Colorado Soil Evaluation Values (CSEV) and EPA Regional Screening Levels (RSL)

Update on the Division's New Approach to Soil Screening Numbers

For the last few years, the Division has published health-based screening numbers in its Colorado Soil Evaluation Values (CSEV) table, the most recent version dated July 2011. Historically, numbers in the CSEV table were calculated using a mix of both EPA and Colorado specific methods and assumptions used for assessing risk and calculating soil screening numbers. However, in light of the fact that a) with each passing year, Colorado adopted more of the EPA approach, and b) in recognition of EPA's decision to harmonize the Region 3, 6 and 9 numbers into a single table, the Division was faced with the question of whether it was worthwhile maintaining the CSEV table considering that the differences between it and the national table were relatively small. After considering the benefits of adopting the EPA Regional Screening Levels (RSL) table versus the cost in time and money having to maintain Colorado's version of that table, a decision was made to be consistent with the nation and use the EPA RSLs to determine whether levels of contamination found at a site may warrant further investigation or cleanup, or whether no further investigation or action may be required.

Rather than delay this change, after November 28, 2012 the Division will use the RSL and CSEV tables in the following fashion:

Screening Levels for Residential and Industrial Worker Exposure Scenarios

From this point forward, the Division will be using the direct exposure levels for residential and industrial exposure scenarios listed in the EPA RSLs. This table, which EPA updates on a regular basis, can be found at:

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Please use one of the links to the **Summary Table** in the top row of links.

Another benefit of adopting the national approach to calculating screening levels is that EPA also has a **Calculator** that can be used to adjust the input parameters for the purpose of coming up with site-specific RSLs. A link to this feature is provided on the web page referenced above. A useful background document and **User's Guide** identifying the toxicity values, equations and exposure assumptions used to calculate RSLs is also provided on this web page.

Screening values presented in the RSL table are based on human health risk from the combined exposure of direct soil ingestion, dermal contact with soil, and inhalation of vapors or particulates associated with soil. Other pathways, such as indoor air or food chain effects, may need to be considered on a site-specific basis. Users should also be aware that some sites in sensitive ecological settings may need to be evaluated for potential ecological risk. In addition, please continue to take into consideration the following:

- Colorado Department of Public Health and Environment-specific toxicity values such as an inhalation Reference Concentration (RfC) of 7.0 ug/m^3 for 1,1-dichloroethylene (1,1-DCE) and an oral Reference Dose (RfD) of 0.0011 mg/kg/day for diisopropyl methylphosphonate (DIMP).
- For facilities where multiple non-carcinogenic chemicals are present, HQ values should be divided by a factor of 10 to account for additivity. If adjusted tables values are exceeded, consultation with a toxicologist is recommended to assess likely impact on specific target organs.
- For lead, consideration of site-specific inputs to the IEUBK or ALM lead models and consultation with a toxicologist is strongly recommended for facilities with lead levels in soil that exceed the residential or worker table values. Contact the Division for additional information about details of the lead models and site-specific considerations.
- For workers at facilities where soil-intensive use is anticipated, additional analysis and consultation with a toxicologist will be required to determine appropriate site-specific inputs to the risk equations.

Screening Levels Protective of Groundwater Quality

The Division will continue using the Groundwater Protection Level and Leachate Reference Concentration columns in the CSEV table, the last column in that table identifying the water standard used in the calculations which are based on standards and methods established and employed by the Water Quality Control Commission.

Colorado Soil Evaluation Values (CSEV) Table

These two columns should be consulted when reviewing site data because in some cases, decisions on whether or not further evaluation or remediation are needed may be based on the mobility of constituents and their potential to reach and degrade groundwater quality.

Air Screening Concentrations

Although the method by which the Division calculates air exposure screening numbers is identical to the method used by EPA, there are a few differences between our Air Screening Concentration Table and air columns listed in the RSLs. You are therefore advised to continue using the Division's air table.

Air Screening Concentrations Table

Target indoor air concentrations for those chemicals not included on the Division's list may be found in the EPA RSL table.

Next Steps

When time permits, the Division will modify the CSEV table to only show the Groundwater Protection Level, Leachate Reference Concentration and the Water Standard columns, relying entirely on the EPA RSLs for the direct exposure soil concentrations. The groundwater

protection numbers for certain constituents will need be modified in light of the recent changes approved by the Water Quality Control Commission that went into effect on January 31, 2013.

