

STATE OF COLORADO

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Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

April 29, 2011

Terrence Reis, Deputy Director
Division of Materials Safety and State Agreements
Office of Federal and State Materials and
Environmental Management Programs
U.S. Nuclear Regulatory Commission
T8-E24
Washington, D.C. 20555-0001

Dear Mr. Reis:

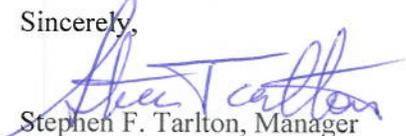
Enclosed is the final revision to the Colorado *Rules and Regulations Pertaining to Radiation Control*, 6 CCR 1007-1, Part 18, Licensing Requirements for Uranium and Thorium Processing) which becomes effective April 30, 2011. The final regulatory changes are identified by strike-out text (deletions) and bold/small-caps text (additions). Part 18 contains requirements that correspond to those of 10 CFR Part 40, and Part 51.

These regulatory changes are not in response to any NRC Regulatory Action Tracking System (RATs) changes. Rather, these regulatory changes were made to incorporate changes made to the enabling legislation (the Colorado Radiation Control Act, 25-11-101 through 25-11-305, Colorado Revised Statutes (CRS)) in 2010 and prior years. The changes to the enabling legislation were submitted to NRC under separate cover in a letter dated April 11, 2011.

These changes are made to ensure compliance between the Radiation Control regulations and Colorado Law. We believe that adoption of these revisions satisfies the compatibility and health and safety categories established in the Office of Federal and State Materials and Environmental Management Programs (FSME) Procedure SA-200.

If you have any questions, please feel free to contact me at 303/692-3423 or James Jarvis of my staff at 303/692-3454 or james.jarvis@state.co.us.

Sincerely,


Stephen F. Tarlton, Manager
Radiation Program
Hazardous Materials and Waste Management Division

Enclosures: As stated above

1 **DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT**

2 **Hazardous Materials and Waste Management Division**

3 **6 CCR 1007-1 Part 18**

4 **RULES AND REGULATIONS PERTAINING TO RADIATION CONTROL**

5 **PART 18: LICENSING REQUIREMENTS FOR URANIUM AND THORIUM PROCESSING**

6 **18.1 Purpose and Scope.**

7 18.1.1 The regulations in this part establish criteria, terms and conditions upon which the Department
8 issues licenses to receive title to, receive, possess, use, transfer, or deliver source and byproduct
9 materials, to operate uranium and thorium processing facilities and for the disposition of the
10 resulting byproduct material. The requirements of this part are in addition to, and not in
11 substitution for, other applicable requirements of these regulations.

12 18.1.2 This part establishes performance objectives and procedural requirements applicable to any
13 uranium or thorium material processing operation, to waste systems for byproduct material as in
14 definition (2) of 1.2.2, and to related activities concerning uranium-bearing and thorium-bearing
15 materials. It establishes specific technical and financial requirements for siting, construction,
16 operation, and decontamination, reclamation and ultimate stabilization, as well as requirements
17 for license transfer and termination, long-term site monitoring and surveillance, and ownership
18 and ultimate custody of source material milling facilities and byproduct material impoundments.

19 18.1.3 The requirements of this part apply to byproduct material that is located at a site where milling
20 operations are no longer active, if such site is not covered by the remedial action program of Title
21 I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) OF 1978 (92 STAT. 3021; 42
22 U.S.C. 7901). The regulations in this part do not establish procedures and criteria for the
23 issuance of licenses for materials covered under Title I of the Uranium Mill Tailings Radiation
24 Control Act of 1978 (92 Stat. 3021) unless that program fails to accomplish remedial action.
25 Disposal at a uranium or thorium processing site of radioactive material which is not type 2
26 byproduct material must not inhibit reclamation of the tailings impoundment or the ability of the
27 U.S. Government to take title to the impoundment as long-term custodian.

28 **18.1.4 NOTHING IN THIS PART SHALL APPLY TO THE FOLLOWING NATURALLY OCCURRING RADIOACTIVE**
29 **MATERIALS (NORM) OR TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE**
30 **MATERIALS (TENORM):**

31 **18.1.4.1 RESIDUALS OR SLUDGES FROM THE TREATMENT OF DRINKING WATER BY ALUMINUM, FERRIC**
32 **CHLORIDE, OR SIMILAR PROCESSES; EXCEPT THAT THE MATERIAL MAY NOT CONTAIN**
33 **HAZARDOUS SUBSTANCES THAT OTHERWISE WOULD PRECLUDE RECEIPT;**

34 **18.1.4.2 SLUDGES, SOILS, OR PIPE SCALE IN OR ON EQUIPMENT FROM OIL AND GAS EXPLORATION,**
35 **PRODUCTION, OR DEVELOPMENT OPERATIONS OR DRINKING WATER OR WASTEWATER**
36 **TREATMENT OPERATIONS; EXCEPT THAT THE MATERIAL MAY NOT CONTAIN HAZARDOUS**
37 **SUBSTANCES THAT OTHERWISE WOULD PRECLUDE RECEIPT;**

38 **18.1.4.3 MATERIALS FROM OR ACTIVITIES RELATED TO CONSTRUCTION MATERIAL MINING REGULATED**
39 **UNDER ARTICLE [32.5](#) OF TITLE [34](#), CRS.**

40 **18.1.4.4 THE TREATMENT, STORAGE, MANAGEMENT, PROCESSING, OR DISPOSAL OF SOLID WASTE,**
41 **WHICH MAY INCLUDE NORM AND TENORM, EITHER PURSUANT TO ISSUANCE OF A**

42 CERTIFICATE OF DESIGNATION OR CONSIDERED APPROVED OR OTHERWISE DEEMED TO SATISFY
43 THE REQUIREMENT FOR A CERTIFICATE OF DESIGNATION.

44 **18.1.5 THE REGULATION OF URANIUM IN SITU LEACH MINING (IN SITU RECOVERY), AS DEFINED IN SECTION 34-**
45 **32-103, CRS., INVOLVES THE DEPARTMENT OF NATURAL RESOURCES, DIVISION OF RECLAMATION,**
46 **MINING AND SAFETY OR THEIR SUCCESSOR. THE REQUIREMENTS OF THAT AGENCY MAY, DUE TO THE**
47 **USE OF TERMS-OF-ART AND OTHER TECHNICAL WORDS, PHRASES AND DEFINITIONS, BE INTERPRETED**
48 **INCONSISTENTLY OR BE HELD IN CONFLICT WITH THE DEPARTMENT’S REQUIREMENTS. THE DEPARTMENT**
49 **WILL COORDINATE WITH THAT AGENCY TO THE MAXIMUM EXTENT PRACTICABLE TO RESOLVE ANY SUCH**
50 **CONFLICTS OR INCONSISTENCIES. AN APPLICANT OR LICENSEE THAT IDENTIFIES SUCH INCONSISTENCY**
51 **OR CONFLICT SHALL PROVIDE THAT INFORMATION TO BOTH AGENCIES FOR RESOLUTION.**

52 **18.1.6 LICENSE AMENDMENTS FOR THE RECEIPT OF CLASSIFIED MATERIAL AT A FACILITY ARE SUBJECT TO**
53 **SECTIONS 18.3 AND 18.4 EXCEPT WHEN THE MATERIAL IS FROM AN APPROVED SOURCE AND SUCH**
54 **AMENDMENT WOULD NOT RESULT IN A CHANGE IN OWNERSHIP, DESIGN, OR OPERATION OF THE FACILITY.**
55 **LICENSE AMENDMENTS NOT SUBJECT TO 18.3 AND 18.4 OF THIS PART ARE SUBJECT TO 18.5 OF THIS**
56 **SECTION.**

57 **18.2 As used in this regulation:**

58 “Active maintenance” means any significant activity needed during the period of long term care
59 including ongoing activities such as the pumping and treatment of water from a site or one-time
60 measures such as replacement of a disposal site's cover. Active maintenance does not include
61 custodial activities such as repair of fencing, repair or replacement of monitoring equipment,
62 revegetation, minor additions to soil cover, minor repair of disposal site cover, and general
63 disposal site upkeep such as mowing grass.

64 “Aquifer” means a geologic formation, group of formations, or part of a formation capable of
65 yielding a significant amount of ground water to wells or springs. Any saturated zone created by
66 uranium or thorium operations would not be considered an aquifer unless the zone is or
67 potentially is:

- 68 (1) hydraulically interconnected to a natural aquifer;
- 69 (2) capable of discharge to surface water; or
- 70 (3) reasonably accessible because of migration beyond the vertical projection of the
71 boundary of the land transferred for long-term government ownership and care in
72 accordance with Criterion 9 of Appendix A to this Part 18.

73 “As expeditiously as practicable considering technological feasibility” , for the purposes of
74 Criterion 6A, means as quickly as possible considering: the physical characteristics of the tailings
75 and the site; the limits of available technology; the need for consistency with mandatory
76 requirements of other regulatory programs; and factors beyond the control of the licensee. The
77 phrase permits consideration of the cost of compliance only to the extent specifically provided for
78 by use of the term available technology.

79 “Available radon barrier technology” means technologies and methods for emplacing a final radon
80 barrier on uranium mill tailings piles or impoundments. This term shall not be construed to include
81 extraordinary measures or techniques that would impose costs that are grossly excessive as
82 measured by practice within the industry (or one that is reasonably analogous), (such as, by way
83 of illustration only, unreasonable overtime, staffing, or transportation requirements, etc.,
84 considering normal practice in the industry; laser fusion of soils, etc.), provided there is
85 reasonable progress toward emplacement of the final radon barrier. To determine grossly
86 excessive costs, the relevant baseline against which cost shall be compared is the cost estimate

87 for tailings impoundment closure contained in the licensee's approved reclamation plan, but costs
88 beyond these estimates shall not automatically be considered grossly excessive.

89 **"CERTIFICATE OF DESIGNATION" MEANS THE APPROVAL PURSUANT TO ARTICLE 20 OF TITLE 30, CRS.,**
90 **OR SECTION 25-15-204 (6).**

91 "Closure" means the activities following operations to decontaminate and decommission the
92 buildings and site used to produce byproduct materials and reclaim the tailings and/or waste
93 disposal area.

94 "Closure plan" means the Department approved plan to accomplish closure.

95 "Compliance period" begins when the Department sets secondary ground-water protection
96 standards and ends when the owner or operator's license is terminated and the site is transferred
97 to the State or Federal agency for long-term care.

98 "Dike" means an embankment or ridge of either natural or man-made materials used to prevent
99 the movement of liquids, sludges, solids, or other materials.

100 "Disposal area" means the area containing byproduct materials to which the requirements of
101 Criterion 6 of Appendix A to this Part 18 apply.

102 "Disposal site" means all land that is subject to transfer to a government agency after termination
103 of the license.

104 "Existing portion" means that land surface area of an existing surface impoundment on which
105 significant quantities of uranium or thorium byproduct materials had been placed prior to
106 September 30, 1983.

