

MINNESOTA POLLUTION CONTROL AGENCY  
 AQUATIC LIFE CRITERIA AND WATER QUALITY STANDARDS

Page 1 SUMMARY

A. Chemical/Element: Perfluorooctanesulfonic acid (PFOS)	CAS# 1763231	Dates Proposed/Promulgated /	Aquatic Tox. & Human Health
Site-specific Pool 2, Mississippi R.		Developed 3Aug2007	
		Revised 30 Oct 2009	
		Revised	

B. Minnesota Water Quality Standards: µg/l (unless noted otherwise)					
Water Class	Use	CS	MS	FAV	CS Basis <sup>1</sup>
1,2A	DW, Salmonid	7 ng/L	85 µg/L	170 µg/L	PCA Hs
1,2Bd	DW, NonSalmonid	7 ng/L	85 µg/L	170 µg/L	PCA Hs
2B, 2C, 2D	NonSalmonid	7 ng/L	85 µg/L	170 µg/L	PCA Hs
	Other				

CS: Chronic Standard, DW: Drinking Water, FAV: Final Acute Value, MS: Maximum Standard

Toxicity related to water quality?: no  
 If yes, above criteria values determined for:  
 Slope: Acute:  
 Chronic:

Formulas:	MPCA	EPA
CS:		
MS:		
FAV:		

Notes:

C. EPA Criterion: µg/l	CCC: none	Basis:
Date:	MC: none	Basis:
	FAV: none	Basis:

D. Other Criteria µg/l	Source

E. Notes: Mississippi River site-specific criterion for PFOS is based on BAF information collected from Pool 2, Mississippi River.

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<sup>1</sup> Criteria basis codes for part B:

- EPA = From U. S. Environmental Protection Agency (EPA) criterion
- PCA = Criterion developed by Minnesota Pollution Control Agency staff
- T1 = Direct aquatic life toxicity, EPA national criteria procedures used
- T2 = Direct aquatic life toxicity, EPA advisory procedures used
- Hs = Human health systemic effects
- Hc = Human health carcinogenic effects
- R = Tissue residue (bioaccumulation)
- W = Wildlife effects
- O = Organoleptic (taste and odor)
- Other = Criterion based on other end point

AQUATIC LIFE CRITERIA AND WATER QUALITY STANDARDS

Page 2 DIRECT AQUATIC LIFE TOXICITY - EPA Criterion Available

A. Chemical/Element: PFOS	CAS# 1763231
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B. EPA Criterion: $\mu\text{g/l}$	CCC: none	Basis:
Date:	MC: none	Basis:
	FAV: none	Basis:

1. Related to water quality?: no			
2. Toxicity:	FAV:	N:	ACR:
$\mu\text{g/l}$	Chronic value:	N:	
3. Residue			
Food and Drug Administration (FDA) action level:			
BCF Final:	N total:	N used:	
geo mean at 1% lipid:			
% lipid:			
geo man unadjusted for lipid:			
ACR: Acute to Chronic Ratio, BCF: Bioconcentration Factor, CCC: Chronic Criterion, MC: Maximum Criterion			

C. MPCA Evaluation of EPA Criterion

1. Four lowest GMAVs (Genus Mean Acute Values):
2. Commercially or recreationally important species:
3. Plant data:
4. Extrapolation of water quality effects:
5. Chronic data            No. of values:  
                                    No. below criterion:

Notes:

6. ACRS	ACR used by EPA:	N:
	Geo. mean, all ACRs:	N:
	ACR used by MPCA: 9.12	N: 3

Notes: EPA has no surface water criteria for PFOS

D. Separate Cool/Warm Water Criterion,  $\mu\text{g/l}$

No. of Salmonids deleted from lowest 4 GMAVs:  
 N(nonsal):            FAV:                            MC:                            CC:  
 Adjustments to FAV:

Notes:

E. Summary of changes made to EPA criterion

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Page 3 DIRECT AQUATIC LIFE TOXICITY when no EPA criterion is available

