

CHAPTER 8  
QUALITY STANDARDS FOR WYOMING GROUNDWATERS

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**CHAPTER 8**

**QUALITY STANDARDS FOR WYOMING GROUNDWATERS**

5  
6  
**Section 1. Authority.**

7 These regulations are promulgated pursuant to Sections 35-11-101 through 1104 of the Wyoming  
8 Statutes, specifically Section 35-11-302, and no person shall cause, threaten or allow violation of  
9 any water quality standard or provision contained herein.

10  
11  
12  
**Section 2. Definitions.**

13 The following definitions supplement those definitions contained in Section 35-11-103 of the  
14 Wyoming Environmental Quality Act.

15  
16 (a) "Aquifer" means a zone, stratum or group of strata that can store and transmit  
17 water in sufficient quantities for a specific use.

18  
19 (b) "Background" means the constituents or parameters and the concentrations or  
20 measurements which describe water quality and water quality variability prior to a subsurface  
21 discharge.

22  
23 (c) "Below-Surface Receiver (Receiver)" means any zone, interval, formation or  
24 unit in the subsurface which can accept water or fluid from other sources.

25  
26 (d) "Domestic Water" means a water which is suitable for uses, including but not  
27 limited to, drinking, gardening and other household uses, municipal uses and farmstead uses,  
28 including water used in the washing or hydro-cooling of farm products destined for human  
29 consumption on the farm, for sale on the fresh food market or for delivery to a processing plant  
30 for canning, freezing or other type of preparation prior to marketing. Classification of Domestic  
31 water does not mean that it meets the national drinking water standards.

32  
33 (e) "Fluid" means any material which flows or moves whether semisolid liquid,  
34 sludge, gas or any other form or state.

35  
36 (f) "Groundwater" means subsurface water that fills available openings in rock or  
37 soil materials such that they may be considered water saturated under hydrostatic pressure.

38  
39 (g) "Groundwaters of the State" are all bodies of underground water which are  
40 wholly or partially within the boundaries of the State; Groundwaters of the State is synonymous  
41 with Groundwaters of Wyoming.

42  
43 (h) "Hazardous Material (Substance)" means any matter of any description  
44 including petroleum related products and radioactive material (substance) which, when

45 discharged into any waters of the State presents an imminent and substantial hazard to public  
46 health or welfare and shall include all materials (substances) so designated by the U.S.  
47 Environmental Protection Agency in the Federal Register for March 13, 1978 (Part III), Water  
48 Programs, Hazardous Substances.

49  
50 (i) "Milliequivalents Per Liter", abbreviated meq/L, used to report the Residual  
51 Sodium Carbonate concentration in water used for irrigation, is defined as 0.001 of the equivalent  
52 weight of the ion per liter volume.

53  
54 (j) "Milligrams Per Liter", abbreviated mg/L, means milligrams of solute per liter of  
55 solution -- equivalent to parts per million assuming unit density of water.

56  
57 (k) "Parameter" means one of a set of physical or chemical properties whose  
58 measured values determine the characteristics of a fluid.

59  
60 (l) "pH" is a term to express the intensity of the acid or basic condition. A pH value  
61 of 7.0 at 25 degrees C is neutral, with pH's of less than 7.0 progressively more acid and pH's of  
62 greater than 7.0 progressively more basic.

63  
64 (m) "Picocuries Per Liter", abbreviated pCi/L, is a measure of radioactivity of waters  
65 or fluids. A picocurie is equal to 10<sup>-12</sup> curie; a curie is defined as 3.7 x 10<sup>10</sup> disintegrations per  
66 second.

67  
68 (n) "Residual Sodium Carbonate", abbreviated RSC, is defined as twice the  
69 concentration of carbonate or bicarbonate a water would contain after subtracting an amount  
70 equivalent to the calcium plus the magnesium, and is a measure of potential hazard which exists  
71 when waters high in carbonate and bicarbonate and relatively low in calcium and magnesium are  
72 used for irrigation.

73  
74 (o) "Sodium Adsorption Ratio", abbreviated SAR, of a water is defined by the  
75 U.S. Department of Agriculture Laboratory (1954) as: where ion concentrations are expressed in  
76 milliequivalents per liter. The SAR predicts reasonably well the degree to which irrigation water  
77 tends to enter into cation-exchange reactions in soil.

