

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 <sup>1</sup>
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?: 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
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 <a href="http://www.epa.gov/waterscience/criteria/drinking/">http://www.epa.gov/waterscience/criteria/drinking/</a>

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.

<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

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**Page 2 DIRECT AQUATIC LIFE TOXICITY - EPA Criterion Available**

A. Chemical/Element: PFOS	CAS# 1763231	
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B. EPA Criterion: µg/l	CCC: none	Basis:
Date:	MC: none	Basis:
	FAV: none	Basis:

1. Related to water quality?: no			
2. Toxicity:	FAV:	N:	ACR:
µg/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
- 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			
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
	9100		410
Generic: 18	67,200		35,350
	Generic		Generic
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		
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		
Additivity endpoint(s): Development (body weight/weight gain), Hepatic (liver) system, Thyroid		Source: MDH		
2. Cancer Potency Slope: n/a (mg/kg-d) <sup>-1</sup>		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 (7.6% 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/L MDH Health Risk Limit/ Health Based Value for Groundwater
D. Organoleptic: n/a		Source:		

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).