

**Drinking Water and Groundwater Program****White Paper-Rule Development**

Comments on this White Paper may be sent to:

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**ISSUE**

Recommendations for state creating groundwater quality standards in ch. NR 140 for the pesticide and pesticide metabolites: Clothianidin, Dacthal metabolites MTP (monomethyl tetrachloroterephthalic acid) and TPA (tetrachloroterephthalic acid), Glyphosate, Glyphosate metabolite AMPA (aminomethylphosphonic acid), Imidacloprid, Isoxaflutole, Isoxaflutole DKN (diketonitrile), Isoxaflutole BA (benzoic acid), Sulfentrazone, Thiamethoxam and Thien carbazone-methyl.

**BACKGROUND**

This paper provides an overview of the Wisconsin Department of Health Services recommendations for groundwater quality standards for selected substances in Wisconsin Administrative Code chapter NR 140. Specifically, this paper addresses recommended groundwater quality standards for the pesticide and pesticide metabolites: Clothianidin, Dacthal metabolites MTP and TPA, Glyphosate, Glyphosate metabolite AMPA, Imidacloprid, Isoxaflutole, Isoxaflutole DKN, Isoxaflutole BA, Sulfentrazone, Thiamethoxam and Thien carbazone-methyl.

Wisconsin Statute chapter 160 establishes an administrative process for developing numerical state groundwater quality standards to be used as criteria for the protection of public health and welfare by all state groundwater regulatory programs. Chapter 160, Stats., directs the Department of Natural Resources (DNR) and the Department of Health Services (DHS) to use this administrative process to establish numeric groundwater quality standards for substances of public health or welfare concern, found in, or having a reasonable probability of being detected in, the groundwater resources of the state.

As part of a continuing commitment to protect public health, public welfare, and the environment, the DNR periodically updates groundwater quality standards in ch. NR 140, Wis. Adm. Code. The DNR requests that DHS review existing federal numbers and available toxicologic information and, as applicable under ch. 160 Stats., provide recommendations for new or revised groundwater quality standards for substances of public health concern. The DNR then proposes amendments to ch. NR 140, Wis. Adm. Code, to incorporate the DHS recommended standards into rule. Since its establishment in 1985, the Natural Resources Board has approved amendments to ch. NR 140 twelve times in order to revise existing standards, establish new standards and clarify rule language.

**SETTING NEW/REVISING EXISTING GROUNDWATER STANDARDS UNDER CHAPTER 160**

A list of substances which are detected in groundwater, or have a reasonable probability of entering groundwater, is compiled from one of two sources: 1) lists of substances submitted by state regulatory agencies (in accordance with s. 160.05(1), Stats.) related to facilities, activities and practices within their authority to regulate and which have been detected in, or have a reasonable probability of entering, the groundwater resources of the state; or 2) substances petitioned by any person (in accordance with s. 160.05(2), Stats.) to be added to the list.

DNR and DHS determine which substances on the priority list are of public health concern and which are of public welfare concern. In accordance with ss. 160.07 and 160.13, Stats., DHS develops recommendations for state groundwater quality standards for substances of public health concern. DNR

develops proposed groundwater quality standards for substances which are not health-related, but cause aesthetic or other effects. Scientific support documents for all recommended groundwater standards are prepared as part of the rulemaking process.

*Please note: to ensure full discussion of DG program's rule changes, information on recommended groundwater standards for Volatile Organic Compounds, Pesticides, Indicator Bacteria and PFAS/PFOS, substances have been divided among different meetings and white papers. This paper focuses on recommended updated groundwater quality standards for pesticides and pesticide metabolites.*

### **RECOMMENDATIONS FOR NEW AND REVISED GROUNDWATER QUALITY STANDARDS**

Recommended groundwater standards for incorporation into ch. NR 140 are organized by substance. A summary of information on how the recommended groundwater standard for each substance on the Cycle 10 list was established, and the method used by the DHS, is provided in a Scientific Support Document. The Scientific Support Documents for the recommended groundwater standards for substances described in this paper can be found on the DHS website at:

<https://www.dhs.wisconsin.gov/publications/p02434v.pdf> .

### **DEFINITIONS**

Enforcement standard: Level of a substance in groundwater that is used to protect public health or welfare and the level at which the sources of the substance might be regulated.