78  
79 (p) "Standard Unit", abbreviated s.u., is the unit of measurement used to describe the  
80 numerical pH of a solution, fluid or pollutant.

81  
82 (q) "Subsurface Discharge" means a discharge to a below-surface receiver.

83  
84 (r) "Total Dissolved Solids", abbreviated TDS, is the sum of the dissolved mineral  
85 constituents in water, expressed as mg/L.

86  
87 (s) "Toxic Materials (Substances)" are those materials (substances) or combinations  
88 of materials (substances), including disease causing agents, which, after discharge and upon  
89 exposure, ingestion, inhalation or assimilation into any environmentally significant organism,  
90 either directly from the environment or indirectly by ingestion through food chains, may cause

91 death, disease, behavioral abnormalities, cancer, genetic malfunctions, physiological  
92 malfunctions (including malfunctions in reproduction of offspring) or physical deformations in  
93 such organisms or their offspring; and includes all materials (substances) so designated as toxic  
94 by the U.S. Environmental Protection Agency in the Federal Register for December 24, 1975  
95 (Part IV), Water Programs, National Interim Primary Drinking Water Regulations.

96  
97 (t) "Underground Water" means subsurface water, which is any body of water  
98 under the surface of the earth, including water in the vadose zone and groundwater.

99  
100 (u) "Vadose Zone" means the unsaturated zone in the earth, between the land  
101 surface and the top of the first saturated aquifer which is not a perched water aquifer. The vadose  
102 zone characteristically contains liquid water under less than atmospheric pressure, and water  
103 vapor and air or other gases at atmospheric pressure. Perched water bodies exist within the vadose  
104 zone.

105  
106 (v) "Virtually Free" means a concentration less than the concentration which is the  
107 lower limit of detection.

108  
109 **Section 3. Underground Water Protected.**

110  
111 (a) All waters, including groundwaters of the State, within the boundaries of the  
112 State of Wyoming are the property of the State; and control of the beneficial use of waters of the  
113 State resides with the Wyoming State Engineer.

114  
115 (b) Nothing herein contained shall be construed so as to interfere with the right of  
116 any person to use water from any underground water source for any purpose identified in W.S.  
117 35-11-102 and 35-11-103(c)(i); or to limit or interfere with the jurisdiction, duties or authorities  
118 of other Wyoming State agencies or officials.

119  
120 (c) Protection shall be afforded all underground water bodies (including water in the  
121 vadose zone). Water being used for a purpose identified in W.S. 35-11-102 and 103(c)(i) shall be  
122 protected for its intended use and uses for which it is suitable. Water not being put to use shall be  
123 protected for all uses for which it is suitable.

124  
125 **Section 4. Quality Standards Prescribed; Groundwaters of the State Classified.**

126  
127 (a) Standards are prescribed to protect the natural quality of underground water:

128  
129 (i) Receiving pollution or wastes directly from a subsurface discharge or by  
130 migrating water or fluid of a discharge;

131  
132 (ii) Invaded by underground water of inferior quality as a result of well or  
133 exploration hole drilling or completion practices;

135 (iii) From pollution which may result from above-ground facilities capable of  
136 causing or contributing to pollution;

137

138 (iv) From pollution which may result from surface mining operations.

139

140 (b) Groundwaters of the State are classified in order to apply standards to protect  
141 water quality. Groundwaters of the State are classified by use, and by ambient water quality.

142

143 (c) Waters which are known sources of supply and appropriated for uses identified in  
144 W.S. 35-11-102 and 103(c)(i) are classified herein as: Domestic water; Water for fish and aquatic  
145 life; Water for agriculture; Water for livestock; and, Water for industry. A discharge or activity  
146 that impacts an underground source of water for existing uses identified in W.S. 35-11-102 and  
147 103(c)(i) shall not make the affected water unsuitable for its intended use or uses, at any place or  
148 places of withdrawal or natural flow to the surface.

149

150 (d) Unappropriated waters are classified by ambient water quality.

151

152 (i) Class I Groundwater of the State - This water is suitable for domestic  
153 use. The ambient quality of underground water of this suitability does not have a concentration in  
154 excess of any of the standards for Class I Groundwater of the State (see Table I, page 9).

