

# NR 538 TAC: Appendix I Standards

Fifth TAC Meeting, Fitchburg Service Center  
May 24<sup>th</sup>, 2017

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Bureau of Waste and Materials Management





# Additional 538.10 Changes

- NR 538.10(1) – Added slurry seals to this use at request of asphalt industry:

(1) ~~Raw materials for manufacturing of a product~~ **Encapsulated uses** in which the measurable leaching, emissions or decomposition characteristics of the industrial byproduct are substantially eliminated **by binding them into a solid matrix**. Products that would meet these criteria include cement, lightweight aggregate, structural or ornamental concrete or ceramic materials, portland cement concrete pavement, asphaltic concrete pavement, **slurry seals**, roofing materials, plastics, paint, fiberglass, mineral wool, wallboard, plaster and other products as approved by the department.





# Additional 538.10 Changes

- NR 538.10(6) – Livestock Operations-  
language from DNR Ag. Runoff Section:

(6) Use at livestock operations as liner material for feed and manure storage structures or subgrade geotechnical fill under livestock barns. If more than 5,000 cubic yards are to be used in an individual project, prior written notification in accordance with s. NR 538.14 (4) and concurrence by the department under s. NR 538.14(5) are needed. ~~If the department does not respond to the notification within 10 business days, concurrence is considered to be granted.~~





# Additional NR 538.10 Changes

- NR 538.10(6)(a) – Livestock Operations, non-CAFOS

(a) Liner material used for agricultural waste storage structures at livestock operations that have less than 1000 Animal Units and have not applied for a Wisconsin pollution prevention discharge elimination system permit under s. NR 243. The agricultural waste storage structures shall be designed and constructed in accordance with applicable Natural Resources Conservation Service Standards and approved under any applicable local ordinances.





# Additional NR 538.10 Changes

- NR 538.10(6)(b) – Livestock Operations, CAFOs

(b) Liner material used for feed and agricultural waste storage structures at livestock operations that have 1000 or more Animal Units and have applied for or received a WPDES Permit under NR 243. The agricultural waste storage structures shall be designed, approved and constructed in accordance with applicable NR 243 requirements.





# Additional NR 538.10 Changes

- NR 538.10(6)(c) – Livestock Operations, barns

(c) Geotechnical fill used beneath barns used to house livestock. Fill material shall only be approved for use beneath livestock housing (barns) that have a paved floor (asphalt or concrete) in all animal access and manure accumulation areas.

Note: Natural Resources Conservation Service (NRCS) conservation practice standard Code 313 applies to the construction of waste storage facilities and NRCS conservation practice Code 629 applies to construction of feed storage pads. Copies of these and other conservation practice codes can be obtained online from the NRCS Field Office Technical Guide, [www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home](http://www.nrcs.usda.gov/wps/portal/nrcs/site/wi/home). Copies are also available at the Wisconsin NRCS State Office or the Wisconsin Land and Water Conservation Association Office.





# What's NR 538.14(5)?

- Clarify vague rule language concerning concurrences:

(5) For proposed projects under s. NR 538.10 (5), (6), (7), (8) and (9) that require submission of a written notification, the department shall reply with a written concurrence within 10 business days provided the applicant demonstrates they can meet performance standards under s. NR 538.04 and applicable criteria under s. NR 538.10 and 12. If the applicant cannot demonstrate that the proposed project will meet these standards, the department will provide a written notice of non-concurrence within 10 business days noting any deficiencies and allowing the applicant an opportunity to correct them or provide additional information. If the department does not respond to the notification within 10 business days, concurrence is considered to be granted.