107 **"FACILITY" IN THIS PART MEANS THE PHYSICAL LOCATION AT ONE SITE OR ADDRESS AND UNDER THE**
108 **SAME ADMINISTRATIVE CONTROL AT WHICH:**

109 **(1) THE POSSESSION, USE, PROCESSING OR STORAGE OF URANIUM-BEARING AND**
110 **THORIUM-BEARING RADIOACTIVE MATERIAL IS OR WAS AUTHORIZED BY LICENSE**
111 **PURSUANT TO THIS PART; OR**

112 **(2) URANIUM AND THORIUM IS MILLED, OR OTHERWISE PROCESSED AND THE RESULTING**
113 **BYPRODUCT MATERIAL IS DISPOSITIONED.**

114 "Factors beyond the control of the licensee" means factors proximately causing delay in meeting
115 the schedule in the applicable reclamation plan for the timely emplacement of the final radon
116 barrier notwithstanding the good faith efforts of the licensee to complete the barrier in compliance
117 with paragraph (1) of Criterion 6A. These factors may include, but are not limited to:

118 (1) physical conditions at the site;

119 (2) inclement weather or climatic conditions;

120 (3) an act of god;

121 (4) an act of war;

122 (5) a judicial or administrative order or decision, or change to the statutory, regulatory, or
123 other legal requirements applicable to the licensee's facility that would preclude or delay
124 the performance of activities required for compliance;

- 125 (6) labor disturbances;
- 126 (7) any modifications, cessation or delay ordered by state, federal, or local agencies;
- 127 (8) delays beyond the time reasonably required in obtaining necessary government permits,
128 licenses, approvals, or consent for activities described in the reclamation plan proposed
129 by the licensee that result from agency failure to take final action after the licensee has
130 made a good faith, timely effort to submit legally sufficient applications, responses to
131 requests (including relevant data requested by the agencies), or other information,
132 including approval of the reclamation plan; and
- 133 (9) an act or omission of any third party over whom the licensee has no control.

134 "Final radon barrier" means the earthen cover (or approved alternative cover) over tailings or
135 waste constructed to comply with Criterion 6 of this Appendix (excluding erosion protection
136 features).

137 "Ground water" means water below the land surface in a zone of saturation. For purposes of
138 Appendix A to this Part 18, ground water is the water contained within an aquifer as defined
139 above.

140 "Leachate" means any liquid, including any suspended or dissolved components in the liquid that
141 has percolated through or drained from the byproduct material.

142 "Licensed site" means the area contained within the boundary of a location under the control of
143 persons generating or storing radioactive materials under a Department license.

144 "Liner" means a continuous layer of natural or man-made materials, beneath or on the sides of a
145 surface impoundment, which restricts the downward or lateral escape of byproduct material,
146 hazardous constituents, or leachate.

147 "Long term care" means the observation and maintenance of a site following the postclosure
148 period and termination of the license.

149 "Milestone" means an action or event that is required to occur by an enforceable date.

150 "Monitoring" means observing and making measurements to provide data to evaluate the
151 performance and characteristics of a site.

152 "Operation" means that a uranium or thorium mill tailings pile or impoundment is being used for
153 the continued placement of byproduct material or is in standby status for such placement. A pile
154 or impoundment is in operation from the day that byproduct material is first placed in the pile or
155 impoundment until the day final closure begins.

156 "Point of compliance" is the site specific location in the uppermost aquifer where the ground-water
157 protection standard must be met.

158 "Postclosure" means the period of time from completion of the site closure plan for
159 decontamination, reclamation, and stabilization of the site and disposal area and prior to the
160 termination of the license.

161 "Reclamation plan" , for the purposes of Criterion 6A of Appendix A of this Part 18, means the
162 plan detailing activities to accomplish reclamation of the tailings or waste disposal area in
163 accordance with the technical criteria of Appendix A of this Part. The reclamation plan must
164 include a schedule for reclamation milestones that are key to the completion of the final radon

165 barrier including as appropriate, but not limited to, wind blown tailings retrieval and placement on
166 the pile, interim stabilization (including dewatering or the removal of freestanding liquids and
167 recontouring), and final radon barrier construction. (Reclamation of tailings must also be
168 addressed in the closure plan; the detailed reclamation plan may be incorporated into the closure
169 plan.)

170 "Surface impoundment" means a natural topographic depression, man-made excavation, or diked
171 area, which is designed to hold an accumulation of liquid wastes or wastes containing free liquids,
172 and which is not an injection well.

173 "Surveillance" means the observation of the site for the purposes of visual detection of the need
174 for maintenance, custodial care, evidence of unauthorized access, and compliance with other
175 license and regulatory requirements.

176 "Third-party contractor" or "Third-party agreement" means a legal or contractual mechanism
177 whereby an applicant or licensee voluntarily agrees to pay for the services, solely selected and
178 supervised by the Department, of qualified persons not Department staff nor under contract
179 directly to the Department.

180 "Uppermost aquifer" means the geologic formation nearest the natural ground surface that is an
181 aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the
182 facility's property boundary.

183 **18.3 Special Requirements for Issuance of Specific Licenses For Source Material Milling.**

184 In addition to the requirements set forth in 3.8 and 3.9, a specific license for source material milling will
185 be issued if the applicant submits to the Department a complete and accurate application that
186 clearly demonstrates how objectives and requirements of this Part are met. Failure to clearly so
187 demonstrate shall be grounds for refusing to accept an application. **ANY PERSON DESIRING TO HAVE**
188 **A FACILITY OR SITE REFERRED TO IN THIS PART SHALL APPLY TO THE DEPARTMENT FOR APPROVAL OF**
189 **SUCH FACILITY OR SITE. THE APPLICATION SHALL CONTAIN SUCH INFORMATION AS THE DEPARTMENT**
190 **REQUIRES AND SHALL BE ACCOMPANIED BY AN APPLICATION FEE DETERMINED BY THE BOARD**
191 **PURSUANT TO THE PROVISIONS OF PART 12 OF THESE REGULATIONS.**18.3.1 An application for a
192 license or to amend or renew an existing license to receive, possess, and use source material for
193 milling or byproduct material as in definition (2) of 1.2.2 shall include all information required
194 under these regulations and such other information as the Department may deem necessary, and
195 shall address the following:

196 18.3.1.1 Description of the proposed project or action;

197 18.3.1.2 Area/site characteristics including geology, topography, hydrology and
198 meteorology;

199 18.3.1.3 Radiological and nonradiological impacts of the proposed project or action,
200 including waterway and groundwater impacts;

201 18.3.1.4 Environmental effects of accidents;

202 18.3.1.5 Tailings disposal and decommissioning;

203 18.3.1.6 Site and project alternatives.

204 18.3.2 The applicant shall provide procedures describing the means employed to meet the following
205 requirements during the operational phase of any project.

206 18.3.2.1 Milling operations shall be conducted so that all releases are reduced to as low
207 as is reasonably achievable below the limits of Part 4.

208 18.3.2.2 The mill operator shall conduct at least daily inspection of any tailings or waste
209 retention systems. The inspection shall be performed by a person who is qualified and
210 approved by the Department. Records of such inspections shall be maintained for review
211 by the Department.

212 18.3.2.3 The mill operator shall immediately notify the Department of the following:

213 18.3.2.3.1 Any failure in a tailings or waste retention system which results in a
214 release of tailings or waste into uncontrolled areas; and

215 18.3.2.3.2 Any unusual conditions which are not contemplated in the design of the
216 retention system and which if not corrected could lead to failure of the system
217 and result in a release of tailings or waste into uncontrolled areas.

218 18.3.3 During any one full year prior to **SUBMITTAL OF A NEW APPLICATION OR AMENDMENT EXPANDING THE**
219 **FACILITY** the applicant/licensee shall conduct a preoperational monitoring program to provide
220 complete baseline data on a milling site and its environs. Throughout the construction and
221 operating phases of the mill, the applicant/licensee shall conduct an operational monitoring
222 program to measure or evaluate compliance with applicable standards and regulations, to
223 evaluate performance of control systems and procedures, to evaluate environmental impacts of
224 operation, and to detect potential long-term effects.

225 18.3.4 The environmental report required by 3.8.8 shall contain all information deemed necessary by
226 the agency to assist the agency in the evaluation of the short-term and long-range environmental
227 impact of the project and activity so that the agency may weigh environmental, economic,
228 technical, and other benefits against environmental costs, while considering available
229 alternatives. The environmental report shall be submitted **WITH THE LICENSE APPLICATION OR**
230 **AMENDMENT REQUEST**, unless an exemption as provided by 3.8.7.1 has been obtained from the
231 Department.

232 18.3.5 The following types of actions require an applicant's environmental report:

233 18.3.5.1 Issuance or renewal of a source material milling license;

234 18.3.5.2 Issuance of an amendment that would authorize or result in:

235 (1) A significant expansion of a site;

236 (2) A significant change in the types of releases;

237 (3) A significant increase in the amounts of releases;

238 (4) A significant increase in individual or cumulative occupational radiation exposure;
239 or

240 (5) A significant increase in the potential for or consequences from radiological
241 accidents.
242

243 **18.3.5.3. THE ENVIRONMENTAL ASSESSMENT SHALL CONTAIN ALL INFORMATION DEEMED NECESSARY**
244 **BY THE DEPARTMENT, AND SHALL INCLUDE, AT A MINIMUM:**

- 245 (1) THE IDENTIFICATION OF THE TYPES OF CLASSIFIED MATERIAL TO BE RECEIVED,
246 STORED, PROCESSED, OR DISPOSED OF;
- 247 (2) A REPRESENTATIVE PRESENTATION OF THE PHYSICAL, CHEMICAL, AND RADIOLOGICAL
248 PROPERTIES OF THE TYPE OF CLASSIFIED MATERIAL TO BE RECEIVED, STORED,
249 PROCESSED, OR DISPOSED OF;
- 250 (3) AN EVALUATION OF THE SHORT-TERM AND LONG-RANGE ENVIRONMENTAL IMPACTS OF
251 SUCH RECEIPT, STORAGE, PROCESSING, OR DISPOSAL;
- 252 (4) AN ASSESSMENT OF THE RADIOLOGICAL AND NONRADIOLOGICAL IMPACTS TO THE
253 PUBLIC HEALTH FROM THE PROPOSED ACTIVITIES;
- 254 (5) ANY FACILITY-RELATED IMPACT ON ANY WATERWAY AND GROUND WATER FROM THE
255 PROPOSED ACTIVITIES;
- 256 (6) AN ANALYSIS OF THE ENVIRONMENTAL, ECONOMIC, SOCIAL, TECHNICAL, AND OTHER
257 BENEFITS OF THE PROPOSED ACTIVITIES AGAINST ENVIRONMENTAL COSTS AND SOCIAL
258 EFFECTS WHILE CONSIDERING AVAILABLE ALTERNATIVES;
- 259 (7) A LIST OF ALL MATERIAL VIOLATIONS OF LOCAL, STATE, OR FEDERAL LAW AT THE
260 FACILITY SINCE THE SUBMITTAL DATE OF THE PREVIOUS LICENSE APPLICATION OR
261 LICENSE RENEWAL APPLICATION;
- 262 (8) FOR AN APPLICATION FOR A LICENSE OR LICENSE AMENDMENT PERTAINING TO THE
263 FACILITY'S RECEIPT OF CLASSIFIED MATERIAL FOR STORAGE, PROCESSING, OR
264 DISPOSAL AT THE FACILITY, A DEMONSTRATION THAT:
- 265 (A) THERE ARE NO OUTSTANDING MATERIAL VIOLATIONS OF ANY STATE OR
266 FEDERAL STATUTES, COMPLIANCE ORDERS, OR COURT ORDERS APPLICABLE
267 TO THE FACILITY, AND ANY RELEASES GIVING RISE TO ANY SUCH VIOLATION
268 HAVE BEEN REMEDIATED;
- 269 (B) THE OPERATOR, AFTER A GOOD FAITH REVIEW OF THE FACILITY AND ITS
270 OPERATIONS, IS NOT AWARE OF ANY CURRENT LICENSE VIOLATION AT THE
271 FACILITY;
- 272 (C) THERE ARE NO CURRENT RELEASES TO THE AIR, GROUND, SURFACE WATER,
273 OR GROUNDWATER THAT EXCEED PERMITTED LIMITS; AND
- 274 (D) NO CONDITIONS EXIST AT THE FACILITY THAT WOULD PREVENT THE
275 DEPARTMENT OF ENERGY'S RECEIPT OF TITLE TO THE FACILITY PURSUANT TO
276 THE FEDERAL "ATOMIC ENERGY ACT OF 1954", 42 U.S.C. SEC. 2113;
- 277 (9) A LIST OF ALL NECESSARY PERMITS AND ANY CHANGES TO LOCAL LAND USE
278 ORDINANCES THAT ARE NEEDED TO CONSTRUCT OR OPERATE THE FACILITY; AND
- 279 (10) FOR SITES OR FACILITIES PLACED ON THE NATIONAL PRIORITY LIST PURSUANT TO THE
280 FEDERAL "COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND
281 LIABILITY ACT", 42 U.S.C. SEC. 9605, A COPY OF THE MOST RECENT FIVE-YEAR
282 REVIEW AND ANY ASSOCIATED UPDATES THAT HAVE BEEN ISSUED BY THE UNITED
283 STATES ENVIRONMENTAL PROTECTION AGENCY.