If you have questions about the derivation or application of these table values, please contact the Division by email sent to comments.hmwmd@state.co.us . Please be sure to put "Avramenko" in the subject line.

REGULATION #38 STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS

REGION: 3 AND 4 BASIN: **UPPER SOUTH PLATTE RIVER** Stream Segment Description	DESIG	CLASSIFICATIONS	NUMERIC STANDARDS PHYSICAL and BIOLOGICAL	INORGANIC mg/l		METALS µg/l			TEMPORARY MODIFICATIONS AND QUALIFIERS
14. Mainstem of the South Platte River from the outlet of Chatfield Reservoir to the Burlington Ditch diversion in Denver, Colorado.		Aq Life Warm 1 Recreation E Water Supply Agriculture	T=TVS(WS-I) °C summer= 14 Feb-Nov D.O.=5.0 mg/l pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 $S0_4$=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS Fe(ch)=WS(dis)	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=190(dis) Mn(ac/ch)=TVS Hg(ch)=0.01(Tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	Temporary modifications: Cu(ac/ch)=TVSx2.7 (Type iii). Applies below the confluence with Marcy Gulch. Expiration date of 12/31/2015. T=current conditions (Type iii). Expiration date of 12/31/2015. Temporary modification: As(ch)=hybrid Expiration date of 12/31/21.
15. Mainstem of the South Platte River from the Burlington Ditch diversion in Denver, Colorado, to a point immediately below the confluence with Big Dry Creek.	UP	Aq Life Warm 2 Recreation E Water Supply Agriculture	T=TVS(WS-I) °C D.O.* pH = 6.5-9.0** E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=1.0 NO_3=10 Cl=250 $S0_4$=WS	As(ac)=340 As(ch)=0.02-10(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS Fe(ch)=WS(dis)	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=400(dis) Mn(ac/ch)=TVS Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	*See attached table for site-specific Dissolved Oxygen and Ammonia standards. **pH=6.0-9.0 from 64th Ave. downstream 2 miles. Temporary modifications: NH_3(ac)=TVS(old); NH_3(ch)=0.10 mg/l (Type i). Expiration date of 12/31/2014. Cu(ac/ch)=TVSx2.3 (Type iii). Expiration date of 12/31/2015. T=current conditions (Type iii). Expiration date of 12/31/2015.
16a. Mainstem of Sand Creek from the confluence of Murphy and Coal Creek in Arapahoe County to the confluence with the Toll Gate Creek.		Aq Life Warm 2 Recreation E Agriculture	T=TVS(WS-II) °C D.O.=5.0 mg/l pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=100	As(ac)=340 As(ch)=100(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(Tot) Ni(ac/ch)=TVS	Se(ac)=TVS Se(ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	
16b. Aurora Reservoir.		Aq Life Warm 1 Recreation E Water Supply Agriculture	T=TVS(WL) °C D.O.=5.0 mg/l pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=WS	As(ac)=340 As(ch)=0.02(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Mn(ch)=WS(dis) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	
16c. All tributaries to the South Platte River, including all wetlands, from the outlet of Chatfield Reservoir, to a point immediately below the confluence with Big Dry Creek, except for specific listings in the subbasins of the South Platte River, and in Segments 16a, 16d, 16e, 16f, 16g, 16h, 16i and 16j.	UP	Aq Life Warm 2 Recreation E Agriculture	T=TVS(WS-II) °C D.O.=5.0 mg/l pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=100	As(ac)=340 As(ch)=100 (Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(Tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	.
16d. Second Creek from the source to the O'Brian Canal.	UP	Aq Life Warm 2 Recreation E Agriculture	T=TVS(WS-IV) °C D.O. (ch)=3.3 mg/l[1] pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=100	As(ac)=340 As(ch)=100(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(Tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	[1] 15th percentile of D.O. measurements collected between 6:30 a.m. and 6:30 p.m.
16e. Third Creek from the source to the O'Brian Can	UP	Aq Life Warm 2 Recreation E Agriculture	T=TVS(WS-IV) °C D.O. (ch)=4.0 mg/l[1] pH=6.5-9.0 E. Coli=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=100	As(ac)=340 As(ch)=100(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(Tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS	[1] 15th percentile of D.O. measurements collected between 6:30 a.m. and 6:30 p.m.