A. Chemical/Element: PFOS	CAS# 1763231
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B. EPA National Method			
1. Data requirements:	Salmonid (2A water only):	Onchorynchus mykiss	
	Osteichthyes (fish):	Pimephales promelas	
	Chordata (fish, amphibian):	Pseudacris crucifer	
	Planktonic crustacean:	Daphnia magna	
	Benthic crustacean:	Hyalella azteca	
	Aquatic insect:		
	Phylum other than Arthropoda or Chordata:	Unio complamatus	
	Second insect or phylum not already rep.:	Lumbriculus variegatus	
2. GMAVs	Lowest 4(2A): See Tier II method	Lowest 4(2B,2C, 2D): See Tier II method	
µg/l			
	N:	N:	
3. FAV:	2A:	2B, 2C, 2D:	
4. Adjustments to FAVs:			
5. Chronic data:	See Table 2a	No.	Species:
mean values			
µg/l			
6. ACR Measured:	Acute value	Chronic value	ACR
	9100	410	22.19
Generic: 18	67,200	35,350	1.9
	Generic	Generic	18
Final: 9.12			
7. Final Plant Value: NOEC = 300 µg/L, Northern milfoil			
8. Chronic Criterion (FAV/ACR) see Tier II method			

C. EPA Advisory Method (Tier II method)			
1. Data requirements:	Fish:	Pimephales promelas	
N = 7	Crustacean:	Daphnia magna	
No. SMAVs: 8	Third animal:	Lumbriculus variegatus	
No. GMAVs: 7	Plant for herbicide:		
Adjustment Factor: 4.3	Insect for pesticide:		
2. Lowest GMAV: 5600 µg/L	Species:	Lumbriculus variegatus	
3. FAV: 1302 µg/L (reduced to 170 µg/L)	MC:	85 µg/L	
4. Chronic data: See B.5.			
5. ACR: 9.12 (See B.6)			
6. CC: 18.6 µg/L (rounded up to 19 µg/L)			
7. Citation for lowest GMAV: STS-334			

D. Notes: FAV = GMAV ÷ Adjustment Factor; EAO staff lowered the Tier II calculated FAV of 1302 µg/L to the project EC50 of 170 µg/L to protect Chironomus tentans. The original Chironomus tentans study used the highest exposure concentration of 150 µg/L and reported the EC50 as greater than 150 µg/L. Therefore, EAO staff determined an estimated EC50 for the test at 170 µg/L.

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Page 4 HUMAN HEALTH

A. Chemical/Element: PFOS	CAS# 1763231
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B. EPA Human Health Criterion (µg/l):	DW and fish: none	fish only: none	DW only: Perfluorooctane Sulfonate. Provisional short-term value 0.2 µg/L
Reference Dose: mg/kg/day	Cancer Potency Slope: (mg/kg-d) <sup>-1</sup>		
Final BCF:	%lipid:		
Relative Source Contribution (RSC):			

C. Minnesota Human Health Criterion			
1. Ref.dose: 0.00008 mg/kg/day	Source: MDH		
RSC: 0.2	Source: MDH		
2. Cancer Potency Slope: (mg/kg-d) <sup>-1</sup>	Source:		
3. Measured BAFs: Species/Tissue	BAF	%lipid	Norm BAF
1. Bluegill/ Fillet	5112	n/a	5112
2. Carp/ Fillet	3149	n/a	3149
3. Freshwater Drum / Fillet	7246	n/a	7246
4. Smallmouth Bass/ Fillet	5197	n/a	5197
5. White Bass/ Fillet	8582	n/a	8582
Geo mean:	5537		
4. Measured BCFs: Species/Tissue	BCF	%lipid	Norm. BCF
1.			
2.			
3.			
4.			
Geo mean:			
5. Edible portion BAF or BCF	BAF		BCF
Cold water: 6.0 % lipid	n/a		
Warm water: 1.5 % lipid	n/a		
6. Geo mean unadjusted for lipid:	n/a		
7. log Kow: adjust. for % lipid:	meas.	QSAR (7.6% lipid):	Est. BCF:
8. Parachor: n/a			
9. BCF to BAF conversion factor: n/a			
10. Final BAF: 2A (6% lipid): 5537	2B & 2Bd,2C, 2D (1.5% lipid): 5537		
11. Criteria: ug/l	2A: 7 ng/L *	2Bd: 7 ng/L *	2B/2C, 2D: 7 ng/L # HRL/HBV: 0.3 µg/L MDH Health Risk Limit/ Health Based Value for Groundwater

D. Organoleptic: n/a ug/l	Source:
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E. Notes: E. Notes: \* Criterion developed using 2 L/day water and 70 kg body wt. as specified in Minn. R. ch.7050.  
F. # Criterion developed using 0.01 L/day water incidental ingestion and 70 kg body wt. as specified in Minn. R. Ch. 7050.