284 18.3.6 An application for a license to receive, possess and use source material for milling or byproduct
285 material as in definition (2) of 1.2.2 shall contain proposed specifications relating to the milling

286 operations and the disposition of tailings or wastes resulting from such milling activities to achieve
287 the requirements and objectives set forth in the criteria listed in Appendix A to this Part 18. Each
288 application for a new license or for license renewal must clearly demonstrate how the
289 requirements and objectives set forth in Appendix A to this Part 18 have been addressed. Failure
290 to clearly demonstrate how the requirements and objectives in Appendix A to this Part 18 have
291 been addressed shall be grounds for refusing to accept an application.
292

293 **18.3.7 NOTHING IN 18.3 SHALL APPLY TO A CONTRACT FOR THE STORAGE, PROCESSING, OR DISPOSAL OF LESS**
294 **THAN THE SUM OF ONE HUNDRED TEN TONS OF CLASSIFIED MATERIAL PER SOURCE OR TO A CONTRACT**
295 **FOR A BENCH-SCALE OR A PILOT-SCALE TESTING PROJECT OR A CONTRACT FOR LESS THAN A DE**
296 **MINIMIS AMOUNT OF CLASSIFIED MATERIAL AS DETERMINED BY THE DEPARTMENT FOR STORAGE,**
297 **PROCESSING, OR DISPOSAL.**
298

299 **18.3.8 UPON RECEIPT OF AN APPLICATION OR NOTICE AS PROVIDED IN THIS SECTION, THE DEPARTMENT SHALL**
300 **NOTIFY THE PUBLIC AND FORWARD A COPY OF THE APPLICATION OR NOTICE TO THE GOVERNOR AND THE**
301 **GENERAL ASSEMBLY, AS APPROPRIATE.**

302 **18.3.8.1 THE DEPARTMENT SHALL PUBLISH A DETERMINATION AS TO WHETHER AN APPLICATION**
303 **SUBMITTED PURSUANT TO PARAGRAPH (B) OF SUBSECTION (2) OF THIS SECTION IS**
304 **SUBSTANTIALLY COMPLETE WITHIN FORTY-FIVE DAYS AFTER RECEIPT OF THE APPLICATION.**

305 **18.3.8.2 AN INITIAL PUBLIC MEETING OR HEARING SHALL BE CONVENED WITHIN FORTY-FIVE DAYS AFTER**
306 **PUBLICATION OF THE DETERMINATION THAT THE APPLICATION IS SUBSTANTIALLY COMPLETE. A**
307 **SECOND SUCH PUBLIC MEETING SHALL BE CONVENED WITHIN THIRTY DAYS AFTER THE FIRST**
308 **PUBLIC MEETING.**

309 **18.3.8.3 THE DEPARTMENT SHALL APPROVE, APPROVE WITH CONDITIONS, OR DENY THE APPLICATION**
310 **WITHIN THREE HUNDRED SIXTY DAYS AFTER THE SECOND PUBLIC MEETING.**

311 **18.3.9 IN ADDITION TO THE REQUIREMENTS OF SECTION 18.3 AND 18.4, EACH NEW, RENEWAL OR AMENDMENT**
312 **APPLICATION PERTAINING TO THE FACILITY'S RECEIPT OF CLASSIFIED MATERIAL SHALL INCLUDE A**
313 **WRITTEN APPLICATION TO THE DEPARTMENT AND INFORMATION RELEVANT TO THE PENDING**
314 **APPLICATION, INCLUDING:**

315 **18.3.9.1 TRANSCRIPTS OF TWO PUBLIC MEETINGS HOSTED AND PRESIDED OVER BY A PERSON SELECTED**
316 **UPON AGREEMENT BY THE DEPARTMENT, THE LOCAL BOARD OF COUNTY COMMISSIONERS,**
317 **AND THE APPLICANT. ONE OR BOTH OF THE MEETINGS SHALL BE A HEARING CONDUCTED TO**
318 **COMPLY WITH SECTION 24-4-104 OR 24-4-105, CRS. THE EXPENSE OF THE MEETINGS OR**
319 **HEARING SHALL BE PAID BY THE FACILITY. SUCH MEETINGS SHALL NOT BE HELD UNTIL THE**
320 **DEPARTMENT DETERMINES THAT THE APPLICATION IS SUBSTANTIALLY COMPLETE. THE FACILITY**
321 **SHALL PROVIDE THE PUBLIC WITH:**

322 **(1) AT LEAST TWO WEEKS' WRITTEN NOTICE BEFORE THE FIRST MEETING AND AN**
323 **ADDITIONAL TWO WEEKS' WRITTEN NOTICE BEFORE THE SECOND MEETING;**

324 **(2) AT BOTH MEETINGS, SUMMARIES OF THE FACILITY'S LICENSE TO RECEIVE, STORE,**
325 **PROCESS, OR DISPOSE OF CLASSIFIED MATERIAL AND THE NATURE OF THE CLASSIFIED**
326 **MATERIAL, AND AN OPPORTUNITY TO BE HEARD; AND**

327 **(3) ACCESS TO MAKE COPIES OF A TRANSCRIPT OF THE MEETINGS, AND SHALL PROVIDE AN**
328 **ELECTRONIC COPY TO THE DEPARTMENT IN A MANNER THAT ALLOWS POSTING ON THE**
329 **DEPARTMENT'S WEB SITE WITHIN TEN DAYS AFTER RECEIPT FROM THE TRANSCRIPTION**
330 **SERVICE.**

331 **18.3.9.2 AN ENVIRONMENTAL ASSESSMENT AS DEFINED IN 18.3.5;**

332 **18.3.9.3 A RESPONSE, IF ANY, TO THE ENVIRONMENTAL ASSESSMENT WRITTEN BY THE BOARD OF**
333 **COUNTY COMMISSIONERS PROVIDED TO THE FACILITY WITHIN NINETY DAYS AFTER THE FIRST**
334 **PUBLIC MEETING. UPON REQUEST OF AND DOCUMENTATION OF THE EXPENDITURE BY SUCH**
335 **BOARD, THE APPLICANT SHALL PROVIDE THE BOARD WITH UP TO FIFTY THOUSAND DOLLARS,**
336 **WHICH SHALL BE AVAILABLE TO ASSIST THE BOARD IN RESPONDING TO THE APPLICATION,**
337 **INCLUDING AN INDEPENDENT ENVIRONMENTAL ANALYSIS AND IDENTIFICATION OF ANY**
338 **SUBSTANTIAL ADVERSE IMPACT UPON THE SAFETY OR MAINTENANCE OF TRANSPORTATION**
339 **INFRASTRUCTURE OR TRANSPORTATION FACILITIES WITHIN THE COUNTY.**

340 **18.4 Environmental Impact Analysis**

341 18.4.1 For each license application or application to amend or renew an existing license to receive,
342 possess, or use source material for uranium or thorium milling or byproduct material as in
343 definition (2) of 1.2.2 which will have a significant impact on the environment, the Department
344 shall prepare a written analysis of the impact of the licensed activity on the environment, which
345 shall be available to the public and for review by the NRC at the time of public notice of hearing,
346 which analysis shall include:

347 18.4.1.1 An assessment of the radiological and nonradiological impacts to the public
348 health;

349 18.4.1.2 An assessment of any impact on any waterway and ground water;

350 18.4.1.3 Consideration of alternatives to the activities to be conducted; and

351 18.4.1.4 Consideration of the long-term impacts of the licensed activities.

352 18.4.2 In preparing the environmental impact analysis, the Department may use and incorporate by
353 reference the environmental report prepared by the applicant and environmental assessments
354 prepared by Federal, State or local agencies.

355 18.4.3 The environmental impact analysis, or any part thereof, shall be prepared directly by the
356 Department or the Department shall utilize the third party method set forth in 3.13.

357 **18.5 NOTICES AND FINANCIAL ASSURANCE**

358 **18.5.1 AT LEAST NINETY DAYS BEFORE A FACILITY PROPOSES TO RECEIVE, STORE, PROCESS, OR DISPOSE OF**
359 **CLASSIFIED MATERIAL IN A LICENSE APPLICATION OR AMENDMENT THAT IS NOT SUBJECT TO 18.3 AND**
360 **18.4, THE FACILITY SHALL NOTIFY THE DEPARTMENT, AND THE DEPARTMENT SHALL NOTIFY THE PUBLIC**
361 **AND THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY IN WHICH THE FACILITY IS LOCATED, OF**
362 **THE SPECIFIC CLASSIFIED MATERIAL TO BE RECEIVED, STORED, PROCESSED, OR DISPOSED OF. THE**
363 **NOTICE SHALL INCLUDE:**

364 **18.5.1.1 A REPRESENTATIVE ANALYSIS OF THE PHYSICAL, CHEMICAL, AND RADIOLOGICAL PROPERTIES**
365 **OF THE CLASSIFIED MATERIAL;**

366 **18.5.1.2 THE MATERIAL ACCEPTANCE REPORT THAT DEMONSTRATES THAT THE CLASSIFIED MATERIAL**
367 **DOES NOT CONTAIN HAZARDOUS WASTE CHARACTERISTICS NOT FOUND IN URANIUM ORE;**

368 **18.5.1.3 A DETAILED PLAN FOR TRANSPORT, ACCEPTANCE, STORAGE, HANDLING, PROCESSING, AND**
369 **DISPOSAL OF THE MATERIAL;**

370 18.5.1.4 A DEMONSTRATION THAT THE MATERIAL CONTAINS TECHNICALLY AND ECONOMICALLY
371 RECOVERABLE URANIUM, WITHOUT TAKING INTO ACCOUNT ITS VALUE AS DISPOSAL MATERIAL;