Preventive action limit: Level of a substance in groundwater that is used by regulatory agencies to determine when action may be needed so that levels do not reach or exceed the enforcement standard.

Federal number: A numerical expression of the concentration of a substance in water, established as:

- (a) A drinking water standard or maximum contaminant level, by the federal environmental protection agency;
- (b) A suggested no-adverse-response level, by the federal environmental protection agency; or
- (c) For oncogenic substances, a concentration based on a risk level determination by the federal environmental protection agency or a concentration based on a probability of risk model determined by the national academy of sciences.

Carcinogen: Cancer causing

Mutagenic: Causes DNA damage

Teratogenic: Causes birth defects

Interactive effects: Can affect the toxicity of another substance or its toxicity can be affected by another substance.

CAS RN: Chemical Abstracts Service (CAS) Registry Number (RN) is a chemical naming system that makes it easier to identify specific chemical substances.

### **UNITS**

1 nanogram per liter (ng/L) = 1 part per trillion (ppt), equivalent to one drop of a substance in an Olympic swimming pool.

1 microgram per liter (ug/L) = 1 part per billion (ppb), equivalent to one thousand drops of a substance in an Olympic swimming pool.

1 milligram per liter (mg/L) = 1 part per million (ppm), equivalent to one million drops of a substance in an Olympic swimming pool.

## **RECOMMENDATIONS FOR GROUNDWATER QUALITY STANDARDS FOR SELECTED PESTICIDES AND PESTICIDE METABOLITES**

### **Clothianidin**

Clothianidin is a neonicotinoid pesticide used to control a variety of indoor and outdoor insects. Neonicotinoids are broad spectrum insecticides used on agricultural fields, gardens, pets, and in homes. Neonicotinoid pesticides are similar to nicotine in their structure and are specifically designed to act on insect nicotine receptors resulting in paralysis and death.

Bayer CropScience was the original manufacturer of clothianidin. Other manufacturers include BASF, E.I. du Pont de Nemours and Company and Valent. Agricultural uses of clothianidin include seed treatments and spraying leaves to protect crops like corn, soybeans, snap beans, potatoes, grains (wheat, barley, and canola), and fruit. Residential and commercial uses include sprays and traps for control of bedbugs, ants, flies and other insects, and soil drenches for use on flowers, trees, and shrubs. Some common agricultural products containing clothianidin include Acceleron, Poncho-Votivo, and Prosper FX. Residential products include Crossfire Bedbug Concentrate, Raid Foaming Spray, and BioAdvanced Science Tree and Shrub Protect and Feed product.

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) has tested for clothianidin since 2008 and has detected it in 63 out of 1,504 private drinking wells tested, and in 256 samples collected from 40 monitoring wells installed near agricultural fields.

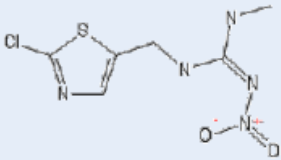
DHS recommends an enforcement standard of 1,000 µg/L for clothianidin based on the United States Environmental Protection Agency's (EPA's) chronic oral reference dose for clothianidin. DHS recommends that the NR 140 Preventive Action Limit for clothianidin be set at 20% of the enforcement standard because clothianidin has not been shown to have carcinogenic, mutagenic, teratogenic, or interactive effects.

### **Recommended Standards for Clothianidin:**

Enforcement Standard **1,000 µg/L (ppb)**

Preventive Action Limit **200 µg/L (ppb)**

### **Clothianidin Chemical Profile**

<b>Clothianidin</b>	
<b>Structure</b>	
<b>Chemical Symbol:</b>	C <sub>6</sub> H <sub>8</sub> ClN <sub>5</sub> O <sub>2</sub> S
<b>CAS Number:</b>	210880-92-5 (formerly 205510-53-8)
<b>Molar Mass:</b>	249.68 g/mol
<b>Synonyms:</b>	(E)-1-[(2-Chloro-1,3-thiazol-5-ylmethyl)]-3-methyl-2-nitroguanidine TI-435 V-10066

### **Dacthal metabolites MTP and TPA**

Monomethyl tetrachloroterephthalic acid (MTP) and tetrachloroterephthalic acid (TPA) are breakdown products of the herbicide dacthal. Dacthal is a pre-emergence herbicide used to control annual grasses and some broadleaf weeds in a variety of crops. In the environment, dacthal breaks down into MTP, which then breaks down into TPA.