# Additional NR 538.10 Changes

- NR 538.10(11) – Bonded Surface Course, also at the request of the asphalt industry:

(11) Bonded surface course material used in accordance with the criteria of this subsection. This use includes placement of industrial byproducts as a bonded surface course material such as seal coats **and chip seals** in paved federal, state or municipal roadways, **commercial and private roadway or parking surfaces, driveways, airport runways and trails** ~~specified in sub. (5)(c)~~. Industrial byproducts used as a bonded surface course shall conform to the Wisconsin department of transportation standard specifications for highway and structure construction applicable to asphaltic pavements. **Bonded surface course material must contain less than 2 percent passing the P200 sieve and applied at a rate no greater than 18 pounds per square yard unless greater application rates are determined to be necessary by the project engineer.**





# Additional NR 538.10 Changes

- NR 538.10(12) – Decorative stone use; eliminate this use

~~(12) Decorative stone applications using industrial byproducts shall conform to Wisconsin department of transportation specifications for highway and structure construction applicable to base aggregates. The use of industrial byproducts as decorative stone is prohibited in residential areas.~~





# Proposed Appendix I Standards

## December 8, 2016 TAC Meeting

- DNR proposed revised Appendix I tables:
  - Elimination of Category 1 and 3
  - Individual tables for each byproduct
  - Water leach test standards updated to revised NR 140 groundwater standards (ES)
  - Totals analyses standards revised to reflect default Occupational Health standards from EPA model in s. NR 720 Wis. Adm. Code (TR=10-6, HQ=0.2)
  - Narrowed required parameters to documented constituents of concern





# New Exposure Scenerios

Explored other health exposure options:

- Alternatives to NR 140 gw standards?  
Internal objections; H&A study to DHS
- For ingestion & inhalation risk, looked to specific use modelling:
  - DNR and DHS evaluated all potential beneficial uses; removed decorative stone
  - Determined that unbonded surface course posed most potential exposure risk
  - Modelled 3 highest potential exposures; biking trails, ATV trails, farm access lanes



# Ryan Wozniak, Department of Health Services

Development of the beneficial use  
health exposure models





## Unbonded Surface Course Exposure Scenario: **ATV (and Bicycle) use on Recreational Trail**

- *Activity description:* Child & adult exposure from mountain bike or ATV use on recreational trails.
- *Exposure pathways:* Incidental ingestion, dermal, inhalation
- *Age:* Child & adult
- *Risk Values* Hazard Quotient of 0.2, Target Risk of  $1 \times 10^{-6}$
- *Exposure Frequency (EF):* 20 days/yr <sup>[1]</sup>
- *Exposure Time (ET):* 8 hrs/day <sup>[2]</sup>
- *Exposure Factor (Dilution):* 100% byproduct material (conservative)
- *Particulate Emission Factor (PEF):* ATV: 4,579,803 m<sup>3</sup>/kg, BIKE: 7,973,437 m<sup>3</sup>/kg <sup>[3]</sup>

### **Air Modeling Assumptions:**

<b>Trail moisture content:</b>	<b>0.2%</b>	<b>ATV weight:</b>	<b>800 lb</b>
<b>Trail silt content:</b>	<b>15%</b>	<b>Bike weight:</b>	<b>200 lb</b>
<b>Trail width:</b>	<b>3,048 m2</b>	<b>ATV/Bike traffic:</b>	<b>50 vehicles/hr (central tendency value)</b>

### Notes:

[1] 20 days per year = 1-2 days/week x 12-20 weeks/year. Based on middle range of assumptions used in Amery-Dresser Health Consultation (<http://www.atsdr.cdc.gov/hac/pha/amerydressertrailhc/amery-dresserhc012307.pdf>) professional judgment of Gary Eddy, DNR recreational trails engineer.

[2] Professional judgment of a reasonable day of ATV use.

[3] PEF developed from average modeled air concentrations by DNR air modelers. Scaled to 50 vehicles per hour, based on professional judgment of Gary Eddy, DNR recreational trails engineer.



