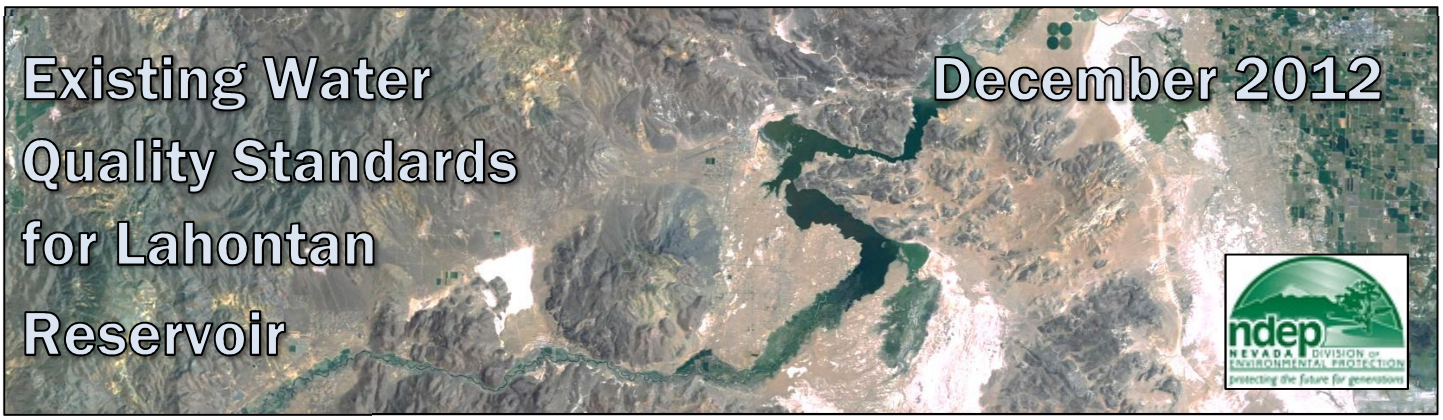

INTRODUCTION

Both Nevada law and the federal Clean Water Act require the establishment of water quality standards. Water quality standards are comprised of three components: beneficial uses, water quality criteria, and antidegradation considerations. Beneficial uses are those uses that are either existing or are desirable to protect as potential uses. Once the beneficial uses have been assigned for a waterbody, numeric water quality criteria are established at levels needed to protect these uses. The antidegradation component is designed to maintain water quality that is better than the beneficial use water quality criteria.

BACKGROUND

Water quality standards for the Lahontan Reservoir first appeared in the Nevada regulations in 1967. These regulations did not provide any description of beneficial uses to be protected, but did provide numeric criteria for a limited suite of parameters. Over time, these regulations have gone through a number of revisions incorporating beneficial uses and improved numeric criteria for an expanded suite of constituents. The last major review and revision of the Lahontan Reservoir standards occurred in 1984, nearly 30 years ago.

BENEFICIAL USES

The beneficial uses that have been assigned to the Lahontan Reservoir include (Nevada Administrative Code (NAC) 445A.1792):

- Livestock watering
- Irrigation
- Aquatic life
- Contact recreation
- Noncontact recreation
- Municipal or domestic supply
- Industrial use
- Wildlife

BENEFICIAL USE WATER QUALITY CRITERIA FOR ROUTINE PARAMETERS

Beneficial use criteria for Lahontan Reservoir have been set for a variety of parameters (Table 1). Currently, Lahontan Reservoir is not separately identified in the NAC, but is included in the Carson River reach extending from U.S. Highway 95 (Alt.) to Lahontan Dam.

Table 1. Existing Standards for Carson River from U.S. Highway 95 (Alt.) to Lahontan Dam (NAC 445A.1824)