Dacthal is an active ingredient used as an herbicide to control grasses and broadleaf weeds. American Vanguard Corporation (AMVAC) is the current manufacturer of dacthal. Products that contain dacthal are primarily applied to a variety of ornamental and turf plants, strawberries, and vegetables. Dacthal is the active ingredient in one product sold in Wisconsin, Dacthal Flowable Herbicide.

DATCP groundwater sampling has detected MTP and TPA in samples collected from monitoring wells installed near fields having known dacthal use. The highest combined concentration detected in samples collected from monitoring wells near fields with known dacthal use was 445 µg/L. Dacthal breakdown compounds were also detected in four private well samples collected by DATCP, but the parent compound dacthal was not detected. In private well samples, the highest combined concentration result was 8.5 µg/L.

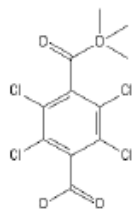
DHS recommends a combined enforcement standard of 70 µg/L for dacthal, MTP, and TPA. The recommended standard is based on the EPA's lifetime health advisory for dacthal, MTP, and TPA. Animal toxicity studies on MTP and TPA are limited, however dacthal has been studied extensively. Animals that ate large amounts of dacthal for long periods of time experienced liver, lung, kidney, and thyroid problems and some studies have shown that dacthal can cause carcinogenic effects in animals. The EPA considers dacthal a possible human carcinogen. DHS recommends that the NR 140 Preventive Action Limit for dacthal, MTP, and TPA be set at 10% of the enforcement standard because dacthal has been shown to have carcinogenic effects.

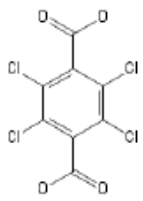
### **Recommended Standards for dacthal, MTP, and TPA combined:**

Enforcement Standard **70 µg/L (ppb)**

Preventive Action Limit **7 µg/L (ppb)**

**MTP and TPA Chemical Profiles**

<b>MTP</b>	
<b>Chemical Symbol:</b>	
<b>CAS Number:</b>	887-54-7
<b>Formula:</b>	C <sub>9</sub> H <sub>4</sub> Cl <sub>4</sub> O <sub>4</sub>
<b>Molar Mass:</b>	317.94 g/mol
<b>Synonyms:</b>	Monomethyl Tetrachloroterephthalic Acid Chlorthal-monomethyl

<b>TPA</b>	
<b>Chemical Symbol:</b>	
<b>CAS Number:</b>	2136-79-0
<b>Formula:</b>	C <sub>8</sub> H <sub>2</sub> Cl <sub>4</sub> O <sub>4</sub>
<b>Molar Mass:</b>	303.91 g/mol
<b>Synonyms:</b>	Tetrachloroterephthalic Acid Chlorthal

**Glyphosate**

Glyphosate is a broad-spectrum herbicidal active ingredient, applied to the leaves of plants to kill both broadleaves and grasses. It is used worldwide in agriculture, forestry, gardening, lawn-care, and for weed control in industrial areas. Glyphosate is also used for aquatic weed control. In the environment, glyphosate can degrade into aminomethylphosphonic acid (AMPA).

Glyphosate is a broad-spectrum herbicidal active ingredient, applied to the leaves of plants to kill both broadleaves and grasses. Monsanto was the original manufacturer of glyphosate, but there are currently numerous glyphosate products available from numerous companies. Glyphosate is the active ingredient in more than 200 products sold in Wisconsin. It is most commonly sold under the trade name Roundup® for both agriculture and non-agriculture uses.

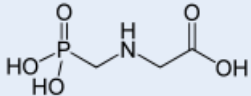
DHS recommends an enforcement standard of 10 mg/L for glyphosate based on the US Environmental Protection Agency (EPA) Office of Pesticide Program's draft oral reference dose for glyphosate. Studies in animals have shown that glyphosate can cause gastrointestinal effects and developmental effects. DHS recommends that the NR 140 Preventive Action Limit for glyphosate be set at 10% of the enforcement standard because glyphosate has been shown to cause mutagenic and teratogenic effects.

