

DNT: The Importance of Testing Groundwater and Drinking Water for All Isomers

Dinitrotoluene, commonly known as DNT, exists as a mixture of two or more of its six isomers (forms). The 2,4- and 2,6- DNT isomers are the most predominant and have been used in military munitions and dye manufacture.

Technical grade DNT is a mixture composed of approximately 76% 2,4-DNT, 19% 2,6-DNT, and 5% other DNT isomers (3,4-DNT, 2,3-DNT, 2,5-DNT, and 3,5 DNT). In groundwater and drinking water, however, these isomers can be found independently and in different ratios.

If you live near a facility that has DNT contamination, it is important that your groundwater and drinking water well be tested for all known isomers of DNT.

In certain groundwater monitoring wells inside Wisconsin's Badger Army Ammunition Plant, for example, levels of 2,4 and 2,6-DNT are much lower than 3,4-DNT concentrations in the same well. In one sample, 2,4- and 2,6-DNT levels were both below 0.08 parts per billion while 3,4-DNT was detected at levels 80 times higher: 6.45 parts per billion (June 2004).

It is also possible to see one isomer of DNT in a well and not see any others. This can come about in several different ways:

One way is if degradation is nearly complete for other isomers and a more resistant isomer could remain. Unlike 2,4- and 2,6-DNT, for example, 2,3-

DNT has not been demonstrated to be biodegradable.

A second way, although less likely, is if there are differences in the affinity of different DNT isomers to the aquifer material and one could show up faster or slower than the other.

Another way one isomer could show up by itself may be that the source area for the well is primarily contaminated with one isomer.

And finally, it is possible that one or more conditions could occur at the same time, resulting in the presence of a single isomer in a specific well.

To date, residents living near Badger Army Ammunition Plant have received test results for only 2 or 3 of the 6 known DNT isomers.

Wisconsin's safe drinking water standard for both 2,4- and 2,6-DNT is 0.05 parts per billion. DNT can affect the blood, nervous system, liver, kidneys, and male reproductive system in both humans and animals, and is a suspected human carcinogen. It is anticipated that the health risks of other DNT isomers are similar due to their structural similarity. Several recent studies, however, indicate that 3,4-DNT may be more toxic than the other more common isomers.

SOURCES: USEPA Office of Water, 2,4 and 2,6 Dinitrotoluene Health Advisory, April 1992. Dr. Jerry Eykholt, environmental engineer and technical consultant for the Badger Restoration Advisory Board, November 6, 2004 correspondence. J. Spain and S. Nishino, Bioremediation of DNT, Air Force Research Laboratory, Tyndall AFB, Florida, February 2001.

Groundwater Monitoring Well Results: June 2004

The following are provided as examples. All results are reported in parts per billion (ppb). DBM- and ELM- series wells are located in the northeast corner of Badger Army Ammunition Plant near the Deterrent Burning Grounds. PBN-series wells are located in the southwest portion of Badger near the Propellant Burning Grounds.

Well: DBM 8201

2,6-DNT	0.086
2,4-DNT	0.042
2,3-DNT	1.57
3,4-DNT	6.45

Well: PBN 8904B

2,6-DNT	0.159
2,4-DNT	0.032
2,3-DNT	0.649
3,4-DNT	0.200

Well: ELM 9501

2,6-DNT	0.016
2,4-DNT	not detected
2,3-DNT	0.007
3,4-DNT	0.031

Well: DBM 8202

2,6-DNT	0.058
2,4-DNT	0.015
2,3-DNT	1.03
3,4-DNT	3.80

Well: PBN 8202A

2,6-DNT	10.5
2,4-DNT	2.7
2,3-DNT	165.
3,4-DNT	191.

Well: PBN 8904B (duplicate)

2,6-DNT	0.185
2,4-DNT	0.038
2,3-DNT	0.763
3,4-DNT	0.239

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