Area I as Fertilizer/Herbicide Spill Areas; a corresponding map was not provided in this report.

Both the operating contractor and the agricultural lessees have used pesticides at Badger. The pesticides Monuron, Atrazine, Sevin, Solvit, Lasso, 2,4-Dichlorophenoxyacetic Acid (2,4-D), Bladex, Thimet, Dalaphon, Furadan, and Simazine were used and stored at Badger between 1974 and 1976 (USATHAMA, 1977). Pallets of Monuron and Simazine were stored in Badger Account 507-3 (USAML, 1974). Monuron was used as a soil sterilant for all vegetation on transformer banks, tank farms, railroad sidings, and ballast along tracks. Solvit was used for control of mice and rats, and 2,4-D was used for Canadian and musk thistle (Olin Corporation, 1977a). Chlordane was present in Badger Accounts 214 (Section 1006) and 235 (Section 1006A) (Olin Corporation, 1996a, b, c); however, no mention of chlordane was made in the 1977 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) study (USATHAMA, 1977a, b) and thus it may not have been used to a great extent at the facility. Since 1987, an outside contractor conducts pesticide application mainly for tenant activities (PRC Engineering, 1987; Olin Corporation, 2004a).³¹

According to an USAEHA (1982) Pest Management Program Review, general pest control operations (which at the time of the review were limited to rodent control) were limited to one employee of Olin Corporation who received DoD training in pest management. Rodent control consisted of placing anticoagulant rodenticide bait stations (e.g., Warfarin, 0.025%) in buildings where rodents were reported. A certified subcontractor conducted weed control at Badger. The weed control contractor and local farmers who leased land at Badger stored all pesticides off-site. Herbicides used at Badger include 2,4-D, dicamba, glyphosate, oryzalin, simazine, tebuthiuron, and a combination of sodium metaborate tetrahydrate and bromacil (USAEHA, 1982a).³²

Pesticide mixing operations were limited to formulation of herbicides.³³ The pesticides were brought to the site and mixed onsite using water from five fire hydrants (USAEHA, 1984). The 1990 USAEHA Pest Management Survey indicated that two dedicated fire hydrants were used for pesticide mixing (USAEHA, 1990c), whereas, the USAEHA 1980 survey indicates the presence of "three roadside pesticide mixing sites" (USAEHA, 1980). Following the 1978 USAEHA Pest Management Program Review, the fire hydrants were equipped with backflow prevention devices. Herbicide formulations were reportedly mixed on the gravel surface near Badger Account

²⁹ Department of Army, Headquarters, United States Army Armament, Munitions, and Chemical Command, Environmental Assessment for Total Plant Operations, BAAP, Introduction, Mission and Operations, page 6, July 1983.

³⁰ U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

³¹ U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

³² U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

³³ U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

512. Pest control dispersal equipment was improperly rinsed on the gravel surface. USAEHA (1978) recommended that an outdoor mixing facility be constructed.³⁴

A 1971 Industrial Hygiene Survey reported that two workers (for up to eight hours per day) conducted the mixing and dispersing of herbicides (USAEHA, 1971c).³⁵

Pest control activities at Badger are handled in accordance with a formal Pest Management Plan. The last major revision was in 1998 and the plan was last updated in August 2004. The plan encourages the use of non-chemical methods for pest control and requires that all pesticides be mixed prior to being brought on to the installation. Pesticides are only stored on the installation by exception (CHPPM, 1998). The types of herbicides used at Badger include: Amine-2,4-D, Banvel, Bladex, Butyl-2,4,-D, Genep, Lasso, Princep-90, Prowl, Roundup, and Surflan (BAAAP, 1998d).

A 1981 Contaminant Survey at Badger reports Endrin and Delta-BCH were detected in water in the drainageway leading into the settling ponds (Final Creek). The concentrations were 0.066 ug/l and 0.14 ug/l. The predominant source of water in this drainageway is wastewater discharge from the sanitary and industrial wastewater.

Initial data submitted by the Army in its 1996 WPDES permit application indicated levels of the following parameters were elevated in the influent (Bluffview, Badger sanitary, boiler blowdown and landfill leachate, combined) to Badger's sanitary wastewater treatment facility: Chromium - total and hexavalent, Iron, Barium, Manganese, Arsenic, Methylene Chloride, Lindane (reported as Gamma-BHC, also known as Gamma-HCH), and Xylene (reported as M/P-xylene). Not confirmed or inadequate data: Phenols, Ethyl Benzene, Toluene, and Delta-BHC (also known as Delta-HCH). The outfall from this wastewater treatment system is Final Creek and Settling Pond #1.