**Recommended Standards for Glyphosate:**

Enforcement Standard **10 mg/L (ppm)**

Preventive Action Limit **1 mg/L (ppm)**

**Glyphosate Chemical Profile**

Glyphosate	
Structure:	
CAS Number:	1071-83-6
Formula:	C <sub>3</sub> H <sub>8</sub> NO <sub>5</sub> P
Molar Mass:	169.07 g/mol
Synonyms:	N-(phosphonomethyl)glycine

### **Glyphosate metabolite Aminomethylphosphonic acid (AMPA)**

Aminomethylphosphonic acid (AMPA) is the major breakdown product of glyphosate. Glyphosate is a post-emergence herbicide that is used worldwide in agriculture, forestry, gardening and lawn care, and for weed control in industrial areas. The chemical structure of AMPA is similar to that of glyphosate.

Glyphosate is a broad-spectrum herbicidal active ingredient, applied to the leaves of plants to kill both broadleaves and grasses. Monsanto was the original manufacturer of glyphosate, but there are currently numerous glyphosate products available from numerous companies. Glyphosate is the active ingredient in more than 200 products sold in Wisconsin. It is most commonly sold under the trade name Roundup® for both agriculture and non-agriculture uses.

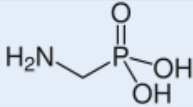
DHS recommends an enforcement standard of 10 mg/L for AMPA. The recommended standard is based on an animal study that found that AMPA caused hyperplasia in urinary tracts in rats. DHS recommends that the NR 140 Preventive Action Limit for AMPA be set at 20% of the enforcement standard because AMPA has not been shown to have carcinogenic, mutagenic, teratogenic, or interactive effects.

### **Recommended Standards for Aminomethylphosphonic acid (AMPA):**

Enforcement Standard **10 mg/L (ppm)**

Preventive Action Limit **2 mg/L (ppm)**

### **Aminomethylphosphonic acid (AMPA) Chemical Profile**

AMPA	
Structure:	
CAS Number:	1066-51-9
Formula:	CH <sub>6</sub> NO <sub>3</sub> P
Molar Mass:	111.04 g/mol
Synonyms:	AMeP Aminomethylphosphonic acid

### **Imidacloprid**

Imidacloprid is a neonicotinoid pesticide used to control a variety of indoor and outdoor insects. Neonicotinoids are broad spectrum insecticides used on agricultural fields, gardens, pets, and in homes. Neonicotinoid pesticides are similar to nicotine in their structure and are specifically designed to act on the nicotine receptors in insects, resulting in paralysis and death.

Imidacloprid is widely used in Wisconsin. The primary manufacturer is Bayer CropScience, but it is also manufactured by others. It is the active ingredient in a large number of insecticide products used to control soil insect pests, insects that feed on plant tissues, structures, and pets. Its largest volume of use is in agriculture products as seed treatments and spraying leaves for corn, soybeans, beans, potatoes, small grains, vegetables, fruit crops, and more. It is also used in non-agriculture products in pet and companion animal collars and sprays, in products for residential trees and ornamentals, and in products used in and around homes for ants, roaches and other household pests. Some common products that use imidacloprid include Admire®, Advantage®, Gaucho®, Imicide, Merit® and Premise®.

DATCP has tested for imidacloprid in groundwater since 2006. As of April 2019, imidacloprid was detected in 75 of 1,503 private wells tested, and in 208 samples from 40 monitoring wells installed near agricultural fields

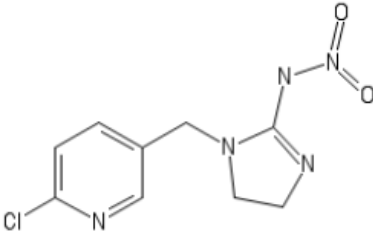
DHS recommends an enforcement standard of 0.2 µg/L for imidacloprid based on a study in 2017 that found that imidacloprid affected weight gain and glucose regulation in male mice. DHS recommends that the NR 140 Preventive Action Limit for imidacloprid be set at 10% of the enforcement standard because recent studies have shown that imidacloprid can cause mutagenic, teratogenic, and interactive effects at high levels.