## Unbonded Surface Course Exposure Scenario: **Occupational Farm Exposure**

- *Activity description:* Adult farm worker exposure from driving farm equipment and walking and working on and around farm lanes and road shoulders. (large ATV/UTV at dairy farm type setting would be a worst case scenario)
- *Exposure pathways:* Incidental ingestion, dermal, inhalation
- *Age:* Adult
- *Risk Values* Hazard Quotient of 0.2, Target Risk of  $1 \times 10^{-6}$
- *Exposure Frequency (EF):* 240 days/yr <sup>[4]</sup>
- *Exposure Time (ET):* 8 hrs/day (conservative) <sup>[5]</sup>
- *Exposure Factor (Dilution):* 100% byproduct material (conservative)
- *Particulate Emission Factor (PEF):* 24,078,979 m<sup>3</sup>/kg <sup>[6]</sup>

### Air Modeling Assumptions:

<b>Trail moisture content:</b>	<b>0.2%</b>	<b>UTV weight:</b>	<b>2000 lb</b>
<b>Trail silt content:</b>	<b>15%</b>	<b>UTV traffic:</b>	<b>10 vehicles/hr</b>
<b>Trail width:</b>	<b>3,048 m<sup>2</sup></b>		

#### Notes:

- Residential exposure does not apply due to 100ft restriction from residences.

[4] 240 days per year = 6 days/week x 40 weeks/year. Basis is the assumption that 12 weeks of the year ground is frozen.

[5] A conservative slag material exposure time for an occupational farm work day.





# Revised Direct Contact Standards

Direct Contact Standards Table includes:

- Target Risk =  $10^{-6}$ , Hazard Quotient = 0.2
- For arsenic, lead and manganese, NR 720 Background Threshold Value
- Lowest value of the 3 scenerios evaluated; almost all were from the occupational farm exposure (detailed CAFO traffic studies)
- Values are based on most recent study results (may differ from EPA)





# Preliminary Comparison

- Compared the proposed standards to analytical data on file
  - Groundwater (Water Leach) Standards:
    - Boron slightly above (coal ash); potential for revised standard per EPA (6 ppm)
  - Direct Contact (Totals) Standards:
    - Arsenic occasionally slightly above (coal ash)
    - Hexavalent chromium (slag, sand, ash)





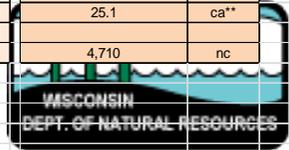
# Alternatives

- Alternative 1 – Place new standard values in Appendix I, Category 1 for Totals
  - Allow for any beneficial use if byproduct could meet standard
  - Based on assumption that unbonded surface course is greatest risk of exposure and all others are less
  - Standards could change if certain uses are not allowed (farm, ATV, bike) or quantities limited