The 1981 Envirodyne Contamination Survey of Badger recommended follow-up testing for PCBs and/or pesticides for wells S1102, S1104, and S1107 located downgradient from the settling ponds along Badger's southern boundary, well S1123 located on the western boundary of Badger near U.S. Highway 12, and production well #4.³⁶

The 2004 Environmental Assessment for Badger notes that in Section 1011, Buffer Zone Wooded Land/Partially Completed TNT Manufacturing Area a release of herbicide occurred; the date of the release is listed as unknown and the quantity is not cited.

Badger's sanitary sewage collection system includes about 207,000 feet of mains and 530 manholes. There are also four lift stations. The June 1997 facility evaluation and planning report for the system describes significant surface water (clear water) inflow problems that are characterized as "severe" during spring snow melt periods and very heavy rainfalls. Sewage flows have been recorded that jumped from 50,000 gallons per day to 220,000 gallons per day during a one day event.³⁷

This question is generally outside the scope of the Army's current proposal and WDNR's review. In general, if records indicate that a possibility exists for the release of a particular contaminant or contaminants, then an investigation for the presence or absence of the contaminants in question must be conducted. This information

³⁴ U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

³⁵ U.S. Army Base Realignment & Closure Office, Environmental Site Assessment, Badger Army Ammunition Plant, Section 4, Investigation Reports, pages 4-2 and 4-3, December 2004.

³⁶ Envirodyne Engineers, Badger Army Ammunition Plant Contamination Survey, March 1981.

³⁷ Olin Corporation, Sanitary Sewage Treatment System Facility Evaluation and Planning Report, BAAP, pages 10-11, June 1997.

will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Are pesticides present in groundwater at Badger?

Gruber's Grove Bay. In a June 7, 2007 letter to CSWAB, the Wisconsin DNR said it has found mercury concentrations more than 25 times the required cleanup goal and almost 400 times higher than levels reported by the Army in sediments at Gruber's Grove Bay on Lake Wisconsin. The sediment contamination was caused by the historical discharge of sanitary and industrial wastewater from Badger Army Ammunition Plant directly to the river. Despite a second multi-million dollar cleanup effort by the Army, 8 of the 10 sediment samples tested by the WDNR exceeded the cleanup goal of 0.36 parts per million (ppm). WDNR test results for mercury ranged from 0.24 to more than 9 ppm. The WDNR previously described the Lake Wisconsin bay as "one of the worst localized mercury contaminant sediment situations that we know about on a state-wide basis."

These questions are generally outside the scope of the Army's current proposal and WDNR's review. They will be considered in the future as part of future review of implementing the groundwater remedial action and during closure considerations.

Q: Is mercury present in groundwater near Gruber's Grove Bay and the Settling Ponds Area?

Q: Is groundwater moving under the bay from Water's Edge towards the Windings?

Sulfates.

Q: What is the source of sulfates in groundwater at the northeast corner of Badger?

The source appears to be Landfill #5, considering groundwater flow direction in the vicinity and concentration distributions using data from monitoring wells in the vicinity.

Cost. The most cost-effective remedies invariably prevent and/or significantly reduce environmental releases from occurring altogether. At Badger, the most cost-effective solution could be found by preventing further contamination from reaching groundwater at all and/or achieving control or removal of the source area. In fact, the original approved remedy for the Propellant Burning Grounds was a source removal action which was proposed by the U.S. Army, the WDNR, EPA, and the Badger RAB. When compared to the costs of the alternatives cited in the Alt FS, this and other source control remedies may now very competitive in terms of cost.

Q: What alternative remedies could be implemented to address the source area and better control releases to the environment? What is the comparative cost for the life of each of these alternatives?

Numerous remedial actions have already been implemented at the major contaminant source areas. Regarding remedies to be approved and implemented in the future at BAAP, WDNR rules allow a responsible party to choose and implement remedial actions and are accountable and have liability for the effectiveness of these actions to achieve compliance with soil and groundwater quality standards.

Q: Do the individual groundwater/drinking water sample costs vary greatly between remedies presented in the Alt FS? If so, why is there such a great disparity in sample costs?

This question, and the following five, should be asked of the Army, the author of the proposal.

Q: Do the Army's cost estimates incorporate the expected decrease in annual costs for groundwater and drinking water testing over time? Are there other factors that Army overlooked in its calculations?

Q: The Army's Spring 2012 Clean Water Well Done flyer says that groundwater monitoring is only expected to continue for 20 years. What is this number based on? Is this number reasonable? What variables could affect this number? Is this consistent with cost and timeline projections in the Alt FS?

Also note that groundwater monitoring will be required of the Army until contamination case closure has been issued for all of the source areas associated with BAAP.