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

WATER QUALITY CONTROL COMMISSION

5 CCR 1002-38

REGULATION NO. 38
CLASSIFICATIONS AND NUMERIC STANDARDS
FOR
SOUTH PLATTE RIVER BASIN, LARAMIE RIVER BASIN
REPUBLICAN RIVER BASIN, SMOKY HILL RIVER BASIN

ADOPTED:	April 6, 1981	EFFECTIVE:	May 16, 1981
AMENDED:	April 12, 1982	EFFECTIVE:	May 16, 1982 through May 30, 1982
AMENDED:	December 6, 1982	EFFECTIVE:	January 30, 1983
SEPARATELY AMENDED:	December 6, 1982	EFFECTIVE:	January 30, 1983
AMENDED:	May 9, 1983	EFFECTIVE:	July 16, 1983
AMENDED:	December 12, 1983	EFFECTIVE:	January 30, 1984
AMENDED:	May 15, 1984	EFFECTIVE:	June 30, 1984
AMENDED:	August 14, 1984	EFFECTIVE:	September 30, 1984
AMENDED:	April 1, 1985	EFFECTIVE:	May 30, 1985
AMENDED:	March 7, 1986	EFFECTIVE:	April 30, 1986
AMENDED:	April 8, 1986	EFFECTIVE:	May 30, 1986
AMENDED:	May 9, 1986	EFFECTIVE:	June 30, 1986
AMENDED:	September 18, 1986	EFFECTIVE:	October 30, 1986
AMENDED:	August 4, 1987	EFFECTIVE:	September 30, 1987
AMENDED:	November 3, 1987	EFFECTIVE:	December 30, 1987
AMENDED:	May 2, 1988	EFFECTIVE:	June 30, 1988
AMENDED:	February 6, 1989	EFFECTIVE:	March 30, 1989
EMERGENCY AMENDED:	February 6, 1989	EFFECTIVE:	February 6, 1989 through August 30, 1989
AMENDED:	March 6, 1989	EFFECTIVE:	April 30, 1989
AMENDED:	June 5, 1989	EFFECTIVE:	July 30, 1989
EMERGENCY AMENDED:	July 11, 1989	EFFECTIVE:	July 11, 1989 through March 30, 1990
AMENDED:	February 5, 1990	EFFECTIVE:	March 30, 1990
AMENDED:	September 5, 1991	EFFECTIVE:	October 30, 1991
AMENDED:	January 6, 1992	EFFECTIVE:	March 1, 1992
AMENDED:	June 2, 1992	EFFECTIVE:	July 30, 1992
AMENDED:	July 6, 1992	EFFECTIVE:	August 30, 1992
AMENDED:	December 7, 1992	EFFECTIVE:	January 30, 1993
AMENDED:	March 1, 1993	EFFECTIVE:	April 30, 1993
AMENDED:	August 2, 1993	EFFECTIVE:	September 30, 1993
AMENDED:	September 7, 1993	EFFECTIVE:	October 30, 1993
AMENDED:	March 7, 1994	EFFECTIVE:	April 30, 1994
AMENDED:	May 2, 1994	EFFECTIVE:	June 30, 1994
AMENDED:	February 13, 1995	EFFECTIVE:	March 30, 1995
AMENDED:	June 12, 1995	EFFECTIVE:	July 30, 1995
AMENDED:	July 10, 1995	EFFECTIVE:	August 30, 1995
AMENDED:	December 11, 1995	EFFECTIVE:	January 30, 1996