155

156 (ii) Class II Groundwater of the State - This water is suitable for agricultural  
157 use where soil conditions and other factors are adequate. The ambient quality of underground  
158 water of this suitability does not have a concentration in excess of any of the standards for Class  
159 II Groundwater of the State (see Table I, page 9).

160

161 (iii) Class III Groundwater of the State - This water is suitable for livestock.  
162 The ambient quality of underground water of this suitability does not have a concentration in  
163 excess of any of the standards for Class III Groundwater of the State (see Table I, page 9).

164

165 (iv) Class Special (A) Groundwater of the State -This water is suitable for  
166 fish and aquatic life. The ambient quality of underground water of this suitability does not have a  
167 concentration in excess of any of the standards for Class Special (A) Groundwater of the State  
168 (see Table I, page 10).

169

170 (v) Underground water of Class I, II, III or Special

171

172 (A) shall not contain biological, hazardous, toxic or potentially toxic  
173 materials or substances in concentrations or amounts which exceed maximum allowable  
174 concentrations based upon information of the EPA in the Federal Register for December 24, 1975  
175 (Part IV), Water Programs, National Interim Primary Drinking Water Regulations; and in the  
176 Federal Register for March 13, 1978 (Part II), Water Programs, Hazardous Substances. In  
177 addition, underground water of Class I, II, III or Special (A) shall not contain any biological,  
178 hazardous, toxic or potentially toxic materials or substances in concentrations or amounts which,  
179 based upon the latest available scientific information and as determined by the Administrator, will

180 impair this water for its use suitability or which may contribute to a condition in contravention of  
181 groundwater quality standards or to any toxic or hazardous effect on natural biota.

182

183 (vi) A discharge into an aquifer containing Class I, II, III or Special

184

185 (A) Groundwater of the State shall not result in variations in the  
186 range of any parameter, or concentrations of constituents in excess of the standards of these  
187 regulations at any place or places of withdrawal or natural flow to the surface. A discharge which  
188 results in concentrations in excess of standards shall be permitted if post-discharge water quality  
189 can be returned to a quality of use equal to, or better than, and consistent with the uses for which  
190 the water was suitable prior to the operation.

191

192 (vii) Class IV Groundwater of the State - This water is suitable for industry.  
193 The quality requirements for industrial water supplies range widely and almost every industrial  
194 application has its own standards.

195

196 (A) Class IV (A) Groundwater of the State has a total dissolved  
197 solids concentration not in excess of 10,000 mg/L.

198

199 (B) Class IV (B) Groundwater of the State has a total dissolved  
200 solids concentration in excess of 10,000 mg/L.

201

202 (C) A discharge into an aquifer containing Class IV (A) or  
203 IV (B) Groundwater of the State shall not result in the water being unfit for its intended use.

204

205 (D) A discharge into an aquifer with Class IV (A) or IV (B)  
206 Groundwater of the State shall not result in oil and grease concentrations in excess of 10 mg/L or  
207 a lesser amount if a concentration in excess of the lesser amount is determined to be toxic; or oil  
208 and grease in excess of background concentrations of the underground water, whichever is  
209 greater, at any place or places of withdrawal or natural flow to the surface.

210

211 (E) A discharge into an aquifer with Class IV (A) or IV (B)  
212 Groundwater of the State shall not result in radioactivity concentrations or amounts which exceed  
213 the standards for Class I through III and Special (A) Groundwaters of the State; or in  
214 concentrations or amounts which exceed background concentrations of the underground water,  
215 whichever is greater, at any place or places of withdrawal or natural flow to the surface.

216

217 (F) A discharge into an aquifer with Class IV (A) or IV (B)  
218 Groundwater of the State shall not result in biological, hazardous, toxic or potentially toxic  
219 materials or substances including pesticides, insecticides or herbicides in concentrations or  
220 amounts which exceed maximum allowable concentrations, based upon information of the EPA  
221 in the Federal Register for December 24, 1975 (Part IV), Water Programs, National Interim  
222 Primary Drinking Water Regulations, and in the Federal Register for March 13, 1978 (Part II),  
223 Water Programs, Hazardous Substances; or which exceed background concentrations of the  
224 underground water, whichever is greater, at any place or places of withdrawal or natural flow to  
225 the surface.