#### **Recommended Standards:**

Enforcement Standard **0.2 µg/L (ppb)**

Preventive Action Limit **0.02 µg/L (ppb)**

#### **Imidacloprid Chemical Profile**

Imidacloprid	
<b>Chemical Symbol:</b>	
<b>CAS Number:</b>	138261-41-3
<b>Molar Mass:</b>	255.66 g/mol
<b>Synonyms:</b>	N-[1-[(6-Chloropyridin-3-yl)methyl]imidazolidin-2-ylidene]nitramide

#### **Isoxaflutole**

Isoxaflutole is a herbicide used to control certain broadleaf and grass weeds in field corn and soybeans. In the environment, isoxaflutole quickly breaks down into isoxaflutole diketonitrile (DKN). Isoxaflutole diketonitrile further breaks down into inactive benzoic acid derivatives.

Isoxaflutole is a low-use-rate herbicide currently used in Wisconsin for weed control on corn crops. It is manufactured by Bayer CropScience. Two restricted-use herbicide products containing isoxaflutole are currently sold in Wisconsin, Corvus Herbicide and Balance Flexx Herbicide.

Wisconsin, Minnesota, and Michigan have requested that Bayer CropScience complete isoxaflutole fate and toxicity studies due to the compound's rapid leaching potential and plant toxicity at low concentrations. In 2016, contingent on the manufacturer completing studies at several approved use locations, the Department of Agriculture, Trade and Consumer Protection (DATCP) approved limited-use of isoxaflutole in Wisconsin on corn crops.

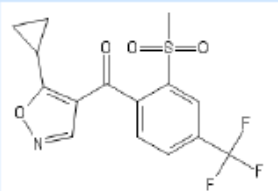
DHS recommends a combined enforcement standard of 3 µg/L for isoxaflutole and isoxaflutole diketonitrile (DKN). This standard recommendation is based on the US Environmental Protection Agency's (EPA's) cancer slope factor for isoxaflutole. Because of the possibility that isoxaflutole diketonitrile is contributing to the toxicity observed in animals dosed with isoxaflutole, DHS has recommended combined groundwater quality standards for isoxaflutole and isoxaflutole diketonitrile. DHS recommends that the NR 140 Preventive Action Limit for isoxaflutole and isoxaflutole diketonitrile be set at 10% of the enforcement standard as EPA has classified isoxaflutole as a likely human carcinogen and isoxaflutole diketonitrile likely contributes to these effects.

#### **Recommended Standards for isoxaflutole and isoxaflutole diketonitrile (DKN) combined:**

Enforcement Standard **3 µg/L (ppb)**

Preventive Action Limit **0.3 µg/L (ppb)**

#### **Isoxaflutole Chemical Profile**

<b>Isoxaflutole</b>	
Structure:	
IUPAC name:	5-cyclopropyl-4-(2-mesylyl-4-trifluoromethylbenzoyl) isoxazole
CAS Number:	141112-29-0
Formula:	C <sub>15</sub> H <sub>12</sub> F <sub>3</sub> NO <sub>4</sub> S
Molar Mass:	359.32 g/mol
Synonyms:	RPA 201772

#### **Isoxaflutole diketonitrile (DKN)**

Isoxaflutole diketonitrile (DKN) is a breakdown product of the herbicide isoxaflutole. Isoxaflutole diketonitrile is the active herbicide of the formulation and is used to control certain broadleaf and grass weeds in field corn and soybeans. In the environment, isoxaflutole quickly breaks down into isoxaflutole diketonitrile, which then further degrades into benzoic acid derivatives.

Isoxaflutole is a low-use-rate herbicide currently used in Wisconsin for weed control in corn. It is manufactured by Bayer CropScience. Two restricted-use herbicide products containing isoxaflutole are currently sold in Wisconsin, Corvus Herbicide and Balance Flexx Herbicide.



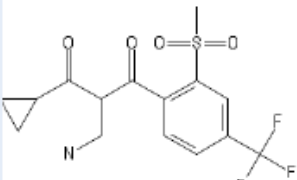
DHS recommends a combined enforcement standard of 3 µg/L for isoxaflutole and isoxaflutole diketonitrile. This standard recommendation is based on the US Environmental Protection Agency's (EPA's) cancer slope factor for isoxaflutole. Because of the possibility that isoxaflutole diketonitrile is contributing to the toxicity observed in animals dosed with isoxaflutole DHS has recommended combined groundwater quality standards for isoxaflutole and isoxaflutole diketonitrile. DHS recommends that the NR 140 Preventive Action Limit for isoxaflutole and isoxaflutole diketonitrile be set at 10% of the enforcement standard as EPA has classified isoxaflutole as a likely human carcinogen and isoxaflutole diketonitrile likely contributes to these effects.

