

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 Lake Calhoun		Developed 3Aug2007	
		Revised 12 May 2010	
		Revised	

B. Minnesota Water Quality Standards: µg/l (unless noted otherwise)

Water Class	Use	CS	MS	FAV	CS Basis ¹
1,2A	DW, Salmonid	n/a	85 µg/L	170 µg/L	PCA Hs
1,2Bd	DW, NonSalmonid	n/a	85 µg/L	170 µg/L	PCA Hs
2B, 2C, 2D	NonSalmonid	6.1 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?:
 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
0.2 (based on 10 kg child and 1 L drinking water intake)	EPA Office of Water Provisional Health Advisory under the Safe Drinking Water Program at http://www.epa.gov/waterscience/criteria/drinking/

E. Notes: Lake Calhoun site –based water quality criteria are based from calculations using fish tissue data collected in 2008 and 2009, and surface waters samples collected in 2007 and 2008 from Lake Calhoun.

¹ 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

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Page 2 DIRECT AQUATIC LIFE TOXICITY - EPA Criterion Available

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

1. Revised to water quality?: no			
2. Toxicity $\mu\text{g/l}$	FAV: Chronic value:	N:	ACR:
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
- Four lowest GMAVs (Genus Mean Acute values):
 - Commercially or recreationally important species:
 - Plant data:
 - Extrapolation of water quality effects:
 - 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, ug/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			
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 1(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	5,350	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) ⁻¹		
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		
Additivity endpoint(s): Development (body weight/weight gain), Hepatic (liver) system, Thyroid	Source: MDH		
2. Cancer Potency Slope: n/a (mg/kg-d) ⁻¹	Source:		
3. Measured BAFs: Species/Tissue	BAF	%lipid	Norm BAF
1. Bluegill/ Fillet	4516	n/a	4516
2. Black Crappie/ Fillet	5552	n/a	5552
3. Northern Pike / Fillet	4908	n/a	4908
4. Largemouth Bass/ Fillet	10418	n/a	10418
Geo mean:	6087		
4. Measured BCFs: Species/Tissue	BCF	%lipid	Norm. BCF
1.			
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 (6% lipid):	Est. BCF:
8. Parachor: n/a			
9. BCF to BAF conversion factor: n/a			
10. Final BAF: 2A (6% lipid):	2B & 2Bd,2C, 2D (1.5% lipid): 6087		
11. Criteria:	2A: n/a	2Bd: n/a	2B/2C, 2D: 6.1 ng/L * HRL/HBV: 0.3 µg MDH Health Risk Limit Based Value for Groundwater

D. Organoleptic: n/a	Source:
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F. * Criterion developed using 0.01 L/day water incidental ingestion and 70 kg body wt. as specified in Minn. R. Ch. 7050. Data used for calculation of fish BAF values for PFOS and PFOA were reported fish tissue and surface water samples collected from the Mississippi R, Pool 2 in 2009, and Lake Calhoun in 2007 and 2008. Methods used for calculating water quality criteria can be found in the MPCA water quality guidance manual (Maschwitz, 2000).

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