226 In addition, a discharge shall not result in any biological, hazardous, toxic or potentially  
227 toxic materials or substances, in concentrations or amounts which, based on the latest available  
228 scientific information and as determined by the Administrator, will impair the quality of ambient  
229 groundwaters of the State of this Class; or which may contribute to a condition in contravention  
230 of groundwater quality standards or cause, allow or permit any deleterious effect on natural biota.

231  
232 (viii) Groundwater of the State found closely associated with commercial  
233 deposits of hydrocarbons and/or other minerals, or which is considered a geothermal resource, is  
234 Class V (Hydrocarbon Commercial), Class V (Mineral Commercial) or Class V (Geothermal)  
235 Groundwater of the State.

236  
237 (A) A discharge into a Class V (Hydrocarbon Commercial)  
238 Groundwater of the State shall be for the purpose of the production of oil and gas and shall not  
239 result in the degradation or pollution or waste of other water resources.

240  
241 (B) A discharge into a Class V (Mineral Commercial)  
242 Groundwater of the State shall be for the purpose of mineral production and shall not result in the  
243 degradation or pollution of the associated or other groundwater and, at a minimum, be returned to  
244 a condition and quality consistent with the pre-discharge use suitability of the water.

245  
246 (C) A discharge into a Class V (Geothermal) Groundwater of the  
247 State shall be for the purpose of the production of geothermal resources and shall not result in the  
248 degradation or pollution or waste of other water resources.

249  
250 (ix) Class VI Groundwater of the State may be unusable or unsuitable for  
251 use:

252  
253 (A) Due to excessive concentration of total dissolved solids or  
254 specific constituents; or

255  
256 (B) Is so contaminated that it would be economically or  
257 technologically impractical to make the water useable; or

258  
259 (C) Is located in such a way, including depth below the surface, so as  
260 to make use economically and technologically impractical.

261

262 **Section 5. Classification for Groundwater of the State Affected by a Discharge;**  
263 **Classification by Aquifer and Area.**

264  
265 (a) Classification of groundwaters of the State shall be based on the water quality  
266 standards of this chapter; excepting, a Class I Groundwater of the State shall be classified by  
267 ambient water quality and the technical practicability and economic reasonableness of treating  
268 ambient water quality to meet use suitability standards.

269

- 270 (b) Underground water quality shall be classified for an aquifer which is or may be  
271 affected by a subsurface discharge or other activity identified in Section 4.a. of these regulations.  
272
- 273 (c) Classification shall be made:  
274
- 275 (i) Whenever there is pollution or the threat of pollution to a groundwater of  
276 the State; or  
277
- 278 (ii) The physical, chemical, radiological or biological properties of any  
279 groundwater of the State are or may be altered by man's action.
- 280 (d) Classification shall be for a water in a specified locally defined area by named  
281 and described aquifer or receiver. Any aquifer or receiver in its regional setting  
282 may have one or more classifications by defined area or areas.  
283
- 284 (i) The name shall be a recognized geologic name whenever possible;  
285
- 286 (ii) The description shall include a lithologic description.  
287
- 288 (e) The lateral and vertical limits of an aquifer or receiver, for purposes of  
289 classification, shall be based on existing water use, ambient water quality and geologic and  
290 hydrologic characteristics of the aquifer or of the receiver.  
291
- 292 (f) An underground water may be reclassified if new or additional data warrant  
293 reclassification.