**Recommended Standards for isoxaflutole and isoxaflutole diketonitrile (DKN) combined:**

Enforcement Standard **3 µg/L (ppb)**

Preventive Action Limit **0.3 µg/L (ppb)**

**Isoxaflutole diketonitrile (DKN) Chemical Profile**

Isoxaflutole Diketonitrile	
<b>Structure:</b>	
<b>IUPAC name:</b>	1-(2-mesylylsulfonyl-4-trifluoromethylphenyl)-2-cyano-3-cyclopropyl-propane-1,3-dione
<b>CAS Number:</b>	143701-75-1
<b>Formula:</b>	C <sub>15</sub> H <sub>12</sub> F <sub>3</sub> NO <sub>4</sub> S
<b>Molar Mass:</b>	359.32 g/mol
<b>Synonyms:</b>	RPA 202248

**Isoxaflutole benzoic acid (BA)**

Isoxaflutole benzoic acid (BA) is a breakdown product of the herbicide, isoxaflutole. Isoxaflutole is used to control certain broadleaf and grass weeds in field corn and soybeans. In the environment, isoxaflutole quickly breaks down into isoxaflutole diketonitrile (DKN), which then further degrades into benzoic acid derivatives, including Isoxaflutole benzoic acid.

Isoxaflutole is a low-use-rate herbicide currently used in Wisconsin for weed control in corn. It is manufactured by Bayer CropScience. Two restricted-use herbicide products containing isoxaflutole are currently sold in Wisconsin, Corvus Herbicide and Balance Flexx Herbicide.

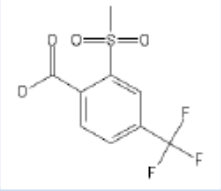
DHS recommends an enforcement standard of 800 µg/L for isoxaflutole benzoic acid (BA). The recommended standard is based on a study that found that isoxaflutole benzoic acid decreased weight gain and feed consumption in pregnant animals. DHS recommends that the NR 140 Preventive Action Limit for isoxaflutole benzoic acid be set at 20% of the enforcement standard because it has not been shown to cause mutagenic, teratogenic, or interactive effects.

**Recommended Standards for isoxaflutole benzoic acid (BA):**

Enforcement Standard **800 µg/L (ppb)**

Preventive Action Limit **160 µg/L (ppb)**

#### Isoxaflutole benzoic acid (BA) Chemical Profile

Isoxaflutole Benzoic Acid	
Structure:	
IUPAC name:	2-Methylsulfonyl-4-trifluoromethylbenzoic acid
CAS Number:	142994-06-7
Formula:	C <sub>9</sub> H <sub>7</sub> F <sub>3</sub> O <sub>4</sub> S
Molar Mass:	268.21 g/mol
Synonyms:	RPA 203328

#### Sulfentrazone

Sulfentrazone is an herbicide used to control a broad variety of weeds by inhibiting photosynthesis in plants. Sulfentrazone controls weeds by a process of membrane disruption commonly referred to as PPO inhibition. This process takes place when the roots of a treated plant take up the herbicide and then die after emerging from the treated soil into sunlight. Sulfentrazone pesticides are used on agricultural crops, Christmas tree farms, golf courses, seedling nurseries, landscape ornamentals, and non-crop use sites such as railroad tracks, highways, and residential/commercial turf.

Sulfentrazone is an herbicide active ingredient used to control broadleaf weeds, grasses, and sedges. FMC Corporation was the original manufacturer of sulfentrazone. Companies that also carry sulfentrazone products include Dow AgroSciences, Helm Agro US, and the Scotts Company. Sulfentrazone is the active ingredient in almost 100 products sold in Wisconsin including agricultural products sold under the Authority<sup>®</sup> trade name and residential-use products sold under the Spectracide, Scotts<sup>®</sup>, Gordon's, and Ortho<sup>®</sup> brands.

DATCP groundwater monitoring has detected sulfentrazone in a few monitoring well samples and one private well sample. Sulfentrazone concentrations in groundwater samples collected by DATCP have been relatively low.