Q: How do the true projected costs of testing private wells compare to the true projected costs of municipal water?

Q: The Army has suggested the agricultural users will receive a "bulk rate" for water. What are the potential implications for other users? Could this increase the rates to residential users?

Q: Many of the homes in our area are vacation homes. Does the Army's proposal and cost analysis include this factor? What are the implications?

DuPont Barksdale site.

The Army has often argued that the WDNR should assure that decisions at Badger should be consistent with other sites, particularly the DuPont Barksdale site in northern Wisconsin where the explosive DNT is a primary contaminant of concern.

DuPont and URS representatives have reported that they have been analyzing samples for all DNT isomers, as well as DNX isomers where appropriate, for quite some time now, according to WDNR records obtained through an open records request by CSWAB.

While the WDNR and DuPont did work together to evaluate the different water supply alternatives for the residents around the Barksdale site, the connection of nearby residents to municipal water from the City of Washburn was **not considered a remedy, but an interim action** to address drinking water contamination issues with the former private wells, WDNR records confirmed.

As of October 24, 2011, the WDNR had made no decision on a final remedy or remedies, including monitored natural attenuation (MNA), for impacted groundwater associated with the Barksdale site. The Department still considered the site to be in the investigation phase, and appropriate remedies are to be considered once enough data has been gathered to evaluate the site and those remedies, WDNR records said.

BAAP and the Barksdale sites are very different in very significant ways so to compare the two could be misleading. Soil and groundwater monitoring parameters have been chosen for BAAP based on Army records, WDNR regulations, and input from a variety of participants over many years. WDNR has explained in a recent letter its strategy on the issue of requiring monitoring the four DNT isomers listed in the third question below. Also note that a public water supply system can be considered part of groundwater contamination remedy because it eliminates any risk associated with consumption of water from private wells. However, a water system does not eliminate the requirement of compliance with the NR 700 series administrative codes and with ch. NR 140.

Q: What are DNX isomers? Has such testing been conducted at Badger? Why or why not?

Q: Are there other parameters that DuPont tests for that are not included in testing at Badger? Why or why not?

Q: As part of current and future site investigations and evaluation, does the WDNR have the authority to ask the responsible parties at the DuPont Barksdale site to test soils for 2,3-DNT, 3,5-DNT, 3,4-DNT, and/or 2,5-DNT?

Q: Is the municipal water system at the DuPont Barksdale site considered a remedy?

Q: If WDNR does not consider the municipal water system at the DuPont Barksdale site a remedy, what are the implications for Badger?

Alternatives.

A responsible party is required to identify and evaluate a range of remedial action options, but is not required to evaluate every possible option. It also is able to choose its preferred option if that option complies with WDNR rules. Also, as stated above, a public water supply system can be considered part of groundwater contamination remedy because it eliminates any risk associated with consumption of water from private wells. However, a water system does not eliminate the requirement of compliance with the NR 700 series administrative codes and with ch. NR 140.

Q: Are deeper neighborhood and/or shared wells a possible cost-effective alternative? If they are, should this be evaluated as a component in remedy selection?

Q: Are new wells that have been installed by Army for homeowners providing clean safe water? If they are, is this a possible remedy component?

Q: The Army provided the Dairy Forage with a water treatment system and filters when low levels of DNT were detected in its livestock well. Is this system providing clean water for the Dairy Forage? If they are, is this a possible remedy component?

Q: Are there other alternatives or components that are appropriate for evaluation that Army did not include in the Alt FS?

Q: Is long term non-compliance with groundwater and drinking water standards and advisories likely with the Army's proposed mitigation effort? Are there alternatives that the Army has not presented that are more likely to achieve compliance with environmental standards and advisories?

Q: Are there alternatives that the Army has not presented that may better serve affected communities and the State of Wisconsin in terms of environmental quality?

Q: Do the Hazardous Substance Discharge law, the Environmental Repair law, or other similar laws require restoration of the environment to the extent practicable? Does the Army's proposal achieve this goal? Are there other alternatives that could better achieve this goal that the Army has not proposed?

Q: Has sustainability been evaluated as part of this process?

Irrigation wells.

Consideration of (non-potable) irrigation wells is outside the scope of the proposal and associated regulatory review. The following questions may be more appropriate for the local government review and approval process for the proposed public water supply system.

Q: Who will conduct and pay for regular testing irrigation wells until the groundwater enforcement standard is achieved?

Q: What will happen if contaminant concentrations in groundwater near irrigation wells increase? If this occurs, how will these wells be protected?

Q: What will happen if contaminant concentrations in irrigation wells increase?