AMENDED:	May 13, 1996	EFFECTIVE:	June 30, 1996
AMENDED:	August 12, 1996	EFFECTIVE:	September 30, 1996
AMENDED:	January 13, 1997	EFFECTIVE:	March 3, 1997
AMENDED:	April 14, 1997	EFFECTIVE:	May 30, 1997
AMENDED:	May 12, 1997	EFFECTIVE:	June 30, 1997
AMENDED:	July 14, 1997	EFFECTIVE:	August 30, 1997
AMENDED:	November 9, 1998	EFFECTIVE:	December 30, 1998
AMENDED:	May 11, 1999	EFFECTIVE:	June 30, 1999
AMENDED:	October 10, 2000	EFFECTIVE:	February 20, 2001
AMENDED:	February 13, 2001	EFFECTIVE:	June 20, 2001
EMERGENCY AMENDMENT:	May 14, 2001	EFFECTIVE:	May 14, 2001
AMENDED:	September 10, 2001	EFFECTIVE:	October 30, 2001
AMENDED:	December 10, 2001	EFFECTIVE:	January 30, 2002
AMENDED:	September 13, 2004	(Clear Creek seg. 5 and Middle South Platte segs. 1a & 1b)	
		EFFECTIVE:	November 1, 2004
AMENDED:	September 13, 2004	(all other segments)	
		EFFECTIVE:	January 20, 2005
AMENDED:	December 12, 2005	EFFECTIVE:	March 2, 2006
AMENDED:	August 14, 2006	EFFECTIVE:	September 30, 2006
AMENDED:	February 12, 2007	EFFECTIVE:	July 1, 2007
AMENDED:	April 9, 2007	EFFECTIVE:	September 1, 2007
AMENDED:	August 13, 2007	EFFECTIVE:	September 30, 2007
AMENDED:	January 14, 2008	EFFECTIVE:	March 1, 2008
AMENDED:	February 9, 2009	EFFECTIVE:	March 30, 2009
AMENDED:	August 10, 2009	EFFECTIVE:	January 1, 2010
AMENDED:	February 8, 2010	EFFECTIVE:	June 30, 2010
AMENDED:	April 12, 2010	EFFECTIVE:	June 30, 2010
AMENDED:	July 12, 2010	EFFECTIVE:	November 30, 2010
AMENDED:	January 10, 2011	EFFECTIVE:	June 30, 2011
EMERGENCY AMENDMENT:	December 13, 2011	EFFECTIVE:	December 13, 2011
AMENDED:	June 13, 2011	EFFECTIVE:	January 1, 2012
AMENDED:	August 13, 2012	EFFECTIVE:	December 31, 2012
AMENDED:	October 9, 2012	EFFECTIVE:	March 1, 2013
AMENDED:	January 14, 2013	EFFECTIVE:	June 30, 2013
EMERGENCY AMENDMENT:	May 13.2013	EFFECTIVE:	May 13, 2013
AMENDED:	May 1, 2013	EFFECTIVE:	September 30, 2013
AMENDED:	March 11, 2014	EFFECTIVE:	April 30, 2014
AMENDED:	March 11, 2014	EFFECTIVE:	June 30, 2014

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

WATER QUALITY CONTROL COMMISSION

5 CCR 1002-38

REGULATION NO. 38
CLASSIFICATIONS AND NUMERIC STANDARDS
FOR
SOUTH PLATTE RIVER BASIN, LARAMIE RIVER BASIN
REPUBLICAN RIVER BASIN, SMOKY HILL RIVER BASIN

38.1 AUTHORITY

These regulations are promulgated pursuant to section 25-8-101 et seq C.R.S., as amended, and in particular, 25-8-203 and 25-8-204.

38.2 PURPOSE

These regulations establish classification and numeric standards for the South Platte River, the Laramie River, the Republican River and the Smoky Hill River, including all tributaries and standing bodies of water as indicated in section 38.6. The classifications identify the actual beneficial uses of the water. The numeric standards are assigned to determine the allowable concentrations of various parameters. Discharge permits will be issued by the Water Quality Control Division to comply with basic, narrative, and numeric standards and control regulations so that all discharges to waters of the state protect the classified uses. (See section 31.14). It is intended that these and all other stream classifications and numeric standards be used in conjunction with and be an integral part of Regulation 31.0 - BASIC STANDARDS AND METHODOLOGIES FOR SURFACE WATER.

38.3 INTRODUCTION

These regulations and Tables present the classifications and numeric standards assigned to stream segments listed in the attached Tables (See section 38.6). As additional stream segments are classified and numeric standards for this drainage system, they will be added to or replace the numeric standards in the Tables in section 38.6). Any additions or revisions of classifications or numeric standards can be accomplished only after public hearing by the Commission and proper consideration of evidence and testimony as specified by the statute and the “basic regulations”.

38.4 DEFINITIONS

See the Colorado Water Quality Control Act and the codified water quality regulations for definitions.