372 18.5.1.5 THE EXISTING LOCATION OF THE CLASSIFIED MATERIAL;

373 18.5.1.6 THE HISTORY OF THE CLASSIFIED MATERIAL;

374 18.5.1.7 A WRITTEN STATEMENT BY THE APPLICANT DESCRIBING ANY PRE-EXISTING REGULATORY
375 CLASSIFICATION OF THE CLASSIFIED WASTE IN THE STATE OF ORIGIN THAT DESCRIBES ALL
376 STEPS TAKEN BY THE APPLICANT TO IDENTIFY SUCH CLASSIFICATION;

377 18.5.1.8 A WRITTEN STATEMENT FROM THE UNITED STATES DEPARTMENT OF ENERGY OR SUCCESSOR
378 AGENCY THAT THE RECEIPT, STORAGE, PROCESSING, OR DISPOSAL OF THE CLASSIFIED
379 MATERIAL AT THE FACILITY WILL NOT ADVERSELY AFFECT THE DEPARTMENT OF ENERGY'S
380 RECEIPT OF TITLE TO THE FACILITY PURSUANT TO THE FEDERAL "ATOMIC ENERGY ACT OF 1954
381 ", 42 U.S.C. SEC. 2113;

382 18.5.1.9 DOCUMENTATION SHOWING ANY NECESSARY APPROVALS OF THE UNITED STATES
383 ENVIRONMENTAL PROTECTION AGENCY; AND

384 18.5.1.10 AN ENVIRONMENTAL ASSESSMENT AS DEFINED IN SECTION 18.4 AND 18.5 OF THIS SECTION,
385 WHICH MAY INCORPORATE BY REFERENCE RELEVANT INFORMATION CONTAINED IN AN
386 ENVIRONMENTAL ASSESSMENT PREVIOUSLY SUBMITTED FOR THE FACILITY.

387 18.5.2 WITHIN THIRTY DAYS AFTER THE DEPARTMENT'S RECEIPT OF NOTICE PURSUANT TO 18.5.1, THE
388 DEPARTMENT SHALL DETERMINE WHETHER THE NOTICE IS COMPLETE.

389 18.5.3 ONCE THE DEPARTMENT DETERMINES THAT THE NOTICE PURSUANT TO 18.5.1 IS COMPLETE, THE
390 DEPARTMENT SHALL PUBLISH THE NOTICE ON ITS WEB SITE AND PROVIDE A SIXTY-DAY PUBLIC COMMENT
391 PERIOD FOR THE RECEIPT OF WRITTEN COMMENTS CONCERNING THE NOTICE. A PUBLIC HEARING MAY BE
392 HELD, AT THE DEPARTMENT'S DISCRETION, AT THE OPERATOR'S EXPENSE.

393 18.5.4 WITHIN THIRTY DAYS AFTER THE CLOSE OF THE WRITTEN PUBLIC COMMENT PERIOD HELD PURSUANT TO
394 18.5.3, THE DEPARTMENT SHALL APPROVE, APPROVE WITH CONDITIONS, OR DENY THE RECEIPT,
395 STORAGE, PROCESSING, OR DISPOSAL AS DESCRIBED IN THE NOTICE BASED ON WHETHER THE MATERIAL
396 PROPOSED FOR RECEIPT, STORAGE, PROCESSING, OR DISPOSAL COMPLIES WITH THE FACILITY'S
397 LICENSE AND:

398 18.5.4.1 BE CONDUCTED SUCH THAT THE EXPOSURES TO WORKERS AND THE PUBLIC ARE WITHIN THE
399 DOSE LIMITS OF PART 4 OF THE DEPARTMENT'S RULES PERTAINING TO RADIATION CONTROL FOR
400 WORKERS AND THE PUBLIC;

401 18.5.4.2 NOT CAUSE RELEASES TO THE AIR, GROUND, OR SURFACE OR GROUND WATER THAT EXCEED
402 PERMITTED LIMITS; AND

403 18.5.4.3 NOT PREVENT TRANSFER OF THE FACILITY TO THE UNITED STATES IN ACCORDANCE WITH 42
404 U.S.C. SEC. 2113 UPON COMPLETION OF DECONTAMINATION, DECOMMISSIONING, AND
405 RECLAMATION OF THE FACILITY.

406

407 18.5.5 Prior to issuance of the license, the applicant shall (1) establish financial assurance
408 arrangements, as provided by 3.9.5, to ensure decontamination and decommissioning of the
409 facility and (2) provide a fund adequate to cover the payment of the cost for long-term care and
410 monitoring as provided by 3.9.5.10. Such fund shall be sufficient to meet the requirements of
411 3.9.5.10.4. The Department will consider proposals to combine the two types of financial

412 assurance. Financial assurance shall be provided prior to commencement of construction or
413 operation.

414 **18.6 License Hearings**

415 18.6.1 There shall be an opportunity for public hearings to be held in accordance with the procedures in
416 24-4-104 and 24-4-105, CRS. , and 18.6, prior to the granting, denial or renewal of a specific
417 license permitting the receipt, possession or use of source material for milling or byproduct
418 material as in definition (2) of 1.2.2.

419 18.6.2 Notice of Hearing

420 18.6.2.1 All hearings shall be preceded by written notice containing:

421 18.6.2.1.1 The nature of the hearing and its time and place;

422 18.6.2.1.2 The legal authority and jurisdiction under which the hearing is to be held;

423 18.6.2.1.3 The matters of fact and law asserted or to be considered;

424 18.6.2.1.4 A description of the proposed licensing action and a statement of the
425 availability of its text from the Department;

426 18.6.2.1.5 A description of the right of any interested person to make written
427 comments to the Department or present oral comments at the hearing;

428 18.6.2.1.6 The procedure for applying to become a party to the hearing; and

429 18.6.2.1.7 A description of the procedures to be followed at the hearing and at a
430 prehearing conference if required.

431 18.6.2.2 The notice of the hearing shall be mailed by the Department to the licensee or
432 applicant and to each person who has filed a written request to receive notice of such
433 proceedings. The licensee or applicant shall cause the notice to be published for three (3)
434 days in a newspaper of statewide circulation and in local newspapers designated by the
435 Department in the area to be affected by the proposed action. The notice shall be mailed
436 and published not less than ninety (90) days prior to the hearing.

437 18.6.2.3 The time and place of hearing will be fixed with due regard for the convenience of
438 the parties or their representatives, and the public interest. The hearing will be held in the
439 locale of the site to be licensed.

440 18.6.2.4 The cost of any licensing action hearing shall be at the expense of the applicant.
441 These costs shall include, but not be limited to, the hearing officer, the meeting room, the
442 court reporter and transcript copies, and the required notices. The costs shall not include
443 the expenses of other parties to the hearing.

444 18.6.3 Party Status

445 18.6.3.1 A person who may be affected or aggrieved by Department action may apply for
446 party status not less than twenty (20) days prior to the hearing. Thereafter, application to
447 be made a party shall not be considered except upon motion for good cause shown.

448 18.6.3.2 Application for party status must identify the individual or group applying,
449 including the address or phone number where they may be contacted, state the nature of

450 their interest in the hearing and the specific ground on which they claim to be affected or
451 aggrieved, and the specific aspects of the hearing which they wish to address.

452 18.6.3.3 The Department, or the hearing officer, will grant or deny party status within five
453 (5) days after receipt of the request for party status based on the nature and extent of the
454 person's property, financial or other interest in the hearing and the possible effect of any
455 order which may be entered as a result of the hearing on the person's interest. Any
456 person applying for or granted party status may, by motion to the hearing officer or
457 Department, as appropriate, challenge the right of any other person to be a party.

458 18.6.3.4 Parties shall have the right to initiate discovery. Parties shall have the right to
459 make motions or objections, present evidence, cross-examine witnesses, and appeal
460 from the decision of the hearing as provided by the Colorado Administrative Procedures
461 Act, 24-4-101 et seq., CRS..

462 18.6.3.5 A person who is not a party will be permitted to submit written comments to the
463 Department and may be permitted to make an oral presentation at the hearing, but will
464 not have the other rights of a party.

465 18.6.4 Prehearing Conference

466 18.6.4.1 The Department or hearing officer, on its own motion or at the request of any
467 party or any person who has applied to become a party, may direct the parties to appear
468 at a specific time and place for a conference to consider:

469 18.6.4.1.1 The simplification and clarification of the issues;

470 18.6.4.1.2 The obtaining of stipulations and admissions of fact and of the contents
471 and authenticity of documents to avoid unnecessary proof;

472 18.6.4.1.3 Identification of witnesses and the limitation of the number of expert
473 witnesses, and other steps to expedite the presentation of evidence;

474 18.6.4.1.4 The setting of a hearing schedule;

475 18.6.4.1.5 Granting or denying requests for party status, if such decisions have not
476 previously been made;

477 18.6.4.1.6 Such other matters as may aid in the orderly disposition of the hearing.

478 18.6.4.2 At such conference each party or person who has applied to become a party
479 shall present to every other person, party, and the Department a prehearing statement
480 containing the following:

481 18.6.4.2.1 A brief summary of the nature of the claim of the party and the basis
482 therefore;

483 18.6.4.2.2 A copy of all exhibits proposed to be introduced; and

484 18.6.4.2.3 A list of all witnesses who may be called and a brief description of their
485 testimony.

486 18.6.4.3 Except for good cause shown or for evidence or testimony accepted as rebuttal,
487 no witness may testify nor may any exhibits be introduced on behalf of a party who had
488 notice of the prehearing conference unless such witness has been previously listed

489 and/or his written testimony and related exhibits have been presented to opposing parties
490 at the prehearing conference.

491 18.6.4.4 The Department or hearing officer shall issue a written summary of the action
492 taken at the conference and agreements by the parties, which limits the issues or defines
493 the matters in controversy to be determined in the hearing.

494 18.6.5 Discovery

495 18.6.5.1 Any party may initiate discovery in the form of interrogatories to another party,
496 requests for admission to another party, requests for production of documents to another
497 party, or depositions of any persons, or any combination thereof. The Colorado Rules of
498 Civil Procedure, to the extent not inconsistent with the Colorado Administrative Procedure
499 Act, shall apply. Such discovery may be modified by a motion for protective order filed
500 with the Department or hearing officer within seven (7) days of receipt of the notice or
501 request for discovery. Motions for protective order shall set forth the grounds in support
502 thereof and shall be ruled upon immediately. Discovery shall be completed no later than
503 ten (10) days preceding the hearing date, except as otherwise ordered by the
504 Department or hearing officer.

505 18.6.6 Conduct of Hearings

506 18.6.6.1 Hearing presentations will proceed in the following order unless otherwise
507 directed by the Department or hearing officer.

508 18.6.6.1.1 Call to order, introductory remarks, and action on applications for party
509 status, if not already decided.

510 18.6.6.1.2 Presentation of any stipulations or agreements of the parties, and any
511 other matters which were required to be dealt with at the prehearing conference,
512 if held.

513 18.6.6.1.3 Opening statement by the party upon whom the burden of proof rests.

514 18.6.6.1.4 Opening statements by all other parties.

515 18.6.6.1.5 Presentation of case by party upon whom burden of proof rests.