Parameter	Criteria to Protect Beneficial Uses	Most Restrictive Beneficial Use
Temperature - °C	S.V. Nov-Mar $\leq$ 11 S.V. Apr-Jun < 24 S.V. Jul-Oct < 28 $\Delta T \leq 2$	Aquatic life
pH	S.V. 6.5 – 9.0 $\Delta pH \pm 0.5$	Aquatic life, Wildlife
Total Phosphates (as P) – mg/l	S.V. $\leq$ 0.06	Aquatic life, Contact recreation
Nitrate (as N) – mg/l	S.V. $\leq$ 10	Municipal or domestic supply
Nitrite (as N) – mg/l	S.V. $\leq$ 1.0	Aquatic life
Dissolved Oxygen – mg/l	S.V. $\geq$ 5.0	Aquatic life
Total Ammonia (as N) – mg/l	Varies depending upon temperature and pH	Aquatic life
Suspended Solids – mg/l	S.V. $\leq$ 25	Aquatic life
Turbidity - NTU	S.V. $\leq$ 50	Aquatic life
Color - PCU	S.V. $\leq$ 75	Municipal or domestic supply
Total Dissolved Solids – mg/l	S.V. $\leq$ 500	Municipal or domestic supply
Chlorides – mg/l	S.V. $\leq$ 250	Municipal or domestic supply
Sulfate – mg/l	S.V. $\leq$ 250	Municipal or domestic supply
Sodium Adsorption Ratio (SAR)	A.Avg. $\leq$ 8	Irrigation
Alkalinity (as $CaCO_3$) – mg/l	< 25% change from natural conditions	Aquatic life
E coli – No./100 ml	A.G.M. $\leq$ 126 S.V. $\leq$ 235	Contact recreation
Fecal Coliform – No./100 ml **(SEE Note 1)**	G.M. $\leq$ 200 (minimum of 5 samples over 30-day period) S.V. < 10% of samples < 400 (over 30-day period)	Contact recreation

Note 1: NDEP is in the process of revising the fecal coliform standard to 1,000 as a single value, with the most restrictive beneficial uses being wildlife, livestock watering and irrigation.

Note 2: Aquatic life species of concern include walleye, channel catfish and white bass.

ANTIDEGRADATION CRITERIA

A requirement to maintain existing higher quality or RMHQ may be established when the monitoring data show that existing water quality for individual parameters is significantly better than the beneficial use standard. RMHQs have been set for the Carson River at Lahontan Dam for routine parameters such as nitrogen, turbidity, chlorides, etc. Table 2 summarizes the RMHQs that have been established for the lower Carson River waters.

Table 2. Antidegradation Criteria (RMHQs) for Carson River at Lahontan Dam

Parameter	Highway 95 to Lahontan Dam
Temperature - °C	$\Delta T < 0$
Total Nitrogen (as N) – mg/l	S.V. $\leq$ 1.7 A.A. $\leq$ 1.3
Turbidity - NTU	S.V. $\leq$ 27 A.A. $\leq$ 15
Color - PCU	Increase in color must not be more than 10 PCU above natural conditions
Total Dissolved Solids – mg/l	S.V. $\leq$ 225 A.A. $\leq$ 175
Chlorides – mg/l	S.V. $\leq$ 15 A.A. $\leq$ 9
Sulfates – mg/l	S.V. $\leq$ 50 A.A. $\leq$ 35
Sodium Adsorption Ratio (SAR)	A.A. $\leq$ 2
Fecal Coliform – No./100 ml	A.G.M. $\leq$ 25 S.V. $\leq$ 75

BENEFICIAL USE WATER QUALITY CRITERIA FOR TOXIC PARAMETERS

In addition to the criteria in Tables 1 and 2, standards for toxic materials have been assigned to the all designated waters in Nevada, including Lahontan Reservoir (NAC 445A.1236). Table 3 summarizes the toxic material criteria assigned to four of the beneficial uses: 1) municipal or domestic supply; 2) aquatic life; 3) irrigation; and 4) watering of livestock. **Note that NDEP is in the process of revising this table to include more recent EPA recommendations for aquatic life.**