38.5 BASIC STANDARDS

(1) TEMPERATURE

All waters of the South Platte, Laramie, Republican and Smoky Hill River Basins are subject to the following standard for temperature. (Discharges regulated by permits, which are within the permit limitations, shall not be subject to enforcement proceedings under this standard). Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

2016-010025-0001207

(2) QUALIFIERS

See Basic Standards and Methodologies for Surface Water for a listing of organic standards at 31.11 and metal standards found at 31.16 Table III. The column in the tables headed "Water Fish" are presumptively applied to all aquatic life class 1 streams which also have a water supply classification, and are applied to aquatic life class 2 streams which also have a water supply classification, on a case-by-case basis as shown in the Tables 38.6. The column in the tables at 31.11 headed "Fish Ingestion" is presumptively applied to all aquatic life class 1 streams which do not have a water supply classification, and are applied to aquatic life class 2 streams which do not have a water supply classification, on a case-by-case basis as shown in the Tables in Tables 38.6.

(3) URANIUM

(a) All waters of the South Platte River Basin are subject to the following basic standard for uranium, unless otherwise specified by a water quality standard applicable to a particular segment. However, discharges of uranium regulated by permits which are within these permit limitations shall not be a basis for enforcement proceedings under this basic standard.

(b) Uranium level in surface waters shall be maintained at the lowest practicable level.

(c) In no case shall uranium levels in waters assigned a water supply classification be increased by any cause attributable to municipal, industrial, or agricultural discharges so as to exceed 30 µg/l or naturally-occurring concentrations (as determined by the State of Colorado), whichever is greater.

(d) In no case shall uranium levels in waters assigned a water supply classification be increased by a cause attributable to municipal, industrial, or agricultural discharges so as to exceed 30 µg/l where naturally-occurring concentration are less than 30 µg/l.

38.6 TABLES

(1) Introduction

The numeric standards for various parameters in the attached tables were assigned by the Commission after a careful analysis of the data presented on actual stream conditions and on actual and potential water uses.

Numeric standards are not assigned for all parameters listed in the Tables attached to 31.0. If additional numeric standards are found to be needed during future periodic reviews, they can be assigned by following the proper hearing procedures.

(2) Abbreviations:

(a) The following abbreviations are used in the attached tables:

ac	=	acute (1-day)
Ag	=	Silver
Al	=	Aluminum
As	=	Arsenic
B	=	Boron
Ba	=	Barium
Be	=	Beryllium
^{o}C	=	degrees celsius
Cd	=	Cadmium

ch	=	chronic (30-day)
CL	=	cold lake temperature tier
Cl	=	Chloride
CLL	=	cold large lake temperature tier
Cl_2	=	residual chlorine
CN	=	free cyanide
CrIII	=	trivalent chromium
CrVI	=	hexavalent chromium
CS-I	=	cold stream temperature tier one
CS-II	=	cold stream temperature tier two
Cu	=	Copper
dis	=	Dissolved
D.O.	=	Dissolved oxygen
DM	=	daily maximum
E. coli	=	Eschericia coli
F	=	Fluoride
Fe	=	Iron
Hg	=	Mercury
mg/l	=	milligrams per liter
ml	=	Milliliters
Mn	=	Manganese
MWAT	=	maximum weekly average temperature
NH_3	=	ammonia as N(nitrogen)
Ni	=	Nickel
NO_2	=	nitrite as N (nitrogen)
NO_3	=	nitrate as N (nitrogen)
OW	=	outstanding waters
P	=	Phosphorus
Pb	=	Lead
S	=	sulfide as undissociated H_2S (hydrogen sulfide)
Sb	=	Antimony
Se	=	Selenium
SO_4	=	Sulfate
sp	=	Spawning
T	=	temperature
Tl	=	Thallium
Tr	=	Trout
Trec	=	total recoverable
TVS	=	table value standard
U	=	Uranium
µg/l	=	micrograms per liter
UP	=	use-protected
WAT	=	weekly average temperature
WL	=	warm lake temperature tier
WS-I	=	warm stream temperature tier one
WS-II	=	warm stream temperature tier two
WS-III	=	warm stream temperature tier three
WS-IV	=	warm stream temperature tier four
Zn	=	Zinc

(b) In addition, the following abbreviations are used:

Fe(ch)	=	WS(dis)
Mn(ch)	=	WS(dis)
SO_4	=	WS

These abbreviations mean: For all surface waters with an actual water supply use, the less restrictive of the following two options shall apply as numerical standards, as specified in the Basic Standards and Methodologies at 31.11(6);

(i) existing quality as of January 1, 2000; or

(ii)

Iron	=	300 µg/l (dissolved)
Manganese	=	50 µg/l (dissolved)
SO_4	=	250 mg/l

For all surface waters with a "water supply" classification that are not in actual use as a water supply, no water supply standards are applied for iron, manganese or sulfate, unless the Commission determines as the result of a site-specific rulemaking hearing that such standards are appropriate.