Q: What will happen to farmers who cannot use their irrigations wells because they are polluted?

Q: Will farmers be required to use municipal water if their irrigations wells become contaminated?

Q: How will farmers be guaranteed that contaminant concentrations will not exceed groundwater standards, drinking water standards, and/or health advisories so that irrigation water can be safely used for growing vegetables and/or organic produce?

Q: Are the costs of all of the above included in the Army's financial analyses?

Contingency Plan.

The community is very concerned that the Army's proposal may put the cart in front of the horse to the disadvantage of the surrounding community.

Residents and farmers are very concerned that construction of the public infrastructure may begin BEFORE natural attenuation of all three plumes as a remedy (that will achieve prompt compliance with groundwater standard) is demonstrated, the effectiveness of the landfill caps at the source area is known, the potential for better source controls is exhausted, the potential risk to public wells and agricultural wells is verified, the risk of vapor intrusion now and in the future is eliminated, the health and environmental implications and outcomes from modifying the operation of the MIRM are known, the true costs of municipal water to homeowners and farmers are confirmed, etc.

One of our biggest concerns is that once construction has begun, the Army will effectively strong-arm any other option except municipal water as the economic outlay will certainly outweigh and overcome any other alternatives. The Army has been plain that it seeks to eliminate potential receptors in order to avoid additional obligation to achieve actual cleanup.

The approval and installation of a public water supply system is a process separate from the WDNR requirements for compliance with Department contaminant clean-up requirements.

Q: How will the Department make sure that the initiation of construction does not negatively drive other decisions or opportunities that may affect human health and the environment?

Q: How will the Department's plan to address all possible contingencies and outcomes be documented?

Q: If a pulse of contamination is found to be moving away from the source area and the pump and treat system is gone, what will happen? What will happen if this occurs and there is no longer an Army presence at Badger?

Q: Worst case scenario with MNA, how long will it take for groundwater to meet groundwater enforcement standards and drinking water health advisories for each plume?

Prediction with certainty the time necessary to reach compliance with groundwater quality standards is impossible. The Army is responsible for all necessary investigation, remedial action, and monitoring until compliance is achieved.

Rights of Refusal. The U.S. Army has long maintained that the majority of private drinking water wells in the remedy area are not at risk for contamination and for this reason has, for decades, refused to test these wells. The WDNR has taken the same stance and has not mandated testing for the majority of private wells, livestock wells, and irrigation wells in the remediation area. As recently as December 2011, residents asked the U.S. Army to test two private wells on Spear Road in rural Merrimac Township which had not been tested for nearly 20 years. The Army refused to test these residential wells and the WDNR upheld the decision. Even with further consideration, the WDNR refused to use its own resources to test these drinking water wells thereafter.

Q: For residents and farmers who may ultimately be required to use municipal water due to a risk for contamination, why isn't the Army required to regularly monitor these drinking water and agricultural wells in the interim?

The size and configuration of the proposed water supply's service area was the Army's decision. The decision to include certain wells in the current monitoring program is based on potential risk of contamination, the contaminant history of a well, and in some cases, the potential of the well to represent groundwater quality for drinking water wells in the area.

Q: Conversely, if the great majority of residential and agricultural wells in the remedy are not at risk, can these residents and farmers keep their own wells if they want to?

This will be a decision made locally during the process of forming and initiating a sanitary district.

Q: The Army maintains that all contaminant plumes are stable and receding and will pose no additional or new threats to the environment or nearby drinking water wells. If the Army can prove that this is true, why is municipal water necessary?

The stability of the PBG plume has not yet been defined under non-pumping conditions (non-operation of the IRM/MIRM systems). For an answer to the second question, the Army should be consulted as the party that proposed the public water system.

In addition to the above, our expectation is that substantive issues, risks and questions raised in earlier drafts of the Alt FS that were submitted to the Department are addressed. For example, groundwater modeling that was not carried forward in the final document indicated that the PBG plume over time could move closer to Village Well #3. This is a big deal in terms of risks to public health. In this case, the public needs to know if modeling was not carried forward because the conclusions were completely invalid (science) or because it didn't support the Army's preferred alternative (not science). In cases where earlier information contradicts later submittals, we expect and rely on the Department to decide which information and data are reliable and pertinent. In the same way, it is reasonable to expect that affected residents and communities will ask about circulated drafts that contain information indicating a risk to public health and the environment – folks deserve an answer.

WDNR found the model in earlier drafts of the groundwater Alt. FS to be incomplete and not particularly useful in reviewing the proposal. The Army should be consulted with any questions about the draft model.

Central Plume.