516 18.6.6.1.6 Presentation by all other persons wishing to offer evidence in the order to
517 be determined by the Department or hearing officer.

518 18.6.6.1.7 Rebuttal by the party upon whom the burden of proof rests, followed by
519 rebuttal of other parties.

520 18.6.6.1.8 Closing statements by party upon whom the burden of proof rests,
521 followed by closing statements of all other parties.

522 18.6.6.2 Public participation as provided for in these rules shall be allowed at that time or
523 times during the hearing as determined by the Department or hearing officer in their
524 discretion to be appropriate.

525 18.6.6.3 At the conclusion of any witness's testimony, or at the conclusion of the party's
526 entire presentation, as may be determined by the Department or hearing officer, all
527 parties may then cross-examine such witness or witnesses. The Department or hearing

528 officer may examine and cross-examine any witness. A person who is not a party shall
529 not have the right to cross-examine.

530 18.6.6.4 Any person, not a party to the proceeding, wishing to present testimony may do
531 so by indicating his desire in writing. A form will be available prior to and during the
532 hearing. This form will request the person's name, address, whom he represents, the
533 general nature of his testimony, and the time required for his presentation. This form is to
534 be presented to a representative of the Department during the hearing. Voluntary
535 testimony not specifically requested on or by the written form may also be allowed. Any
536 person presenting testimony shall be under oath and be subject to cross examination.

537 18.6.6.5 The proponent of any motion, order, or license issuance bears the burden of
538 proof.

539 18.6.6.6 No interested person, party, or applicant for party status outside the Department
540 will have any oral or written communication with any Department personnel or hearing
541 officer relevant to the merits of a hearing pending before the Department unless
542 reasonable prior notice is given to all participants in the hearing. This prohibition shall
543 apply after the hearing is noticed. Any Department employee or hearing officer who is
544 involved in such a prohibited communication shall make a written record of it and transmit
545 it to all the parties to the hearing.

546 18.6.7 Department Decision

547 18.6.7.1 Any party to a hearing may, or if so directed by the Department or the hearing
548 officer shall, file proposed findings of fact and conclusions of law and a proposed form of
549 order or decision within twenty (20) days after the record is closed. A party who has the
550 burden of proof may reply within ten (10) days after service of proposed findings of fact
551 and conclusions of law.

552 18.6.7.2 After due consideration of the hearing record, the Department or hearing officer
553 shall issue its findings of fact, conclusions of law, and decision and order.

554 18.7 Operational Requirements.

555 Each licensee authorized to receive, possess or use source material for milling or byproduct material as in
556 definition (2) of 1.2.2 shall:

557 18.7.1 Operate in accordance with the requirements of this Part 18, in particular the procedures required
558 by 18.3.2, monitoring required by 18.3.3, and the requirements and objectives of Appendix A to
559 this Part 18.

560 18.7.2 Submit a report to the Department within 60 days after January 1 and July 1 of each year,
561 specifying the quantity of each of the radioactive materials released to unrestricted areas in liquid
562 and in gaseous effluents during the previous six months of operation, and such other information
563 as the Department may require to estimate maximum potential annual radiation doses to the
564 public resulting from effluent releases. If quantities of radioactive materials released during the
565 reporting period are significantly above the licensee's design objectives previously reviewed as
566 part of the licensing action, the report shall cover this specifically. On the basis of such reports
567 and any additional information the Department may obtain from the licensee or others, the
568 Department may from time to time require the licensee to take such action as the Department
569 deems appropriate.

570 18.7.3 FOR ANY LICENSED SITE OR FACILITY DETERMINED BY THE DEPARTMENT TO HAVE CAUSED A RELEASE
571 TO THE GROUNDWATER THAT EXCEEDS THE BASIC STANDARDS FOR GROUNDWATER AS ESTABLISHED BY

572 THE WATER QUALITY CONTROL COMMISSION, UNTIL REMEDIATION HAS BEEN COMPLETED, THE LICENSEE
573 SHALL PROVIDE ANNUAL WRITTEN NOTICE OF THE STATUS OF THE RELEASE AND ANY REMEDIATION
574 ACTIVITIES ASSOCIATED WITH THE RELEASE, BY CERTIFIED OR REGISTERED MAIL, RETURN RECEIPT
575 REQUESTED, TO THE CURRENT ADDRESS FOR EACH REGISTERED GROUNDWATER WELL WITHIN ONE MILE
576 OF THE RELEASE AS IDENTIFIED IN THE CORRECTIVE ACTION MONITORING PROGRAM, UNLESS THE
577 LICENSEE DEMONSTRATES THAT A DISTANCE LESS THAN ONE MILE IS WARRANTED. DOCUMENTATION OF
578 THIS ACTIVITY WILL BE RETAINED AND MADE AVAILABLE TO THE DEPARTMENT UPON REQUEST.

579 **18.8 Decommissioning Requirements.**

580 18.8.1 In addition to the information required under 3.16, each licensee authorized to receive, possess
581 or use source material for milling or byproduct material as in definition (2) of 1.2.2 shall submit a
582 plan for completion of decommissioning if the procedures necessary to carry out
583 decommissioning:

584 18.8.1.1 Have not been previously approved by the Department; and

585 18.8.1.2 Could increase potential health and safety impacts to workers or to the public,
586 such as in any of the following cases:

587 18.8.1.2.1 Procedures would involve techniques not applied routinely during
588 cleanup or maintenance operations; or

589 18.8.1.2.2 Workers would be entering areas not normally occupied where surface
590 contamination and radiation levels are significantly higher than routinely
591 encountered; or

592 18.8.1.2.3 Procedures could result in significantly greater airborne concentrations of
593 radioactive materials than are present during operation; or

594 18.8.1.2.4 Procedures could result in significantly greater releases of radioactive
595 material to the environment than those associated with operation.

596 18.8.2 Procedures with potential health and safety impacts may not be carried out prior to approval of the
597 decommissioning plan.

598 18.8.3 The proposed decommissioning plan, if required by 18.8.1 or by license condition, must include:

599 18.8.3.1 Description of planned decommissioning activities;

600 18.8.3.2 Description of methods used to assure protection of workers and the
601 environment against radiation hazards during decommissioning;

602 18.8.3.3 A description of the planned final radiation survey; and

603 18.8.3.4 An updated detailed cost estimate for decommissioning, comparison of that
604 estimate with present funds set aside for decommissioning, and plan for assuring the
605 availability of adequate funds for completion of decommissioning.

606 18.8.4 The proposed decommissioning plan will be approved by the Department if the information
607 therein demonstrates that the decommissioning will be completed as soon as is reasonable and
608 that the health and safety of workers and the public will be adequately protected.

609 18.8.5 Upon approval of the decommissioning plan by the Department, the licensee shall complete
610 decommissioning in accordance with the approved plan. As a final step in decommissioning, the

611 licensee shall submit the information required in 3.16.4.1.5 and shall certify the disposition of
612 accumulated wastes from decommissioning.

613 18.8.6 If the information submitted under 3.16.4.1.5 or 18.8 does not adequately demonstrate that the
614 premises are suitable for release for unrestricted use, the Department will inform the licensee of
615 the appropriate further actions required for termination of license.

616 **PART 18 , APPENDIX A CRITERIA RELATING TO THE OPERATION OF MILLS AND THE**
617 **DISPOSITION OF THE TAILINGS OR WASTES FROM THESE OPERATIONS**

618 Introduction: Every applicant for a license to possess and use radioactive material in conjunction with
619 uranium or thorium milling, or byproduct material at sites formerly associated with such milling, is required
620 by the provisions of 18.3 to include in a license application proposed specifications relating to milling
621 operations and the disposition of tailings or wastes resulting from such milling activities. This appendix
622 establishes technical, ownership, and long-term site surveillance criteria relating to the siting, operation,
623 decontamination, decommissioning, and reclamation of mills and tailings or waste systems and sites at
624 which such mills and systems are located.

625 As used in this appendix, the term “as low as is reasonably achievable” has the same meaning as in
626 1.2.2.

627 In many cases, flexibility is provided in the criteria to allow achieving an optimum tailings disposal
628 program on a site-specific basis. However, in such cases the objectives, technical alternatives and
629 concerns which must be taken into account in developing a tailings program are identified. As provided by
630 the provisions of 18.3, applications for licenses must clearly demonstrate how the criteria have been
631 addressed.

632 The specifications shall be developed considering the expected full capacity of tailings or waste systems
633 and the lifetime of mill operations. Where later expansions of systems or operations may be likely (for
634 example, where large quantities of ore now marginally uneconomical may be stockpiled), the amenability
635 of the disposal system to accommodate increased capacities without degradation in long-term stability
636 and other performance factors shall be evaluated.

637 Licensees or applicants may propose to the Department alternatives to meet the specific requirements in
638 this Appendix. The alternative proposals may take into account local or regional conditions, including
639 geology, topography, hydrology, and meteorology. The Department may find that the proposed
640 alternatives meet the Department's requirements if the alternatives will achieve a level of stabilization and
641 containment of the sites concerned and a level of protection for public health, safety, and the environment
642 from radiological and nonradiological hazards associated with the site, which is equivalent to, to the
643 extent practicable, or more stringent than the level which would be achieved by the requirements of this
644 Appendix and the standards promulgated by the Environmental Protection Agency in 40 CFR Part 192,
645 Subparts D and E. Proposed alternatives to specific regulations in this Part 18 require notice and
646 opportunity for hearing before the NRC.

647 All site-specific licensing decisions based on the criteria in this Appendix or alternatives proposed by
648 licensees or applicants will take into account the risk to the public health and safety and the environment
649 with due consideration to the economic costs involved and any other factors the Department determines
650 to be appropriate. In implementing this Appendix, the Department will consider “practicable” and
651 “reasonably achievable” as equivalent terms. Decisions involving these terms will take into account the
652 state of technology, and the economics of improvements in relation to benefits to the public health and
653 safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic
654 energy in the public interest.

655 **Criterion 1.**

656 Criterion 1A. The general goal or broad objective in siting and design decisions is permanent isolation of
657 tailings and associated contaminants by minimizing disturbance and dispersion by natural forces, and to
658 do so without ongoing maintenance. For practical reasons, specific siting decisions and design standards
659 must involve finite times (e.g., the longevity design standard in Criterion 6). The following site features
660 which will contribute to such a goal or objective must be considered in selecting among alternative tailings
661 disposal sites or judging the adequacy of existing tailings sites:

- 662 (1) Remoteness from populated areas;
- 663 (2) Hydrologic and other natural conditions as they contribute to continued immobilization and
664 isolation of contaminants from ground-water sources; and
- 665 (3) Potential for minimizing erosion, disturbance, and dispersion by natural forces over the longterm.

666 Criterion 1B. The site selection process must be an optimization to the maximum extent reasonably
667 achievable in terms of the features in Criterion 1A.

668 Criterion 1C. In the selection of disposal sites, primary emphasis must be given to isolation of tailings or
669 wastes, a matter having long-term impacts, as opposed to consideration only of short-term convenience
670 or benefits, such as minimization of transportation or land acquisition costs. While isolation of tailings will
671 be a function of both site and engineering design, overriding consideration must be given to siting
672 features given the long-term nature of the tailings hazards.

673 Criterion 1D. Tailings should be disposed of in a manner that no active maintenance is required to
674 preserve conditions of the site.