(c) As used in the "Temporary Modifications and Qualifiers" column of the tables, the term "type i" refers to a temporary modification adopted pursuant to subsection 31.7(3)(a)(i) of the Basic Standards and Methodologies for Surface Water (i.e., "where the standard is not being met because of human-induced conditions deemed correctable within a twenty (20) year period"). The term "type iii" refers to a temporary modification adopted pursuant to subsection 31.7(3)(a)(iii) of the Basic Standards and Methodologies for Surface Water (i.e., "where there is significant uncertainty regarding the appropriate long-term underlying standard").

(d) Temporary Modification for Water + Fish Chronic Arsenic Standard

(i) The temporary modification for chronic arsenic standards applied to segments with an arsenic standard of 0.02 µg/l that has been set to protect the Water+Fish qualifier is listed in the temporary modification and qualifiers column as As(ch)=hybrid.

(ii) For discharges existing on or before 6/1/2013, the temporary modification is: As(ch)=current condition, expiring on 12/31/2021.

(iii) For new or increased discharges commencing on or after 6/1/2013, the temporary modification is: As(ch)=0.02-3.0 µg/l (Trec), expiring on 12/31/2021.

(a) The first number in the range is the health-based water quality standard previously adopted by the Commission for the segment.

(b) The second number in the range is a technology based value established by the Commission for the purpose of this temporary modification.

(c) Control requirements, such as discharge permit effluent limitations, shall be established using the first number in the range as the ambient water quality target, provided that no effluent limitation shall require an "end-of-pipe" discharge level more restrictive than the second number in the range.

(3) <u>Table Value Standards</u>

In certain instances in the attached tables, the designation "TVS" is used to indicate that for a particular parameter a "table value standard" has been adopted. This designation refers to

numerical criteria set forth in the Basic Standards and Methodologies for Surface Water. The criteria for which the TVS are applicable are on the following table.

TABLE VALUE STANDARDS
(Concentrations in µg/l unless noted)

PARAMETER[1]	**TABLE VALUE STANDARDS** [2][3]
Ammonia [4]	Cold Water = (mg/l as N)Total $acute = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$ $chronic = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \cdot MIN\left(2.85,\ 1.45 \cdot 10^{0.028(25-T)}\right)$
	Warm Water = (mg/l as N)Total $acute = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$
	$chronic\ (Apr1-Aug31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \cdot MIN\left(2.85,\ 1.45 \cdot 10^{0.028(25-T)}\right)$ $chronic\ (Sep1-Mar31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \cdot 1.45 \cdot 10^{0.028 \cdot (25-MAX(T,\ 7))}$
NH_3 = old TVS	Cold Water Acute = 0.43/FT/FPH/2[4 old] in mg/l (N)
	Warm Water Acute = 0.62/FT/FPH/2[4 old] in mg/l (N)
Cadmium	Acute = (1.136672-[ln(hardness) x (0.041838)])*$e^{(0.9151[\ln(hardness)]-3.1485)}$ Acute(Trout) = (1.136672-[ln(hardness) x (0.041838)])*$e^{(0.9151[\ln(hardness)]-3.6236)}$ Chronic = (1.101672-[ln(hardness) x (0.041838)])*$e^{(0.7998[\ln(hardness)]-4.4451)}$
Chromium III[5]	Acute = $e^{(0.819[\ln(hardness)]+2.5736)}$ Chronic = $e^{(0.819[\ln(hardness)]+0.5340)}$
Chromium VI[5]	Acute = 16 Chronic = 11
Copper	Acute = $e^{(0.9422[\ln(hardness)]-1.7408)}$ Chronic = $e^{(0.8545[\ln(hardness)]-1.7428)}$
Lead	Acute = (1.46203-[ln(hardness)*(0.145712)])*$e^{(1.273[\ln(hardness)]-1.46)}$ Chronic = (1.46203-[(ln hardness)* (0.145712)])*$e^{(1.273[\ln(hardness)]-4.705)}$
Manganese	Acute= $e^{(0.3331[\ln(hardness)]+6.4676)}$ Chronic= $e^{(0.3331[\ln(hardness)]+5.8743)}$