CSWAB received a first-hand report from a former worker concerning a possible contributing source to the Central Groundwater Contaminant Plume. The contents of rail cars containing weak sulfuric acid and other waste liquids were regularly discharged to a "sand pit" that was approximately 150 feet square and 3 feet deep, they said. Some of the disposed materials were brought on site originated from the Joliet Arsenal, they said. Some of the materials were transported by a chemical corporation based in Denver, they said. The "sand pit" disposal site was located adjacent to railroad lines near the SAR (sulfuric acid regenerator) plant, they said. The "sand pit" disposal site appears to correspond with the original of the Central Plume as indicated on the plume maps published by Badger, they said. The timeline for that these activities were observed was the early 1980's, they said.

Q: Are there aerial photographs from this time period which show a sandy excavation in this general area? Has this area been investigated?

WDNR is not familiar with the "sand pit" noted above. The Army should be consulted about the existence of aerial photos of the area.

Propellant Burning Ground Plume near the Village of Prairie du Sac.

The Village of Prairie du Sac website provides additional insight on how the geology of the prairie is hard to figure out. On December 13, 2011 drilling of Well #4 reached a depth of 30 feet. During the last week of drilling in February 2012, the contractor was drilling through shale fingers which what caused grey water that was pumped into a storm water retention pond. The website reports that this was a somewhat unusual occurrence of shale and that the depth of shale being drilled through was not anticipated. The drilling of the new well reached the Mt. Simon formation at 580 feet. The original plan was to drill to 550 feet. The additional depth was needed to get past the shale. Well # 2 should be removed from service if nitrate levels approach the maximum contaminant level, the website adds. For more information, go to the Village of Prairie du Sac web site at <http://prairiedusac.net/> and click on "The Village is in the process of constructing a new water well, Well #4".

Q: What are the potential implications of the information presented on the Village website?

The information provided on the construction of Prairie du Sac well #4 is insufficient to draw any conclusions or to respond to the question.

At the April meeting of the Badger Restoration Advisory Board, Army officials stated that the PBG plume is moving at a rate of 300 feet per year in the groundwater. One mile equals 5280 feet. This is approximately 17.6 years per mile of movement. It is approximately 5.5 miles from the PBG area to the river shoreline near the Prairie du Sac dam. There are groundwater seeps along this area and they have not been tested for contaminants, WDNR officials reported at this same public meeting.

Some of the following questions are outside the scope of the proposal or WDNR's review. Some of them will be considered in future review processes.

Q: What are the potential implications of seeps by the dam?

Q: Now that the WDNR and Army are publicly aware of the groundwater seeps by the dam, when is there going to be testing of these for contaminants? If not - why?

Q: Is the existing groundwater plume the start, middle, or the end? How do you know?

Q: How long did the first contamination take to reach groundwater? How do you know? What was the contaminant?

Q: Don't individual contaminants travel at different speeds? How has the movement of the various contaminants differed? How do you know how fast they've traveled?

Q: Do combined contaminants travel at different speeds?

Q: Was documented and undocumented dumping considered?

Q: Was rain and snow averaged or was it based on yearly water/snow fall? Was heat and high or low humidity considered? Was soil compaction or soil movement considered? Was any oil residue layer considered?

Q: Were pulses considered?

Q: Is the area resistant to vertical flow?

Miscellaneous

There is also an Artesian well that is located along Water Street in Sauk City and I am requesting formal testing of this water source. (Donna Schmitz)

The well was related to an old dairy and has reportedly been sealed.

Mercury - On two separate occasions the river bottom at Gruber's Grove Bay has been dredged to remove extremely high levels of mercury from Badger that were found in the sediment. Despite these dredgings WDNR testing has conclusively shown that mercury levels in the Bay sediment still exceed acceptable levels. In fact, Gruber's Bay contains the highest level of mercury contamination in Wisconsin. We are asking WDNR to require the Army to clean up mercury contamination in Gruber's Bay and adjoining waters then test and verify to the satisfaction of WDNR that mercury levels in Gruber's Bay and adjoining waters are at acceptable levels and pose no serious threat to human health, wildlife or the fishery. WDNR needs to make sure the people of Wisconsin who consume fish from Lake Wisconsin and the Wisconsin River are not harmed by these high levels of mercury contamination. (Wisconsin Wildlife Federation)

Contamination at Gruber's Grove Bay and any related fish advisory are outside the scope of this decision.

It seems to me that the land was productive farmland before the plant was built, why couldn't the land be auctioned off... Or what if the land could be rented out to farmers on bids? It seems like a no-brainer. Why give it away? (Robert Endres)

Distributing excess federal land is done according to Federal laws and is outside the DNR's authority.