Table 3. Toxics Criteria for Lahontan Reservoir

Chemical	Municipal or Domestic Supply[1] (µg/l)	Aquatic Life[1,2] (µg/l)	Irrigation[1] (µg/l)	Watering of Livestock[1] (µg/l)
INORGANIC CHEMICALS[3]				
Antimony	146[a]	-	-	-
Arsenic	50[b]	-	100[c]	200[d]
1-hour average	-	340[g,h]	-	-
96-hour average	-	150[g,h]	-	-
Barium	2,000[b]	-	-	-
Beryllium	0[a]	-	100[c]	-
Boron	-	-	750[a]	5,000[d]
Cadmium	5[b]	-	10[d]	50[d]
1-hour average	-	(1.136672-{ln(hardness)(0.041838)})* e (1.0166{ln(hardness)} - 3.924) g,h	-	-
96-hour average	-	(1.101672-{ln(hardness)(0.041838)})* e (0.7409{ln(hardness)} - 4.719) g,h	-	-
Chromium (total)	100[b]	-	100[d]	1,000[d]
Chromium (VI)	-	-	-	-
1-hour average	-	16[g,h]	-	-
96-hour average	-	11[g,h]	-	-
Chromium (III)	-	-	-	-
1-hour average	-	(0.316) * e (0.8190{ln(hardness)} + 3.7256) g,h	-	-
96-hour average	-	(0.860) * e (0.8190{ln(hardness)} + 0.6848) g,h	-	-
Copper	-	-	200[d]	500[d]
1-hour average	-	(0.960) * e (0.9422{ln(hardness)} - 1.700) g,h	-	-
96-hour average	-	(0.960) * e (0.8545{ln(hardness)} - 1.702) g,h	-	-
Cyanide	200[a]	-	-	-
1-hour average	-	22[h]	-	-
96-hour average	-	5.2[h]	-	-
Fluoride	-	-	1,000[d]	2,000[d]
Iron			5,000[d]	
96-hour average	-	1,000[h]		-
Lead	50[a,b]	-	5,000[d]	100[d]
1-hour average	-	(1.46203-{ln(hardness)(0.145712)})* e (1.273{ln(hardness)} - 1.460) g,h	-	-
96-hour average	-	(1.46203-{ln(hardness)(0.145712)})* e (1.273{ln(hardness)} - 4.705) g,h	-	-
Manganese	-	-	200[d]	-
Mercury	2[b]	-	-	10[d]
1-hour average	-	1.4[g,h]	-	-
96-hour average	-	0.77[g,h]	-	-
Molybdenum	-		-	-
1-hour average	-	6,160[e]	-	-
96-hour average	-	1,650[e]	-	-
Nickel	13.4[a]	-	200[d]	-
1-hour average	-	(0.998) * e (0.8460{ln(hardness)} + 2.255) g,h	-	-

Chemical	Municipal or Domestic Supply[1] (µg/l)	Aquatic Life[1,2] (µg/l)	Irrigation[1] (µg/l)	Watering of Livestock[1] (µg/l)
96-hour average	-	(0.997) * e $^{(0.8460\{\ln(\text{hardness})\} + 0.0584)}$ g,h	-	-
Selenium	50[b]	-	20[d]	50[d]
1-hour average	-	20[a]	-	-
96-hour average	-	5.0[h]	-	-
Silver				
1-hour average	-	(0.85) * e $^{(1.72\{\ln(\text{hardness})\} - 6.59)}$ g,h	-	-
Sulfide (undissociated hydrogen sulfide)				
96-hour average	-	2.0[h]	-	-
Thallium	13[a]	-	-	-
Zinc	-	-	2,000[d]	25,000[d]
1-hour average	-	(0.978) * e $^{(0.8473\{\ln(\text{hardness})\} + 0.884)}$ g,h	-	-
96-hour average	-	(0.986) * e $^{(0.8473\{\ln(\text{hardness})\} + 0.884)}$ g,h	-	-
ORGANIC CHEMICALS				
Acrolein	320[a]	-	-	-
Aldrin	0[a]	3[a]	-	-
Chlordane	0[a]	2.4[a]	-	-
24-hour average	-	0.0043[a]	-	-
2,4-D	100[a,b]	-	-	-
DDT & metabolites	0[a]	1.1[a]	-	-
24-hour average	-	0.0010[a]	-	-
Demeton	-	0.1[a]	-	-
Dieldrin	0[a]	2.5[a]	-	-
24-hour average	-	0.0019[a]	-	-
Endosulfan	75[a]	0.22[a]	-	-
24-hour average	-	0.056[a]	-	-
Endrin	0.2[b]	0.18[a]	-	-
24-hour average	-	0.0023[a]	-	-
Guthion	-	0.01[a]	-	-
Heptachlor	-	0.52[a]	-	-
24-hour average	-	0.0038[a]	-	-
Lindane	4[b]	2.0[a]	-	-
24-hour average	-	0.080[a]	-	-
Malathion	-	0.1[a]	-	-
Methoxychlor	100[a,b]	0.03[a]	-	-
Mirex	0[a]	0.001[a]	-	-
Parathion	-	-	-	-
1-hour average	-	0.065[a]	-	-
96-hour average	-	0.013[a]	-	-
Silvex (2,4,5-TP)	10[a,b]	-	-	-
Toxaphene	5[b]	-	-	-
1-hour average	-	0.73[a]	-	-
96-hour average	-	0.0002[a]	-	-
Benzene	5[b]	-	-	-
Monochlorobenzene	488[a]	-	-	-
m-dichlorobenzene	400[a]	-	-	-
o-dichlorobenzene	400[a]	-	-	-
p-dichlorobenzene	75[b]	-	-	-
Ethylbenzene	1,400[a]	-	-	-
Nitrobenzene	19,800[a]	-	-	-
1,2-dichloroethane	5[b]	-	-	-
1,1,1-trichloroethane (TCA)	200[b]	-	-	-
Bis (2-chloroisopropyl) ether	34.7[a]	-	-	-