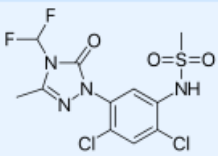
DHS recommends an enforcement standard of 1,000 µg/L for sulfentrazone based on the US Environmental Protection Agency's chronic oral reference dose for sulfentrazone. In laboratory animal studies, animals that ate large amounts of sulfentrazone for long periods of time experienced developmental and reproductive toxicity. DHS recommends that the NR 140 Groundwater Preventive Action Limit for sulfentrazone be set at 10% of the enforcement standard because sulfentrazone has been shown to have teratogenic effects.

#### Recommended Standards for Sulfentrazone:

Enforcement Standard **1,000 µg/L (ppb)**

Preventive Action Limit **100 µg/L (ppb)**

## Sulfentrazone Chemical Profile

Sulfentrazone	
<b>Structure:</b>	
<b>CAS Number:</b>	122836-35-5
<b>Formula:</b>	C <sub>11</sub> H <sub>10</sub> Cl <sub>2</sub> F <sub>2</sub> N <sub>4</sub> O <sub>3</sub> S
<b>Molar Mass:</b>	387.18 g/mol
<b>Synonyms:</b>	N-(2,4-Dichloro-5-[4-(difluoromethyl)-3-methyl-5-oxo-4,5-dihydro-1H-1,2,4-triazol-1-yl]phenyl) methanesulfonamide

## Thiamethoxam

Thiamethoxam is a neonicotinoid pesticide used to control a variety of indoor and outdoor insects. Neonicotinoids are broad spectrum insecticides used on agricultural fields, gardens, pets, and in homes. Neonicotinoid pesticides are similar to nicotine in their structure and are specifically designed to act on insect nicotine receptors resulting in paralysis and death.

Thiamethoxam is a neonicotinoid insecticide that is used widely in Wisconsin. Syngenta is the primary manufacturer of thiamethoxam. Thiamethoxam is the active ingredient in a variety of products used in agriculture to kill sucking and chewing insects that feed on roots, leaves, and other plant tissues. Common agricultural products containing thiamethoxam include Cruiser®, Cruiser Maxx®, Endigo®, Helix®, Platinum®, Avicta®, and Actara®. Commercial and residential products containing thiamethoxam include Tandem® Insecticide, Caravan™, Flagship®, Bonide® Rose Shield™ and Raid® Ant Gel.

DATCP groundwater sampling has shown thiamethoxam detected in 62 of 1,510 private drinking well samples, and in 226 samples collected from 45 monitoring wells installed near agricultural fields.

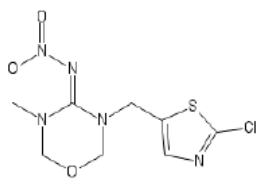
DHS recommends an enforcement standard of 100 µg/L for thiamethoxam based on the US Environmental Protection Agency's chronic oral reference dose for thiamethoxam. Animal studies show that animals that ate large amounts of thiamethoxam for long periods of time had problems with their liver, adrenal glands, and blood, and male animals had problems with their reproductive system. DHS recommends that the NR 140 Preventive Action Limit for thiamethoxam be set at 10% of the enforcement standard because thiamethoxam has been shown to have teratogenic effects.

### Recommended Standards for Thiamethoxam:

Enforcement Standard **100 µg/L (ppb)**

Preventive Action Limit **10 µg/L (ppb)**

## Thiamethoxam Chemical Profile

<b>Thiamethoxam</b>	
<b>Structure:</b>	
<b>CAS Number:</b>	153719-23-4
<b>Formula:</b>	C <sub>8</sub> H <sub>10</sub> ClN <sub>5</sub> O <sub>3</sub> S
<b>Molar Mass:</b>	291.71 g/mol
<b>Synonyms:</b>	3-(2-chloro-1,3-thiazol-5-ylmethyl)-5-methyl-1,3,5-oxadiazinan-4-ylidene(nitro)amine CGA 293343

### **Thiencarbazono-methyl**

Thiencarbazono-methyl is a triazolone herbicide used to control weeds on corn, wheat, turf, and garden plants. Triazolone pesticides work by blocking an enzyme needed for the development of chlorophyll in the plant.

In Wisconsin, agricultural use of thiencarbazono-methyl includes use on corn and wheat, and residential use on turf and ornamentals. Thiencarbazono-methyl is manufactured by Bayer AG. It is the active ingredient in seven products sold in Wisconsin, including agricultural use products: Capreno, Corvus, and Huskie Complete, and residential use product Tribute Total herbicide.

