

Overview of Certain Badger Army Testing Parameters for the Village of Prairie du Sac Well #3

The U.S. Army currently tests the Village of Prairie du Sac Well Municipal Well #3 on an annual basis for some of the groundwater contaminants associated with Badger Army Ammunition Plant. Based on a careful review of dozens of reports by the U.S. Army, WDNR, and WI Division of Public Health, CSWAB found that the Army currently tests Well #3 for all six forms of the explosive Dinitrotoluene (DNT) but does not test for **ANY** of the possible degradation (breakdown) products of DNT.

No.	Degradation Products of the Explosive DNT	CAS #	Agency that identified parameter as Deg Prod of DNT	WDNR Parameter Code	Maximum Conc. At PBG March 2010 (ug/L)	NR 140 Public Health ES (ug/L)	WI DHS/ US EPA Lifetime HAL/CR (ug/L)	Parameter included in Army testing PDS Well #3 March/June/ Aug 2013	Army Result PDS Well #3 March/June 2013 (ug/L)	Army Result PDS Well #3 Aug 2013 (ug/L)
1	2-Nitroaniline	88-74-4	WDNR	78142	150	None found	None found	YES/YES/NO	<0.5	Not tested
2	3-Nitroaniline	99-09-2		78300	3.4			YES/YES/NO	<0.5	
3	4-Nitroaniline	100-01-6		73605	< 1.3			YES/YES/NO	<3	
4	2-Nitrotoluene (o-Nitrotoluene)	88-72-2		77394	8.4		0.15 (a)	NO	Not tested	
5	3-Nitrotoluene (m-Nitrotoluene)	99-08-1		46341	3.4		200 (a)	NO		
6	4-Nitrotoluene (p-Nitrotoluene)	99-99-0		77395	12.6		2 (a)	NO		
7	2-Methyl-3-Nitroaniline	603-83-8		49143	400		4 (a)	NO		
8	2-Methyl-5-Nitroaniline	99-55-8		73622	1,350		4 (a)	NO		
9	2-Methyl-6-Nitroaniline	570-24-1		99544	16.7		4 (a)	NO		
10	4-Methyl-2-Nitroaniline	89-62-3		99545	54.5		4 (a)	NO		
11	4-Methyl-3-Nitroaniline	119-32-4		78898	165		4 (a)	NO		
12	5-Methyl-2-Nitroaniline	578-46-1		99546	93.7		None (c)	NO		
13	2-Amino-4,6-Dinitrotoluene	35572-78-2		78901	Not Tested		1 (a)	NO		
14	2,4-Diaminotoluene	95-80-7		78888			None found	NO		
15	2,6-Diaminotoluene	823-40-5		99543	NO					
16	Nitrite (as N)	14797-65-0		615	8,160			1,000	NO	
17	Benzofuran	271-89-6		None	None			None found	NO	
18	3-Methylbenzofuran	21535-97-7							NO	
19	5-Methylbenzofuran	18441-43-5							NO	
20	3-Methyl-2-Nitroaniline	601-87-6							NO	
21	3-Methyl-4-Nitroaniline	611-05-2							NO	
22	3-Methyl-5-Nitroaniline	618-61-1							NO	
23	1,3-Dinitrobenzene	99-65-0	WI DHS	45622	1 (a)	NO				
24	Nitrobenzene	98-95-3	WDNR	34447	0.35 (b)	YES/YES/NO	< 0.5			

Source: (a) Wisconsin Division of Public Health. The HAL for the methylnitroanilines is intended as the summed total concentration of all five isomers or 4 ug/l.