675 **Criterion 2.**

676 To avoid proliferation of small waste disposal sites and thereby reduce perpetual surveillance obligations,
677 byproduct material as in definition (2) of 1.2.2, from in situ extraction operations, such as residues from
678 solution evaporation or contaminated control processes, and wastes from small remote above ground
679 extraction operations shall be disposed of at existing large mill tailings disposal sites; unless considering
680 the nature of the wastes, such as their volume and specific activity and the costs and environmental
681 impacts of transporting the wastes to a large disposal site, such offsite disposal is demonstrated to be
682 impracticable or the advantages of onsite burial clearly outweigh the benefits of reducing the perpetual
683 surveillance obligations.

684 **Criterion 3.**

685 The "prime option" for disposal of tailings is placement below grade, either in mines or specially
686 excavated pits (that is, where the need for any specially constructed retention structure is eliminated).
687 The evaluation of alternative sites and disposal methods performed by mill operators in support of their
688 proposed tailings disposal program (provided in applicants' environmental reports) must reflect serious
689 consideration of this disposal mode. In some instances, below grade disposal may not be the most
690 environmentally sound approach, such as might be the case if a ground-water formation is relatively close
691 to the surface or not very well isolated by overlying soils and rock. Also, geologic and topographic
692 conditions might make full below grade burial impracticable: For example, bedrock may be sufficiently
693 near the surface that blasting would be required to excavate a disposal pit at excessive cost, and more
694 suitable alternative sites are not available. Where full below grade burial is not practicable, the size of
695 retention structures, and size and steepness of slopes associated with exposed embankments must be
696 minimized by excavation to the maximum extent reasonably achievable or appropriate given the geologic
697 and hydrologic conditions at a site. In these cases, it must be demonstrated that an above grade disposal
698 program will provide reasonably equivalent isolation of the tailings from natural erosional forces.

699 **Criterion 4.**

700 The following site and design criteria must be adhered to whether tailings or wastes are disposed of
701 above or below grade.

702 Criterion 4A. Upstream rainfall catchment areas must be minimized to decrease erosion potential and the
703 size of the floods, which could erode or wash out sections of the tailings disposal area.

704 Criterion 4B. Topographic features should provide good wind protection.

705 Criterion 4C. Embankment and cover slopes must be relatively flat after final stabilization to minimize
706 erosion potential and to provide conservative factors of safety assuring long-term stability. The broad
707 objective should be to contour final slopes to grades which are as close as possible to those which would
708 be provided if tailings were disposed of below grade: this could, for example, lead to slopes of about 10
709 horizontal to 1 vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v.
710 Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable
711 should be provided and compensating factors and conditions, which make such slopes acceptable,
712 should be identified.

713 Criterion 4D. A full self-sustaining vegetative cover must be established or rock cover employed to reduce
714 wind and water erosion to negligible levels.

715 (1) Where a full vegetative cover is not likely to be self-sustaining due to climatic or other conditions,
716 such as in semi-arid and arid regions, rock cover must be employed on slopes of the
717 impoundment system. The Department will consider relaxing this requirement for extremely
718 gentle slopes such as those, which may exist on the top of the pile.

719 (2) The following factors must be considered in establishing the final rock cover design to avoid
720 displacement of rock particles by human and animal traffic or by natural process, and to preclude
721 undercutting and piping:

722 (a) Shape, size, composition, and gradation of rock particles (excepting bedding material
723 average particles size must be at least cobble size or greater);

724 (b) Rock cover thickness and zoning of particles by size; and

725 (c) Steepness of underlying slopes.

726 (3) Individual rock fragments must be dense, sound, and resistant to abrasion, and must be free from
727 cracks, seams, and other defects that would tend to unduly increase their destruction by water
728 and frost actions. Weak, friable, or laminated aggregate may not be used.

729 (4) Rock covering of slopes may be unnecessary where top covers are very thick (on the order of
730 10m or greater); impoundment slopes are very gentle (on the order of 10h:1v or less); bulk cover
731 materials have inherently favorable erosion resistance characteristics; and, there is negligible
732 drainage catchment area upstream of the pile and good wind protection as described in Criteria
733 4A and 4B.

734 (5) Furthermore, all impoundment surfaces must be contoured to avoid areas of concentrated
735 surface runoff or abrupt or sharp changes in slope gradient. In addition to rock cover on slopes,
736 areas toward which surface runoff might be directed must be well protected with substantial rock
737 cover (rip rap). In addition to providing for stability of the impoundment system itself, overall
738 stability, erosion potential, and geomorphology of surrounding terrain must be evaluated to
739 assure that there are not ongoing or potential processes, such as gully erosion, which would lead
740 to impoundment instability.

741 Criterion 4E. The impoundment may not be located near a capable fault that could cause a maximum
742 credible earthquake larger than that which the impoundment could reasonably be expected to withstand.
743 As used in this criterion, the term “capable fault” has the same meaning as defined in section III(g) of
744 Appendix A of 10 CFR Part 100. The term “maximum credible earthquake” means that earthquake which
745 would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential
746 considering the regional and local geology and seismology and specific characteristics of local subsurface
747 material.

748 Criterion 4F. The impoundment, where feasible, should be designed to incorporate features, which will
749 promote deposition. For example, design features, which promote deposition of sediment suspended in
750 any runoff, which flows into the impoundment area, might be utilized; the object of such a design feature
751 would be to enhance the thickness of cover over time.

752 **Criterion 5.**

753 Criteria 5A-5D and Criterion 10 incorporate the basic ground-water protection standards imposed by the
754 Environmental Protection Agency in 40 CFR Part 192, Subparts D and E (48 FR 45926; October 7, 1983)
755 which apply during operations and prior to the end of closure. Groundwater monitoring to comply with
756 these standards is required by Criterion 7A.

757 Criterion 5A.

758 (1) The primary ground-water protection standard is a design standard for surface impoundments
759 used to manage byproduct material. Unless exempted under paragraph 5A(3) of this criterion,
760 surface impoundments (except for an existing portion) shall have a liner that is designed,
761 constructed, and installed to prevent any migration of wastes out of the impoundment to the
762 adjacent subsurface soil, ground water, or surface water at any time during the active life
763 (including the closure period) of the impoundment. The liner may be constructed of materials that
764 may allow wastes to migrate into the liner (but not into the adjacent subsurface soil, ground water,
765 or surface water) during the active life of the facility, provided that impoundment closure includes
766 removal or decontamination of all waste residues, contaminated containment system components
767 (liners, etc.) contaminated subsoils, and structures and equipment contaminated with waste and
768 leachate. For impoundments that will be closed with the liner material left in place, the liner must
769 be constructed of materials that can prevent wastes from migrating into the liner during the active
770 life of the facility.

771 (2) The liner required by paragraph 5A(1) above shall be:

772 (a) Constructed of materials that have appropriate chemical properties and sufficient strength
773 and thickness to prevent failure due to pressure gradients (including static head and
774 external hydrogeologic forces), physical contact with the waste or leachate to which they
775 are exposed, climatic conditions, the stress of installation, and the stress of daily
776 operation;

777 (b) Placed upon a foundation or base capable of providing support to the liner and resistance
778 to pressure gradients above and below the liner to prevent failure of the liner due to
779 settlement, compression, or uplift; and

780 (c) Installed to cover all surrounding earth likely to be in contact with the wastes or leachate.

781 (3) The applicant or licensee will be exempted from the requirements of paragraph 5A(1) of this
782 criterion if the Department finds, based on a demonstration by the applicant or licensee, that
783 alternate design and operating practices, including the closure plan, together with site
784 characteristics will prevent the migration of any hazardous constituents into ground water or
785 surface water at any future time.

786 In deciding whether to grant an exemption, the Department will consider:

- 787 (a) The nature and quantity of the wastes;
- 788 (b) The proposed alternate design and operation;
- 789 (c) The hydrogeologic setting of the facility, including the attenuative capacity and thickness
790 of the liners and soils present between the impoundment and ground water or surface
791 water; and
- 792 (d) All other factors which would influence the quality and mobility of the leachate produced
793 and the potential for it to migrate to ground water or surface water.

794 (4) A surface impoundment must be designed, constructed, maintained, and operated to prevent
795 overtopping resulting from normal or abnormal operations, overfilling, wind and wave actions,
796 rainfall, or run-on; from malfunctions of level controllers, alarms, and other equipment; and from
797 human error.

798 (5) When dikes are used to form the surface impoundment, the dikes must be designed, constructed,
799 and maintained with sufficient structural integrity to prevent massive failure of the dikes. In
800 ensuring structural integrity, it must not be presumed that the liner system will function without
801 leakage during the active life of the impoundment.

802 Criterion 5B.

803 (1) Uranium and thorium byproduct material in definition (2) of 1.2.2 shall be managed to conform to
804 the following secondary ground-water protection standard: hazardous constituents entering the
805 ground water from a licensed site must not exceed the specified concentration limits in the
806 uppermost aquifer beyond the point of compliance during the compliance period. Hazardous
807 constituents are those constituents identified by the Department pursuant to paragraph 5B(2) of
808 this criterion. Specified concentration limits are those limits established by the Department as
809 indicated in paragraph 5B(5) of this criterion. The Department will also establish the point of
810 compliance and compliance period on a site-specific basis through license conditions and orders.
811 The objective in selecting the point of compliance is to provide the earliest practicable warning
812 that the impoundment is releasing hazardous constituents to the ground water. The point of
813 compliance must be selected to provide prompt indication of ground-water contamination on the
814 hydraulically downgradient edge of the disposal area. The Department shall identify hazardous
815 constituents, establish concentration limits, set the compliance period, and may adjust the point of
816 compliance if needed to accord with developed data and site information as to the flow of ground
817 water or contaminants, when the detection monitoring established under Criterion 7A indicates
818 leakage of hazardous constituents from the disposal area.

819 (2) A constituent becomes a hazardous constituent subject to paragraph 5B(5) only when the
820 constituent meets all three of the following tests:

- 821 (a) The constituent is reasonably expected to be in or derived from the uranium and thorium
822 byproduct material in the disposal area;
- 823 (b) The constituent has been detected in the ground water in the uppermost aquifer; and
- 824 (c) The constituent is listed in Criterion 10 of this appendix.

825 (3) Even when constituents meet all three tests in paragraph 5B(2) of this criterion, the Department
826 may exclude a detected constituent from the set of hazardous constituents on a site-specific
827 basis if it finds that the constituent is not capable of posing a substantial present or potential

828 hazard to human health or the environment. In deciding whether to exclude constituents, the
829 Department will consider the following:

- 830 (a) Potential adverse effects on ground-water quality, considering
- 831 (i) The physical and chemical characteristics of the waste in the licensed site,
832 including its potential for migration;
 - 833 (ii) The hydrogeological characteristics of the facility and surrounding land;
 - 834 (iii) The quantity of ground water and the direction of ground water flow;
 - 835 (iv) The proximity and withdrawal rates of ground-water users;
 - 836 (v) The current and future uses of ground water in the area;
 - 837 (vi) The existing quality of ground water, including other sources of contamination
838 and their cumulative impact on the ground water quality;
 - 839 (vii) The potential for health risks caused by human exposure to waste constituents;
 - 840 (viii) The potential damage to wildlife, crops, vegetation, and physical structures
841 caused by exposure to waste constituents;
 - 842 (ix) The persistence and permanence of the potential adverse effects.
- 843 (b) Potential adverse effects on hydraulically-connected surface waterquality, considering
- 844 (i) The volume and physical and chemical characteristics of the waste in the
845 licensed site;
 - 846 (ii) The hydrogeological characteristics of the facility and surrounding land;
 - 847 (iii) The quantity and quality of ground water and the direction of ground water flow;
 - 848 (iv) The patterns of rainfall in the region;
 - 849 (v) The proximity of the licensed site to surface waters;
 - 850 (vi) The current and future uses of surface waters in the area and any water quality
851 standards established for those surface waters;
 - 852 (vii) The existing quality of surface water, including other sources of contamination
853 and the cumulative impact on surface water quality;
 - 854 (viii) The potential for health risks caused by human exposure to waste constituents;
 - 855 (ix) The potential damage to wildlife, crops, vegetation, and physical structures
856 caused by exposure to waste constituents; and
 - 857 (x) The persistence and permanence of the potential adverse effects.