TABLE I

UNDERGROUND WATER CLASS Use Suitability Constituent or Parameter	I Domestic* <u>Concentration**</u>	II Agriculture <u>Concent.**</u>	III Livestock <u>Concent.**</u>
Aluminum (Al)	---	5.0	5.0
Ammonia (NH <sub>3</sub> -N)	0.5 <sup>7</sup>	---	---
Arsenic (AS)	0.05	0.1	0.2
Barium (Ba)	2.0	---	---
Beryllium (Be)	---	0.1	---
Boron (B)	0.75	0.75	5.0
Cadmium (Cd)	.005	0.01	0.05
Chloride (Cl)	250.0	100.0	2000.0
Chromium (Cr)	.10	0.1	0.05
Cobalt (Co)	---	0.05	1.0
Copper (Cu)	1.0	0.2	0.5
Cyanide (CN)	0.2	---	---
Fluoride (F)	4.0	---	---
Hydrogen Sulfide(H <sub>2</sub> S)	0.05	---	---
Iron (Fe)	0.3	5.0	---
Lead (Pb)	.015	5.0	0.1
Lithium (Li)	---	2.5	---
Manganese (Mn)	0.05	0.2	---
Mercury (Hg)	0.002	---	0.0005
Nickel (Ni)	---	0.2	---
Nitrate (NO <sub>3</sub> -N)	10.0	---	---
Nitrite (NO <sub>2</sub> -N)	1.0	---	10.0
(NO <sub>3</sub> +NO <sub>2</sub> )-N	---	---	100.0
Oil & Grease	Virtually Free	10.0	10.0
Phenol	0.001	---	---
Selenium (Se)	.05	0.02	0.05
Silver (Ag)	.10	---	---
Sulfate (SO <sub>4</sub> )	250.0	200.0	3000.0
Total Dissolved Solids (TDS)	500.0	2000.0	5000.0
Vanadium (V)	---	0.1	0.1
Zinc (Zn)	5.0	2.0	25.0
pH	6.5-8.5	4.5-9.0s.u.	6.5-8.5s.u
SAR	---	8	---
RSC	---	1.25 meq/L	---
Combined Total Radium 226 and Radium 228 <sup>8</sup>	5pCi/L	5pCi/L	5pCi/L
Total Strontium 90	8pCi/L	8pCi/L	8pCi/L
Gross alpha particle radioactivity (including Radium 226 but excluding Radon and Uranium <sup>8</sup>	15pCi/L	15pCi/L	15pCi/L

\* This list does not include all constituents in the national drinking water standards.

\*\* mg/L, unless other wise indicated



TABLE I

UNDERGROUND WATER CLASS <u>Use Suitability Constituent or Parameter</u>	Special (A) Fish/Aquatic Life <u>Concentration*</u>
Aluminum (Al)	0.1
Ammonia (NH <sub>3</sub> )	0.021
Arsenic (As)	0.05
Barium (Ba)	5.0
Beryllium (Be)	0.011-1.3 <sup>3</sup>
Boron (B)	---
Cadmium(Cd)	0.0004-0.015 <sup>3</sup>
Chloride (Cl)	---
Chromium (Cr)	0.05
Cobalt (Co)	---
Copper (Cu)	0.01-0.04 <sup>3</sup>
Cyanide (CN)	0.005
Fluoride (F)	---
Hydrogen Sulfide (H <sub>2</sub> S)	0.0022
Iron (Fe)	0.5
Lead (Pb)	0.004-0.15 <sup>3</sup>
Lithium (Li)	---
Manganese (Mn)	1.0
Mercury (Hg)	0.00005
Nickel (Ni)	0.05-0.4 <sup>3</sup>
Nitrate (NO <sub>3</sub> -N)	---
Nitrite (NO <sub>2</sub> -N)	---
(NO <sub>3</sub> +NO <sub>2</sub> -N)	---
Oil & Grease	Virtually free
Phenol	0.001
Selenium(Se)	0.05
Silver(Ag)	0.0001-0.00025 <sup>3</sup>
Sulfate (SO <sub>4</sub> )	---
TotalDissolvedSolids(TDS)	500.0 <sup>4</sup> -1000.0 <sup>5</sup> -2000.0 <sup>6</sup>
Uranium (U)	0.03-1.4 <sup>3</sup>
Vanadium (V)	---
Zinc (Zn)	0.05-0.6 <sup>3</sup>
pH	6.5s.u.-9.0s.u.
Combined Total	
Radium 226 and	
Radium 228 <sup>8</sup>	5pCi/L
Total Strontium 90	8pCi/L
Gross alpha particle	
radioactivity (including	
Radium 226 but excluding	
Radon and Uranium <sup>8</sup>	15pCi/L

\*mg/L, unless other wise indicated

## TABLE I

Explanation for Superscripts Used in Table I

<sup>1</sup>Unionized ammonia: When ammonia dissolves in water, some of the ammonia reacts with water to form ammonium ions. A chemical equilibrium is established which contains unionized ammonia (NH<sub>3</sub>), ionized ammonia (NH<sub>4</sub><sup>+</sup>) and hydroxide ions (OH<sup>-</sup>). The toxicity of aqueous solutions of ammonia is attributed to NH<sub>3</sub>; therefore, the standard is for unionized ammonia. (Note: 0.02 mg/L NH<sub>3</sub> is equivalent to 0.016 NH<sub>3</sub> as N.)