The WI Department of Agriculture, Trade and Consumer Protection (DATCP) has tested for thiencarbazono-methyl in groundwater. DATCP has not detected the compound in any private well samples, but it has been detected at field edge monitoring wells at relatively low concentrations.

DHS recommends an enforcement standard of 10 mg/L for thiencarbazono-methyl based on the United States Environmental Protection Agency's chronic oral reference dose for thiencarbazono-methyl. Health effects of thiencarbazono-methyl are based on laboratory animal studies. Animals that ate large amounts of thiencarbazono-methyl for long periods of time experienced problems with their kidney, bladder, and urinary tract. DHS recommends that the preventive action limit for thiencarbazono-methyl be set at 20% of the enforcement standard because thiencarbazono-methyl has not been shown to be carcinogenic, mutagenic, teratogenic, or interactive effects.

### **Recommended Standards for Thiencarbazono-methyl:**

Enforcement Standard **10 mg/L (ppm)**

Preventive Action Limit **2 mg/L (ppm)**

### **Thiencarbazono-methyl Chemical Profile**

<b>Thiocarbazone-methyl</b>	
<b>Structure:</b>	
<b>CAS Number:</b>	317815-83-1
<b>Formula:</b>	C <sub>12</sub> H <sub>14</sub> N <sub>4</sub> O <sub>7</sub> S <sub>2</sub>
<b>Molar Mass:</b>	390.385 g/mol
<b>Synonyms:</b>	Methyl 4-[(4,5-dihydro-3-methoxy-4-methyl-5-oxo-1H-1,2,4-triazol-1-yl)-carbonylsulfamoyl]-5-methylthiophene-3-carboxylate

**AFFECTED RULE CHAPTERS**

Wisconsin Administrative Code chapter NR 140

**OTHER RELATED RULE REVISIONS**

None

**COMPARABLE FEDERAL AND STATE POLICIES**

The United States Environmental Protection Agency (US EPA) establishes health based drinking water maximum contaminant levels (MCLs), cancer risk levels and health advisories (HAs). Federal drinking water MCLs are established based on scientific risk assessments and, in some cases, economic and technological considerations. Cancer risk levels are established as the concentration of a chemical in drinking water that corresponds to a specific excess estimated lifetime cancer risk. Federal lifetime health advisories (LHAs) are developed based on an established health risk acceptable daily intake (ADI) level or reference dose (RfD).

The groundwater quality standards contained in ch. NR 140 are used in Wisconsin by state regulatory agencies as state groundwater protection standards. These standards are used as contamination site cleanup levels, design and management criteria for regulated activities and as minimum public health and welfare protection standards for contaminants in groundwater. The states surrounding Wisconsin: Minnesota, Michigan, Illinois and Iowa, also use groundwater protection values/levels/standards in their regulation of practices and activities that might impact the quality of groundwater resources. Groundwater protection quality standards are developed based on health risk assessments. Because states follow state specific health risk assessment methodologies, that use state specific health risk assessments and factors in calculating and developing their groundwater protection standards, different groundwater protection standard levels may be established for the same substance by different states.

**DISCUSSION OF POTENTIAL ECONOMIC IMPACTS**

Proposed revisions to ch. NR 140, Wis. Adm. Code are based on recommendations for health based groundwater quality standards provided by DHS. The standards recommended by DHS, for pesticide and pesticide metabolites, were developed in accordance with procedures and methodologies specified in ch. 160, Stats. The proposed revisions to NR 140 don't introduce new requirements that would likely

have a significant economic impact; however, impacts will be considered in further detail as the rule language is drafted.

**COMMENTS**

Section 281.12(1), Stats., grants the DNR the authority to carry out planning, management and regulatory programs necessary to protect, maintain and improve the quality and management of the waters of the state, ground and surface, public and private. Section 281.15, Stats., states that the Department shall promulgate rules setting standards of water quality, applicable to the waters of the state, that protect the public interest, including the protection of public health and welfare, and the present and prospective future use of such waters for public and private water systems. Section 281.19(1), Stats., grants the Department the authority to issue general orders and adopt rules applicable throughout the state for the construction, installation, use and operation of practicable and available systems, methods and means for preventing and abating pollution of the waters of the state.