858 (4) In making any determinations under paragraphs 5B(3) and 5B(6) of this criterion about the use of
859 ground water in the area around the facility, the Department will consider any identification of

- 860 underground sources of drinking water and exempted aquifers made by the Colorado Water
861 Quality Control Commission, as in 5 CCR 1002-8, or other agency having jurisdiction.
- 862 (5) At the point of compliance, the concentration of a hazardous constituent must not exceed:
- 863 (a) The Department-approved background concentration of that constituent in the ground
864 water;
- 865 (b) The respective value given in the table in paragraph 5C if the constituent is listed in the
866 table and if the background level of the constituent is below the value listed; or
- 867 (c) An alternate concentration limit established by the Department.
- 868 (6) Conceptually, background concentrations pose no incremental hazards and the drinking water
869 limits in Criterion 5C state acceptable hazards but these two options may not be practically
870 achievable at a specific site. Alternate concentration limits that present no significant hazard may
871 be proposed by licensees for Department consideration. Licensees must provide the basis for any
872 proposed limits including consideration of practicable corrective actions, that limits are as low as
873 reasonably achievable, and information on the factors the Department must consider. The
874 Department will establish a site specific alternate concentration limit for a hazardous constituent
875 as provided in paragraph 5B(5) of this criterion if it finds that the proposed limit is as low as
876 reasonably achievable after considering practicable corrective actions, and that the constituent
877 will not pose a substantial present or potential hazard to human health or the environment as long
878 as the alternate concentration limit is not exceeded. In making the present and potential hazard
879 finding, the Department will consider the following factors:
- 880 (a) Potential adverse effects on ground water quality, considering:
- 881 (i) The physical and chemical characteristics of the waste in the licensed site
882 including its potential for migration;
- 883 (ii) The hydrogeological characteristics of the facility and surrounding land;
- 884 (iii) The quantity of ground water and the direction of ground water flow;
- 885 (iv) The proximity and withdrawal rates of ground water users;
- 886 (v) The current and future uses of ground water in the area;
- 887 (vi) The existing quality of ground water, including other sources of contamination
888 and their cumulative impact on the ground water quality;
- 889 (vii) The potential for health risks caused by human exposure to waste constituents;
- 890 (viii) The potential damage to wildlife, crops, vegetation, and physical structures
891 caused by exposure to waste constituents;
- 892 (ix) The persistence and permanence of the potential adverse effects.
- 893 (b) Potential adverse effects on hydraulically-connected surface water quality, considering:
- 894 (i) The volume and physical and chemical characteristics of the waste in the
895 licensed site;
- 896 (ii) The hydrogeological characteristics of the facility and surrounding land;

- 897 (iii) The quantity and quality of ground water, and the direction of ground water flow;
- 898 (iv) The patterns of rainfall in the region;
- 899 (v) The proximity of the licensed site to surface waters;
- 900 (vi) The current and future uses of surface waters in the area and any water quality
901 standards established for those surface waters;
- 902 (vii) The existing quality of surface water including other sources of contamination
903 and the cumulative impact on surface water quality;
- 904 (viii) The potential for health risks caused by human exposure to waste constituents;
- 905 (ix) The potential damage to wildlife, crops, vegetations, and physical structures
906 caused by exposure to waste constituents; and
- 907 (x) The persistence and permanence of the potential adverse effects.

908 Criterion 5C.

909 Maximum Values for Ground Water Protection

Constituent or property	Maximum Concentration (Milligrams per liter):
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10, 10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8, 9a-octahydro-1, 4-endo, endo-5, 8-dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2, 2-bis, p-methoxyphenylethane)	0.1
Toxaphene (C ₁₀ H ₁₀ Cl ₆ , Technical chlorinated camphene, 67–69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichloro-phenoxypropionic acid)	0.01

910

	Becquerels per liter	PicoCuries per liter
Combined radium-226 and radium-228	0.185	5
Gross alpha-particle activity (excluding radon and uranium when producing uranium byproduct material or radon and thorium when producing thorium byproduct material)	0.555	15

911

912 Criterion 5D. If the ground water protection standards established under paragraph 5B(1) of this criterion
913 are exceeded at a licensed site, a corrective action program must be put into operation as soon as is

914 practicable, and in no event later than eighteen (18) months after the Department finds that the standards
915 have been exceeded. The licensee shall submit the proposed corrective action program and supporting
916 rationale for Department approval prior to putting the program into operation, unless otherwise directed by
917 the Department. The objective of the program is to return hazardous constituent concentration levels in
918 ground water to the concentration limits set as standards. The licensee's proposed program shall address
919 removing the hazardous constituents that have entered the ground water at the point of compliance or
920 treating them in place. The program shall also address removing or treating in place any hazardous
921 constituents that exceed concentration limits in ground water between the point of compliance and the
922 downgradient facility property boundary. The licensee shall continue corrective action measures to the
923 extent necessary to achieve and maintain compliance with the ground water protection standard. The
924 Department will determine when the licensee may terminate corrective action measures based on data
925 from the ground water monitoring program and other information that provide reasonable assurance that
926 the ground water protection standard will not be exceeded.

927 Criterion 5E. In developing and conducting ground water protection programs, applicants and licensees
928 shall also consider the following:

- 929 (1) Installation of bottom liners (Where synthetic liners are used, a leakage detection system must be
930 installed immediately below the liner to ensure major failures are detected if they occur. This is in
931 addition to the ground water monitoring program conducted as provided in Criterion 7. Where clay
932 liners are proposed or relatively thin, in situ clay soils are to be relied upon for seepage control,
933 tests must be conducted with representative tailings solutions and clay materials to confirm that
934 no significant deterioration of permeability or stability properties will occur with continuous
935 exposure of clay to tailings solutions. Tests must be run for a sufficient period of time to reveal
936 any effects if they are going to occur (in some cases deterioration has been observed to occur
937 rather rapidly after about nine months of exposure)).
- 938 (2) Mill process designs which provide the maximum practicable recycle of solutions and
939 conservation of water to reduce the net input of liquid to the tailings impoundment.
- 940 (3) Dewatering of tailings by process devices and/or in situ drainage systems (At new sites, tailings
941 must be dewatered by a drainage system installed at the bottom of the impoundment to lower the
942 phreatic surface and reduce the driving head of seepage, unless tests show tailings are not
943 amenable to such a system. Where in situ dewatering is to be conducted, the impoundment
944 bottom must be graded to assure that the drains are at a low point. The drains must be protected
945 by suitable filter materials to assure that drains remain free running. The drainage system must
946 also be adequately sized to assure good drainage).
- 947 (4) Neutralization to promote immobilization of hazardous constituents.

948 Criterion 5F. Where ground water impacts are occurring at an existing site due to seepage, action must
949 be taken to alleviate conditions that lead to excessive seepage impacts and restore ground water quality.
950 The specific seepage control and ground water protection method, or combination of methods, to be used
951 must be worked out on a site-specific basis. Technical specifications must be prepared to control
952 installation of seepage control systems. A quality assurance, testing, and inspection program, which
953 includes supervision by a qualified engineer or scientist, must be established to assure the specifications
954 are met.

955 Criterion 5G. In support of a tailings disposal system proposal, the applicant/operator shall supply
956 information concerning the following:

- 957 (1) The chemical and radioactive characteristics of the waste solutions.
- 958 (2) The characteristics of the underlying soil and geologic formations particularly as they will control
959 transport of contaminants and solutions. This includes detailed information concerning extent,

960 thickness, uniformity, shape, and orientation of underlying strata. Hydraulic gradients and
961 conductivities of the various formations must be determined. This information must be gathered
962 from borings and field survey methods taken within the proposed impoundment area and in
963 surrounding areas where contaminants might migrate to ground water. The information gathered
964 on boreholes must include both geological and geophysical logs in sufficient number and degree
965 of sophistication to allow determining significant discontinuities, fractures, and channeled deposits
966 of high hydraulic conductivity. If field survey methods are used, they should be in addition to and
967 calibrated with borehole logging. Hydrologic parameters such as permeability may not be
968 determined on the basis of laboratory analysis of samples alone; a sufficient amount of field
969 testing (e.g., pump tests) must be conducted to assure actual field properties are adequately
970 understood. Testing must be conducted to allow estimating chemi-sorption attenuation properties
971 of underlying soil and rock.

972 (3) Location, extent, quality, capacity and current uses of any ground water at and near the site.

973 Criterion 5H. Steps must be taken during stockpiling of ore to minimize penetration of radionuclides
974 into underlying soils; suitable methods include lining and/or compaction of ore storage areas.

975 **Criterion 6.**

976 (1) In disposing of waste byproduct material, licensees shall place an earthen cover (or approved
977 alternative) over tailings or wastes at the end of milling operations and shall close the waste
978 disposal area in accordance with a design ¹ which provides reasonable assurance of control of
979 radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and,
980 in any case, for at least 200 years, and (ii) limit releases of radon-222 from uranium byproduct
981 materials, and radon-220 from thorium byproduct materials, to the atmosphere so as not to
982 exceed an average ² release rate of 0.74 Becquerel per square meter per second (Bq/m² s), or
983 20 picocuries per square meter per second (pCi/m² s), to the extent practicable throughout the
984 effective design life determined pursuant to (1)(i) of this criterion. In computing required tailings
985 cover thicknesses, moisture in soils in excess of amounts found normally in similar soils in similar
986 circumstances may not be considered. Direct gamma exposure from the tailings or wastes should
987 be reduced to background levels. The effects of any thin synthetic layer may not be taken into
988 account in determining the calculated radon exhalation level. If non-soil materials are proposed
989 as cover materials, it must be demonstrated that these materials will not crack or degrade by
990 differential settlement, weathering, or other mechanism, over long-term intervals.

991 ¹ In the case of thorium byproduct materials, the standard applies only to design. Monitoring for radon emissions from
992 thorium byproduct materials after installation of an appropriately designed cover is not required.

993 ² This average applies to the entire surface of each disposal area over a period of a least one year, but a period short
994 compared to 100 years. Radon will come from both byproduct materials and from covering materials. Radon emissions from
995 covering materials should be estimated as part of developing a closure plan for each site. The standard, however, applies only to
996 the emissions from byproduct materials to the atmosphere.