Nickel	Acute = $e^{(0.846[\ln(hardness)]+2.253)}$ Chronic = $e^{(0.846[\ln(hardness)]+0.0554)}$					
Selenium[6]	Acute = 18.4 Chronic = 4.6					
Silver	Acute = ½ $e^{(1.72[\ln(hardness)]-6.52)}$ Chronic = $e^{(1.72[\ln(hardness)]-9.06)}$ Chronic(Trout) = $e^{(1.72[\ln(hardness)]-10.51)}$					
Temperature	**TEMPERATURE TIER**	**TIER CODE**	**SPECIES EXPECTED TO BE PRESENT**	**APPLICABLE MONTHS**	**TEMPERATURE STANDARD (°C)**	
					(MWAT)	(DM)
	Cold Stream Tier I	CS-I	Brook trout, cutthroat trout	June – Sept.	17.0	21.2
				Oct. - May	9.0	13.0
	Cold Stream Tier II	CS-II	Brown trout, rainbow trout, mottled sculpin, mountain whitefish, longnose sucker, Arctic grayling	April – Oct.	18.2	23.8
				Nov. - March	9.0	13.0
	Cold Lake	CL	Brook trout, brown trout, cutthroat trout, lake trout, rainbow trout, Arctic grayling, sockeye salmon	April – Dec.	17.0	21.2
				Jan. - March	9.0	13.0
Temperature	Cold Large Lake (>100 acres surface area)	CLL	Rainbow trout	April – Dec.	18.2	23.8
				Jan. - March	9.0	13.0
	Warm Stream Tier I	WS-I	Common shiner, Johnny darter, orangethroat darter	March – Nov.	24.2	29.0
				Dec. – Feb.	12.1	14.5
	Warm Stream Tier II	WS-II	Brook stickleback, central stoneroller, creek chub, longnose dace, Northern redbelly dace, finescale dace, white sucker	March – Nov.	27.5	28.6
				Dec. – Feb.	13.7	14.3
	Warm Stream Tier III	WS-III	Razorback sucker	March – Nov.	27.7	31.3
				Dec. – Feb.	13.9	15.2
	Warm Stream Tier IV	WS-IV	Other Warmwater Species	March – Nov.	28.7	31.3
				Dec. – Feb.	14.3	15.2
	Warm Lakes	WL	Yellow perch, walleye, pumpkinseed, smallmouth bass, striped bass, white bass, largemouth bass, bluegill, spottail shiner, Northern pike, tiger muskellunge, black crappie, common carp, gizzard shad, sauger, white crappie, wiper	April – Dec.	26.5	29.3
				Jan. - March	13.3	14.6
Uranium	Acute = $e^{(1.1021[\ln(hardness)]+2.7088)}$ Chronic = $e^{(1.1021[\ln(hardness)]+2.2382)}$					

Zinc	Acute = $0.978\ e^{(0.8525[\ln(hardness)]+1.0617)}$ Chronic = $0.986\ e^{(0.8525[\ln(hardness)]+0.9109)}$

TABLE VALUE STANDARDS - FOOTNOTES

(1) Metals are stated as dissolved unless otherwise specified.

(2) Hardness values to be used in equations are in mg/l as calcium carbonate and shall be no greater than 400 mg/L. The hardness values used in calculating the appropriate metal standard should be based on the lower 95 per cent confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used. In calculating a hardness value, regression analyses should not be extrapolated past the point that data exist.

(3) Both acute and chronic numbers adopted as stream standards are levels not to be exceeded more than once every three years on the average.