DRAFT				Current Table 2B	Original Proposed Standard (default occupational) HQ=0.2 TR=10 <sup>-6</sup>	Endpoint	Unbonded Surface Course based Proposed Standard HQ=0.2 TR=10 <sup>-6</sup>	Endpoint	New Proposed Standard (unbonded surface course scenario) HQ=0.2 TR=10 <sup>-6</sup>	Endpoint	New Proposed Standard (unbonded surface course scenario) HQ=0.2 TR=10 <sup>-6</sup>	Endpoint	New Proposed Standard (unbonded surface course scenario) HQ=0.2 TR=10 <sup>-6</sup>	Endpoint
Chemical	CAS Number	Mutagen?	VOC?	(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)		(mg/kg)	
Antimony (metallic)	7440-36-0	No	No		93.4	nc	97.3	nc	110	nc	110	nc	97.3	nc
Arsenic, Inorganic	7440-38-2	No	No	21	8 <sup>[1]</sup>	BTV	8 <sup>[1]</sup>	BTV	11,000	ca**	11,400	ca**	2,990	ca*
Barium	7440-39-3	No	No		43,700	nc	8,600.0	nc	17,200	nc	24,200	nc	8,600	nc
Beryllium and compounds	7440-41-7	No	No	7	459	nc	122.0	ca*	280.00	ca**	416.00	nc	122.00	ca**
Boron And Borates Only	7440-42-8	No	No		46,600	nc	43,600.0	nc	51,900	nc	53,100	nc	43,600	nc
Cadmium (Diet)	7440-43-9	No	No		197	nc	104.0	ca**	167.00	nc	194.00	nc	104.00	nc
Chromium(VI)	18540-29-9	Yes	No		6.36	ca	1.9	ca	1.880	ca	2.600	ca	2.300	ca
Cobalt	7440-48-4	No	No		69.5	nc	32.5	ca*	64.500	nc	71.000	nc	32.500	ca**
Copper	7440-50-8	No	No		9,340	nc	9,730.0	nc	11,000	nc	11,000	nc	9,730	nc
Lead and Compounds	7439-92-1	No	No		52 <sup>[1]</sup>	BTV	52	BTV*						
Manganese (Non-diet)	7439-96-5	No	No		5,180	nc	2937 <sup>[1]</sup>	BTV	1,810	nc	2,620	nc	886	nc
Mercury (elemental)	7439-97-6	No	Yes		13.2	sat	14.0	sat	163	sat	164	sat	14	sat
Molybdenum	7439-98-7	No	No		1,170	nc	1,220	nc	1,370	nc	1,370	nc	1,220	nc
Nickel Refinery Dust	NA	No	No		4,500	nc	264	ca*	568	nc	867	nc	264	nc
Phenol	108-95-2	No	No		49,200	nc	50,700	nc	65,900	nc	66,100	nc	50,700	nc
Selenium	7782-49-2	No	No		1,170	nc	1,210	nc	1,370	nc	1,370	nc	1,210	nc
Silver	7440-22-4	No	No		1,170	nc	1,220	nc	1,370	nc	1,370	nc	1,220	nc
Strontium, Stable	7440-24-6	No	No		140,000	max	146,000	nc	164,000	max	164,000	max	146,000	max
Thallium (Soluble Salts)	7440-28-0	No	No		2.34	nc	2.4	nc	2.74	nc	2.74	nc	2.43	nc
Vanadium and Compounds	7440-62-2	No	No		1,170	nc	773	nc	1,080	nc	1,190	nc	773	nc
Zinc and Compounds	7440-66-6	No	No		70,100	nc	73,000	nc	82,100	nc	82,100	nc	73,000	nc
Acenaphthene	83-32-9	No	Yes		9,040	nc	9,420	nc	12,600	nc	12,600	nc	9,420	nc
Acenaphthylene	208-96-8	No	Yes		---	---	---	---						
Anthracene	120-12-7	No	Yes		45,200	nc	47,100	nc	62,800	nc	62,800	nc	47,100	nc
Benz[a]anthracene	56-55-3	Yes	Yes	44	2.88	ca	19.9	ca	19.90	ca	20.00	ca	21.50	ca
Benzo[a]pyrene	50-32-8	Yes	No	4.4	0.29	ca	2.0	ca	2.000	ca*	2.000	ca*	2.190	ca*
Benzo[b]fluoranthene	205-99-2	Yes	No	44	2.89	ca	20	ca	20.00	ca	20.00	ca	21.90	ca
Benzo[g,h,i]perylene	191-24-2	No	No		---	---	---	---						
Benzo[k]fluoranthene	207-08-9	Yes	No		28.9	ca	200	ca	200.00	ca	200.00	ca	219.00	ca
Chrysene	218-01-9	Yes	No		289	ca	2,000	ca	2,000	ca	2,000	ca	2,190	ca
Dibenz[a,h]anthracene	53-70-3	Yes	No	4.4	0.29	ca	2	ca	2.000	ca	2.000	ca	2.190	ca
Fluoranthene	206-44-0	No	No		6,030	nc	6,280	nc	8,370	nc	8,370	nc	6,280	nc
Fluorene	86-73-7	No	Yes		6,030	nc	6,280	nc	8,370	nc	8,370	nc	6,280	nc
Indeno[1,2,3-cd]pyrene	193-39-5	Yes	No	44	2.89	ca	20	ca	20.000	ca	20.000	ca	21.900	ca
Methylnaphthalene, 1-	90-12-0	No	Yes		72.7	ca	75.8	ca	307.0	ca*	307.0	ca*	75.8	ca
Methylnaphthalene, 2-	91-57-6	No	Yes		603	nc	628	nc	837	nc	837	nc	628	nc
Naphthalene	91-20-3	No	Yes		24.1	ca**	25.1	ca*	286.00	ca**	288.00	ca**	25.1	ca**
Phenanthrene	85-01-8	No	Yes		---	---	---	---						
Pyrene	129-00-0	No	Yes		4,520	nc	4,710	nc	6,280	nc	6,280	nc	4,710	nc