<sup>2</sup>Undissociated H<sub>2</sub>S: The toxicity of sulfides derives primarily from H<sub>2</sub>S, rather than from the dissociated (HS) or (S) ions; therefore, the standard is for the toxic undissociated H<sub>2</sub>S.

<sup>3</sup>Dependent on hardness: The toxicity of metals in natural waters varies with the hardness of the water; generally, the limiting concentration is higher in hard water than in soft water.

<sup>4</sup>Egg hatching

<sup>5</sup>Fish rearing

<sup>6</sup>Fish and aquatic life

<sup>7</sup>Total ammonia nitrogen

<sup>8</sup>Requirements and procedures for the measurement and analysis of gross alpha particle activity, Radium 226 and Radium 228 shall be the same as requirements and procedures of the U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations, EPA-570/9-76-003, effective June 24, 1977.

**Section 6. Standards for the Underground Management of Hazardous or Toxic Wastes.**

The underground management of wastes includes the temporary storage and the ultimate disposal of all hazardous or toxic wastes in below-surface receivers. The following standards apply to any underground storage or disposal of hazardous or toxic wastes.

- (a) The below-surface receiver:
  - (i) Is an extensive sedimentary rock stratum or strata free of complex faulting and folding and distant from any underground water recharge area;
  - (ii) Is adequately separated from aquifers both above and below;
  - (iii) Has normal or low formation pressure and is capable of accepting the discharge without necessitating excessive discharge or injection pressure;
  - (iv) Has slow movement of ambient formation fluid under the natural horizontal gradient and is not in an area of underground water discharge for the receiver;
  - (v) Is located areally and stratigraphically so that an escape of waste to useable water resources would not be anticipated due to:
    - (A) Seismic risk;
    - (B) Abandoned holes; or
    - (C) Mineral exploration or other drilling, or mineral development.
- (b) The underground water in the receiver;
  - (i) Is not an economically available source of water or is unusable;
  - (ii) Is confined by strata overlying and underlying the receiver; and
  - (iii) Is classified as class VI groundwater by this chapter.
- (c) The discharge or waste:
  - (i) Will not create or result in a hazard to health or impair existing rights, and is not prohibited from subsurface disposal by Federal or State law or regulation;
  - (ii) Will not degrade or decrease the availability of mineral resources, including oil and gas;

- (iii) Is compatible with the receiver and ambient water; and
- (iv) Can be controlled at all times.

**Section 7. Testing Procedures.**

(a) For determination of the parameters involved in the standards, analysis will be in accord with test procedures as defined pursuant to: Title 40, Code of Federal Regulations, Part 136, or any modifications thereto. For test procedures not listed in the Code of Federal Regulations, test procedures outlined in EPA Methods for Chemical Analysis of Water and Wastes (March, 1979); or Standard Methods for the Examination of Water and Wastewaters (1975); or, A.S.T.M. Standards, Part 31 (1979), Water shall be used.

(b) The analytical technique for total uranium (as U) shall be the fluorometric method as referenced in Methods for Determination of Radioactive Substances in Water and Fluvial Sediments, Techniques of Water - Resource Investigations of the U.S. Geological Survey, Book 5, Chapter A-5 (1977).

(c) Where standard methods of testing have not been established, the suitability of testing procedures shall be determined by the Department.

**Section 8. Limit of Detection.**

Where the standard is below the lower limit of detection given in EPA Methods for Chemical Analysis of Water and Wastes (March, 1979), or Standard Methods for the Examination of Water and Wastewaters (1975), or, A.S.T.M. Standards, Part 31 (1979), Water, the standard shall be the lower limit of detection, unless otherwise provided by the Council.