(b) U.S. Environmental Protection Agency (c) No WI DHS HAL based on lack of evidence of mutagenicity, in contrast to the other methyl-nitroaniline isomers listed (WI DHS, R. Wozniak, PhD, 27 March 2014)

NOTATIONS:

- The Army is required to test Village Well #3 annually for all six forms of DNT (2,3-DNT, 2,4-DNT, 2,5-DNT, 2,6-DNT, 3,4-DNT, and 3,5-DNT). DNT has not been detected in Village Well #3. CSWAB successfully petitioned for WI Groundwater Enforcement Standards (ES) for all six DNT isomers. The ES for the summed total concentration of all six isomers of DNT is 0.05 ug/L.
- Of the DNT degradation products listed in this table, only Nitrite has a State Drinking Water or Groundwater Enforcement Standard. The Village monitors Well #3 for Nitrates and Nitrites.
- So far, CSWAB has successfully petitioned the State for Health Advisory Levels (HALs) for five degradation products of DNT. A HAL is a non-regulatory concentration of a contaminant in water that is likely to be without adverse effects on health and aesthetics.
- Concerning active groundwater remediation at Badger Army Ammunition Plant, the MIRM system wells near the plant boundary (which are still functional) are still running. Treated groundwater is discharged to Lake Wisconsin. The IRM system (close to the Propellant Burning Ground source area) is currently shut down as of March 19, 2014, according to Army officials at Badger.
- Carbon Dioxide was also identified by the WDNR as a degradation product of DNT but was not included in the above table.

No.	Other Groundwater Contaminants of Concern	CAS #	Parameter Code	Maximum Level Detected at Plant Boundary October 2013 (ug/L)	NR 140 Public Health ES (ug/L- except as noted)	WI DHS/US EPA Lifetime HAL/CR (ug/L)	Parameter included in Army testing PDS Well #3 Mar/June/Aug 2013	Army Results PDS Well #3 March/June/Aug 2013 (ug/L)
1	Ethyl ether	60-29-7	61056	7,690	1,000	--	YES/YES/YES	< 0.1 (all)



Groundwater monitoring wells north of the Village.

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CAS Registry Number = Chemical Abstracts Service (CAS) Registry Number

NR 140 Public Health ES = NR 140 Wis. Adm. Code, public health related groundwater quality Enforcement Standard (ES)

PBG = Propellant Burning Grounds at Badger Army Ammunition Plant

PDS = Village of Prairie du Sac. The U.S. Army tests Well #3 (PDS-3) under License 3497, Point 911.

WI DHS/US EPA Lifetime HAL/CR = United States Environmental Protection Agency (US EPA) or Wisconsin Dept. of Health Services (WI DHS) established lifetime health advisory level (HAL) or estimated 10-6 cancer risk (CR)

WDNR = Wisconsin Department of Natural Resources

ug/L = micrograms per liter (parts per billion)

References:

U.S. Army, Case Narrative Groundwater Monitoring License Number 2814, Propellant Burning Grounds, March 2010, Badger Army Ammunition Plant.

U.S. Department of Health and Human Services, Health Consultation, Dinitrotoluene in Private Wells, Badger Army Ammunition Plant, September 30, 2006, Table 2.

Wisconsin DNR GEMS Database (Public access to landfill environmental monitoring data), accessed online at <http://dnr.wi.gov/topic/landfills/gems.html> (Notation: Despite the DNR's best efforts to provide accurate data, there may be errors and omissions.)

Wisconsin DNR Response to Public Comments on the Army's Alternative Feasibility Study for Groundwater, 2012, pages 39-40.

Important Questions for Follow-up:

- Should monitoring of Village Well #3 by the U.S. Army at Badger Army Ammunition Plant be expanded to include **all 24** DNT degradation products identified by the Army, health officials, and WDNR?
- Are **offsite** groundwater monitoring wells and **private** drinking water wells being regularly tested for these DNT degradation products?
- Is it possible for DNT degradation products to be present in groundwater in the **absence** of DNT (parent product)?
- Are there **sentinel** groundwater monitoring wells screened at appropriate depths upgradient of drinking water wells in the Village?
- Are there seasonal or other **trends** in groundwater contaminants (from Badger) near the Village?
- Could **irrigation wells** located between Badger and the Village affect the groundwater contaminant plumes and/or groundwater movement near the Village?
- What are the **historical trends in ethyl ether** in groundwater at Badger? Are the current high levels of ethyl ether a new problem? What is the source?
- In addition to those listed in this report, are there **health-based drinking water standards or advisories** for the DNT degradation products identified by the WDNR and health officials?