Notes:  
 HQ = Hazard Quotient  
 TR = Target Risk  
 sat= Soil Saturation Limit Concentration  
 BTV\* = Set at 1/10 of the industrial value which is based on the Background Threshold Value.



[1] Background Threshold Value is defined as non-outlier trace element maximum levels in WI surface soils.  
 See Wis. Adm. Code NR 720. Also see DNR publication RR890: <http://dnr.wi.gov/files/PDF/pubs/rr/RR890.pdf>



# Alternatives

- Alternative 2 – Place new standards in Category 1 Totals, but create new category (Categories 1-4)
  - Create a new category equivalent to old Category 3
  - Allow for uses where the chance for direct contact exposure is low or non-existent
  - Category 1 standards remain for unbonded surface course and cold weather abrasive



<b>Water Leach Test (ASTM D3987-12)</b>	<b>Category 1</b>	<b>Category 2</b>	<b>Category 3</b>
<b>Parameter</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>
Antimony	0.006	0.006	0.03
Arsenic	0.01	0.01	0.05
Barium	2	2	10
Beryllium	0.004	0.004	0.02
Boron	1	1	5
Cadmium	0.005	0.005	0.025
Chloride	1250	1250	2500
Chromium, Tot.	0.1	0.1	0.5
Cobalt	0.04	0.04	0.2
Fluoride	4	4	20
Lead	0.015	0.015	0.075
Mercury	0.002	0.002	0.01
Molybdenum	0.04	0.04	0.2
Selenium	0.05	0.05	0.25
Sulfate	1250	1250	2500
Thallium	0.002	0.002	0.01

<b>Totals Analyses</b>	<b>Category 1</b>
<b>Parameter</b>	<b>mg/kg</b>
Antimony	97.3
Arsenic	8
Barium	8600
Beryllium	122
Boron	43600
Cadmium	104
Chromium, Hex.	1.9
Lead	52
Mercury	13.7
Molybdenum	1220
Selenium	1210
Thallium	2.4
Vanadium	773



Beneficial Use Methods		Industrial Byproduct Category			
		4	3	2	1
<b>NR 538.10</b>		<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
(1)	Encapsulated Uses	x	x	x	x
(2)	Waste Stabilization / Solidification	x	x	x	x
(3)	Supplemental Fuel Source / Energy Recovery	x	x	x	x
(4)	Landfill Daily Cover / Internal Structures at landfills having a leachate collection system	x	x	x	x
(5)	Confined Geotechnical Fill (a) commercial, industrial or institutional building subgrade fill (b) paved lot subgrade fill (c) paved roadway subgrade fill (d) base aggregates (f) tank, vault or tunnel abandonment (g) slabjacking material (h) soil and pavement base stabilization for structural improvements listed in (5)(a) - (c) (i) controlled low strength material (flowable fill) for structural improvements listed in (5)(a), (d), (e) and (f)		x	x	x
(6)	Feed and Manure Storage Structures			x	x
(7)	Transportation Facility Embankment			x	x
(8)	Unconfined Geotechnical Fill			x	x
(9)	Nonmetallic Mine Reclamation			x	x
(10)	Unbonded Surface Course				x
(11)	Bonded Surface Course			x	x
(12)	Cold Weather Abrasive				x
(13)	Blasting Grit/Abrasive	x	x	x	x
(14)	Soil or Plant Additives <sup>1</sup>				