(4) $FT = 10^{0.03(20-TCAP)}$;

Where TCAP is $\leq T \leq 30$

$FT = 10^{0.03(20-T)}$;

Where 0 is $\leq T \leq TCAP$

TCAP = 20° C cold water aquatic life species present

TCAP = 25° C cold water aquatic life species absent

FPH = 1; Where $8 \leq pH \leq 9$

$FPH = \frac{1 + 10(7.4-pH)}{1.25}$; *Where* $6.5 \leq pH \leq 8$

FPH means the acute pH adjustment factor, defined by the above formulas.

FT Means the acute temperature adjustment factor, defined by the above formulas.

T means temperature measured in degrees celsius.

TCAP means temperature CAP; the maximum temperature which affects the toxicity of ammonia to salmonid and non-salmonid fish groups.

NOTE: If the calculated acute value is less than the calculated chronic value, then the calculated chronic value shall be used as the acute standard.

(5) Unless the stability of the chromium valence state in receiving waters can be clearly demonstrated, the standard for chromium should be in terms of chromium VI. In no case can the sum of the instream levels of Hexavalent and Trivalent Chromium exceed the water supply standard of 50 µg/l total chromium in those waters classified for domestic water use.

(6) Selenium is a bioaccumulative metal and subject to a range of toxicity values depending upon numerous site-specific variables.

(4) Assessment Criteria

The following criteria shall be used when assessing whether a specified waterbody is in attainment of the specified standard.

(a) Upper South Platte Segment 6b, Chatfield Reservoir: Assessment Thresholds

chlorophyll = 11.2 µg/l, summer average, 1 in 5 year allowable exceedance frequency
phosphorus(Tot) = 0.035 mg/l, summer average, 1 in 5 year allowable exceedance frequency.

(b) Upper South Platte Segment 16h: Selenium Assessment Locations

- Toll Gate Creek (TG6): Downstream of the confluence of East and West Toll Gate Creeks, at 6th Avenue near the gage station.
- East Toll Gate Creek (ET1): Upstream of the confluence with West Toll Gate Creek, at Chambers Road and 1st Avenue.
- West Toll Gate Creek (WT1): Upstream of the confluence with East Toll Gate Creek, at 2nd Avenue.

(c) Upper South Platte Segment 15 and Middle South Platte Segment 1a: Dissolved Oxygen Assessment Locations

For the purpose of determining attainment of the standard, dissolved oxygen measurements shall only be taken in the flowing portion of the stream and at mid depth, and at least six inches above the bottom of the channel. Dissolved oxygen measurements in man-made pools are not to be used for determination of attainment of the standards.

(d) Big Dry Creek Segment 1: Selenium Assessment Locations

- bdc 1.5: upstream of Broomfield Wastewater Treatment Plant
- bcd 2.0: upstream of Westminster Big Dry Creek Wastewater Treatment Facility
- bcd 4.0: upstream of Northglenn Wastewater Treatment Plant

(e) Big Dry Creek Segment 2 (Standley Lake): Assessment Thresholds

Chlorophyll = 4.4 ug/L, Mar-Nov average, 1 in 5 yr allowable exceedance frequency

(f) Upper South Platte Segment 16i, Sand Creek from Toll Gate Creek to the confluence with the South Platte River: assessment locations for selenium.

- Upper – (SWA) Downstream of the confluence of Sand Creek and Toll Gate Creek approximately 250 meters upstream of the Sand Creek Water Reuse Facility (SCWRF) discharge near the Peoria Street Bridge.
- Lower – (SW1) Above Suncor, approximately 60 meters upstream of the Union Pacific Railroad crossing and upstream of Brighton Boulevard.

(g) Upper South Platte Segment 16g (Marcy Gulch): Selenium assessment.

Determination of attainment of the chronic and acute selenium standards will be based on the 85th and 95th percentile, respectively, of paired samples taken the same day from from the two following locations:

- L29: Marcy Gulch upstream of Santa Fe Drive, immediately upstream of the Centennial Water & Sanitation District WWTF
- L36: Marcy Gulch upstream of the confluence with the South Platte River.

(h) Upper South Platte Segment 16j: Selenium assessment.

Determination of attainment of the chronic and acute selenium standards will be based on the 85th and 95th percentile, respectively. The selenium assessment locations are:

- Lee Gulch: Upstream of the confluence with the South Platte River
- Little's Creek: Upstream of the confluence with the South Platte River
- Big Dry Creek: Upstream of the confluence with the South Platte River
- Little Dry Creek: Upstream of the confluence with the South Platte River