Chemical	Municipal or Domestic Supply[(1)] (µg/l)	Aquatic Life[(1,2)] (µg/l)	Irrigation[(1)] (µg/l)	Watering of Livestock[(1)] (µg/l)
Chloroethylene	2[b]	-	-	-
(vinyl chloride)				
1,1-dichloroethylene	7[b]	-	-	-
Trichloroethylene (TCE)	5[b]	-	-	-
Hexachlorocyclopentadiene	206[a]	-	-	-
Isophorone	5,200[a]	-	-	-
Trihalomethanes (total)[f]	100[b]	-	-	-
Tetrachloromethane	5[b]	-	-	-
(carbon tetrachloride)				
Phenol	3,500[a]	-	-	-
2,4-dichlorophenol	3,090[a]	-	-	-
Pentachlorophenol	1,010[a]	-	-	-
1-hour average	-	exp{1.005 (pH)-4.830}[a]	-	-
96-hour average	-	exp{1.005 (pH)-5.290}[a]	-	-
Dinitrophenols	70[a]	-	-	-
4,6-dinitro-2-methylphenol	13.4[a]	-	-	-
Dibutyl phthalate	34,000[a]	-	-	-
Diethyl phthalate	350,000[a]	-	-	-
Dimethyl phthalate	313,000[a]	-	-	-
Di-2-ethylhexyl phthalate	15,000[a]	-	-	-
Polychlorinated biphenyls				
(PCBs)	0[a]	-	-	-
24-hour average	-	0.014[a]	-	-
Fluoranthene	42[a]	-	-	-
(polynuclear aromatic				
hydrocarbon)				
Dichloropropenes	87[a]	-	-	-
Toluene	14,300[a]	-	-	-

Footnotes:
(1) Single concentration limits and 24-hour average concentration limits must not be exceeded. One-hour average and 96-hour average concentration limits may be exceeded only once every 3 years. See reference a.
(2) Aquatic life standards apply to surface waters only; "hardness" is expressed as mg/L $CaCO_3$; and "e" refers to the base of the natural logarithm whose value is 2.718.
(3) The standards for metals are expressed as total recoverable, unless otherwise noted.

References:

a. U.S. Environmental Protection Agency, Pub. No. EPA 440/5-86-001, *Quality Criteria for Water* (Gold Book) (1986).
b. Federal Maximum Contaminant Level (MCL), 40 C.F.R. §§ 141.11, 141.61 and 141.62 (1992).
c. U.S. Environmental Protection Agency, Pub. No. EPA 440/9-76-023, *Quality Criteria for Water* (Red Book) (1976).
d. National Academy of Sciences, *Water Quality Criteria* (Blue Book) (1972).
e. Nevada Division of Environmental Protection, *Aquatic Life Water Quality Criteria for Molybdenum*, Tetra Tech, Inc., (June 2008).
f. The criteria for trihalomethanes (total) is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform). See reference b.
g. This standard applies to the dissolved fraction.
h. U.S. Environmental Protection Agency, *National Recommended Water Quality Criteria*, May 2005.