# Alternatives

- Alternative 3 – eliminate all beneficial uses that have the potential for significant ingestion/inhalation exposure
  - Removal of all unbonded surface course uses and winter abrasives
  - Would no longer necessitate sampling byproduct for totals; only exposure pathway is groundwater
  - Need to make sure we limit potential exposure prior to final cover



## Coal Ash Industrial Byproduct Characterization

Water Leach Test (ASTM D3987-12)	Category 1	Category 2
Parameter	mg/L	mg/L
Antimony	0.006	0.03
Arsenic	0.01	0.05
Barium	2	10
Beryllium	0.004	0.02
Boron	1	5
Cadmium	0.005	0.025
Chloride	1250	2500
Chromium, Tot.	0.1	0.5
Cobalt	0.04	0.2
Fluoride	4	20
Lead	0.015	0.075
Mercury	0.002	0.01
Molybdenum	0.04	0.2
Selenium	0.05	0.25
Sulfate	1250	2500
Thallium	0.002	0.01



Beneficial Use Methods		Industrial Byproduct Category		
		3	2	1
<b>NR 538.10</b>		<b>3</b>	<b>2</b>	<b>1</b>
(1)	Encapsulated Uses	x	x	x
(2)	Waste Stabilization / Solidification	x	x	x
(3)	Supplemental Fuel Source / Energy Recovery	x	x	x
(4)	Landfill Daily Cover / Internal Structures at landfills having a leachate collection system	x	x	x
(5)	Confined Geotechnical Fill (a) commercial, industrial or institutional building subgrade fill (b) paved lot subgrade fill (c) paved roadway subgrade fill (d) base aggregates (f) tank, vault or tunnel abandonment (g) slabjacking material (h) soil and pavement base stabilization for structural improvements listed in (5)(a) - (c) (i) controlled low strength material (flowable fill) for structural improvements listed in (5)(a), (d), (e) and (f)		x	x
(6)	Feed and Manure Storage Structures			x
(7)	Transportation Facility Embankment			x
(8)	Unconfined Geotechnical Fill			x
(9)	Nonmetallic Mine Reclamation			x
(10)	Unbonded Surface Course			*
(11)	Bonded Surface Course			x
(12)	Cold Weather Abrasive			*
(13)	Blasting Grit/Abrasive	x	x	x
(14)	Soil or Plant Additives <sup>1</sup>			





# Next Steps?

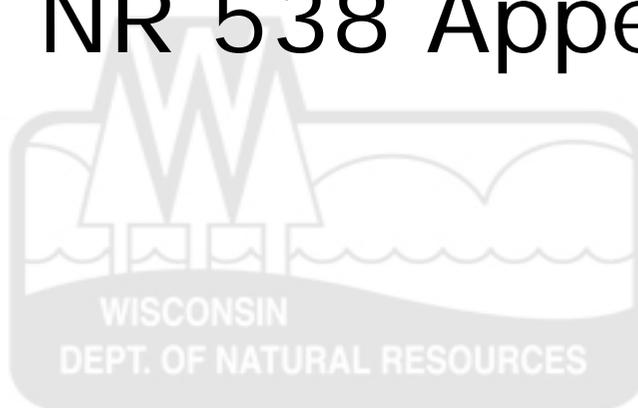
- Solicit feedback on the alternatives presented (or other variations)
- Respond to comments and develop proposed alternative to distribute to TAC members for discussion at next TAC meeting
- Finalize Appendix I and NR 538.10 (beneficial uses) at next TAC meeting



# Paul Koziar

## TAC Sub-committee

Collaborated comments on  
proposed NR 538 Appendix I  
revisions



# Questions?

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