997 (2) As soon as reasonably achievable after emplacement of the final cover to limit releases of radon-
998 222 from uranium byproduct material and prior to placement of erosion protection barriers or
999 other features necessary for long-term control of the tailings, the licensee shall verify through
1000 appropriate testing and analysis that the design and construction of the final radon barrier is
1001 effective in limiting releases of radon-222 to a level not exceeding 0.74 Bq/m² s (20 pCi/m² s)
1002 averaged over the entire pile or impoundment using the procedures described in 40 CFR Part 61,
1003 Appendix B, Method 115, or another method of verification approved by the Department as being
1004 at least as effective in demonstrating the effectiveness of the final radon barrier.

1005 (3) When phased emplacement of the final radon barrier is included in the applicable reclamation
1006 plan, the verification of radon-222 release rates required in paragraph (2) of this Criterion must be
1007 conducted for each portion of the pile or impoundment as the final radon barrier for that portion is
1008 emplaced.

1009 (4) Within ninety days of the completion of all testing and analysis relevant to the required verification
1010 in paragraphs (2) and (3) of this Criterion, the uranium mill licensee shall report to the Department
1011 the results detailing the actions taken to verify that levels of release of radon-222 do not exceed
1012 $0.74 \text{ Bq/m}^2 \text{ s}$ ($20 \text{ pCi/m}^2 \text{ s}$) when averaged over the entire pile or impoundment. The licensee
1013 shall maintain records until termination of the license documenting the source of input parameters
1014 including the results of all measurements on which they are based, the calculations and/or
1015 analytical methods used to derive values for input parameters, and the procedure used to
1016 determine compliance. These records shall be kept in a form suitable for transfer to the custodial
1017 agency at the time of transfer of the site to the U.S. Department of Energy or State for long-term
1018 care if requested.

1019 (5) Near surface cover materials, i.e., within the top three meters (10 feet), may not include waste or
1020 rock that contains elevated levels of radium; soils used for near surface cover must be essentially
1021 the same, as far as radioactivity is concerned, as that of surrounding surface soils. This is to
1022 ensure that surface radon exhalation is not significantly above background because of the cover
1023 material itself.

1024 (6) The design requirements in this Criterion for longevity and control of radon releases apply to any
1025 portion of a licensed and/or disposal site unless such portion contains a concentration of radium
1026 in land, averaged over areas of 100 square meters, which as a result of byproduct material, does
1027 not exceed the background level by more than: (i) 0.18 Becquerels (5 picocuries) per gram of
1028 radium-226, or, in the case of thorium byproduct material, radium-228, averaged over the first 15
1029 centimeters (cm) below the surface, and (ii) 0.56 Becquerels (15 pCi) of radium-226, or, in the
1030 case of thorium byproduct material, radium-228, averaged over 15-cm thick layers more than 15
1031 cm below the surface.

1032 Byproduct material containing concentrations of radionuclides other than radium in soil, and surface
1033 activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the
1034 dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at
1035 levels which are as low as is reasonably achievable. If more than one residual radionuclide is present in the
1036 same 100 square-meter area, the sum of the ratios for each radionuclide of concentration present to the
1037 concentration limit will not exceed "1" (unity). A calculation of the potential peak annual TEDE within 1000
1038 years to the average member of the critical group that would result from applying the radium standard
1039 (not including radon) on the site must be submitted for approval. The use of decommissioning plans with
1040 benchmark doses which exceed 1 millisievert per year (100 mrem/year), before application of ALARA,
1041 requires the approval of the Department. This requirement for dose criteria does not apply to sites that
1042 have decommissioning plans for soil and structures approved before the effective date of this Criterion
1043 6(6).

1044 (7) The licensee shall also address the nonradiological hazards associated with the wastes in
1045 planning and implementing closure. The licensee shall ensure that disposal areas are closed in a
1046 manner that minimizes the need for further maintenance. To the extent necessary to prevent
1047 threats to human health and the environment, the licensee shall control minimize, or eliminate
1048 post-closure escape of nonradiological hazardous constituents, leachate, contaminated rainwater,
1049 or waste decomposition products to the ground or surface waters or to the atmosphere.

1050 Criterion 6A.

1051 (1) For impoundments containing uranium byproduct materials, the final radon barrier must be
1052 completed as expeditiously as practicable considering technological feasibility after the pile or
1053 impoundment ceases operation in accordance with a written, Department-approved reclamation
1054 plan. (The term as expeditiously as practicable considering technological feasibility as specifically
1055 defined in 18.2 includes factors beyond the control of the licensee). Deadlines for completion of
1056 the final radon barrier and, if applicable, the following interim milestones must be established as a
1057 condition of the individual license: windblown tailings retrieval and placement on the pile and
1058 interim stabilization including dewatering or the removal of freestanding liquids and recontouring.

1059 The placement of erosion protection barriers or other feature necessary for long-term control of
1060 the tailings must also be completed in a timely manner in accordance with a written, Department-
1061 approved reclamation plan.

1062 (2) The Department may approve a licensee's request to extend the time for performance of
1063 milestones related to emplacement of the final radon barrier if, after providing an opportunity for
1064 public participation, the Department finds that the licensee has adequately demonstrated in the
1065 manner required in paragraph (2) of Criterion 6 that releases of radon-222 do not exceed an
1066 average of 0.74 Becquerel/m² s (20 pCi/m² s). If the delay is approved on the basis that the
1067 radon releases do not exceed 0.74 Becquerel/m² s (20 pCi/m² s), a verification of radon levels,
1068 as required by paragraph (2) of Criterion 6, must be made annually during the period of delay. In
1069 addition, once the Department has established the date in the reclamation plan for the milestone
1070 for completion of the final radon barrier, the Department may extend that date based on cost if
1071 after providing an opportunity for public participation, the Department finds that the licensee is
1072 making good faith efforts to emplace the final radon barrier, the delay is consistent with the
1073 definition of available technology, and the radon releases caused by the delay will not result in a
1074 significant incremental risk to the public health.

1075 (3) The Department may authorize by license amendment, upon licensee report, a portion of the
1076 impoundment to accept uranium byproduct material or such materials that are similar in physical,
1077 chemical, and radiological characteristics to the uranium mill tailings and associated wastes
1078 already in the pile or impoundment from other sources, during the closure process. No such
1079 authorization will be made if it results in a delay or impediment to emplacement of the final radon
1080 barrier over the remainder of the impoundment in a manner that will achieve levels of radon-222
1081 releases not exceeding 0.74 Becquerel/m² s (20 pCi/m² s) averaged over the entire
1082 impoundment. The verification required in paragraph (2) of Criterion 6 may be completed with a
1083 portion of the impoundment being used for further disposal if the Department makes a final
1084 finding that the impoundment will continue to achieve a level of radon-222 release not exceeding
1085 0.74 Becquerel/m² s (20 pCi/m² s) averaged over the entire impoundment. In this case, after the
1086 final radon barrier is complete except for the continuing disposal area, (a) only byproduct material
1087 will be authorized for disposal, (b) the disposal will be limited to the specified existing disposal
1088 area, and (c) this authorization will only be made after providing opportunity for public
1089 participation. Reclamation of the disposal area, as appropriate, must be completed in a timely
1090 manner after disposal operations cease in accordance with paragraph (1) of Criterion 6; however,
1091 these actions are not required to be complete as part of meeting the deadline for final radon
1092 barrier construction.

1093 **Criterion 7.**

1094 The licensee shall establish a detection monitoring program needed for the Department to set the site-
1095 specific ground water protection standards in paragraph 5B(1) of this appendix. For all monitoring under
1096 this paragraph, the licensee or applicant will propose for Department approval as license conditions which
1097 constituents are to be monitored on a site-specific basis. A detection monitoring program has two
1098 purposes. The initial purpose of the program is to detect leakage of hazardous constituents from the
1099 disposal area so that the need to set ground water protection standards is monitored. If leakage is
1100 detected, the second purpose of the program is to generate data and information needed for the
1101 Department to establish the standards under Criterion 5B. The data and information must provide a
1102 sufficient basis to identify those hazardous constituents which require concentration limit standards and to
1103 enable the Department to set the limits for those constituents and the compliance period. They may also
1104 need to provide the basis for adjustments to the point of compliance. The detection monitoring programs
1105 must be in place when specified by the Department in orders or license conditions. Once ground water
1106 protection standards have been established pursuant to paragraph 5B(1), the licensee shall establish and
1107 implement a compliance monitoring program. The purpose of the compliance monitoring program is to
1108 determine that the hazardous constituent concentrations in ground water continue to comply with the
1109 standards set by the Department. In conjunction with a corrective action program, the licensee shall
1110 establish and implement a corrective action monitoring program. The purpose of the corrective action

1111 monitoring program is to demonstrate the effectiveness of the corrective actions. Any monitoring program
1112 required by this paragraph may be based on existing monitoring programs to the extent the existing
1113 programs can meet the stated objective for the program.

1114 **Criterion 8.**

1115 Milling operations must be conducted so that all airborne effluent releases are reduced to levels as low as
1116 is reasonably achievable. The primary means of accomplishing this must be by means of emission
1117 controls. Institutional controls, such as extending the site boundary and exclusion area, may be employed
1118 to ensure that offsite exposure limits are met, but only after all practicable measures have been taken to
1119 control emissions at the source. Notwithstanding the existence of individual dose standards, strict control
1120 of emissions is necessary to assure that population exposures are reduced to the maximum extent
1121 reasonably achievable and to avoid site contamination. The greatest potential sources of offsite radiation
1122 exposure (aside from radon exposure) are dusting from dry surfaces of the tailings disposal area not
1123 covered by tailings solution and emissions from yellowcake drying and packaging operations. During
1124 operations and prior to closure, radiation doses from radon emissions from surface impoundments of
1125 uranium or thorium byproduct materials must be kept as low as is reasonably achievable.

1126 Checks must be made and logged hourly for all parameters (e.g., differential pressures and scrubber
1127 water flow rates) that determine the efficiency of yellowcake stack emission control equipment operation.
1128 The licensee shall retain each log as a record for three years after the last entry in the log is made. It
1129 must be determined whether or not conditions are within a range prescribed to ensure that the equipment
1130 is operating consistently near peak efficiency; corrective action must be taken when performance is
1131 outside of prescribed ranges. Effluent control devices must be operative at all times during drying and
1132 packaging operations and whenever air is exhausting from the yellowcake stack. Drying and packaging
1133 operations must terminate when controls are inoperative. When checks indicate the equipment is not
1134 operating within the range prescribed for peak efficiency, actions must be taken to restore parameters to
1135 the prescribed range. When this cannot be done without shutdown and repairs, drying and packaging
1136 operations must cease as soon as practicable. Operations may not be restarted after cessation due to off-
1137 normal performance until needed corrective actions have been identified and implemented. All these
1138 cessations, corrective actions, and restarts must be reported to the Department as indicated in Criterion
1139 8A, in writing, within ten days of the subsequent restart.

1140 To control dusting from tailings, that portion not covered by standing liquids must be wetted or chemically
1141 stabilized to prevent or minimize blowing and dusting to the maximum extent reasonably achievable. This
1142 requirement may be relaxed if tailings are effectively sheltered from wind, such as may be the case where
1143 they are disposed of below grade and the tailings surface is not exposed to wind. Consideration must be
1144 given in planning tailings disposal programs to methods which would allow phased covering and
1145 reclamation of tailings impoundments because this will help in controlling particulate and radon emissions
1146 during operation. To control dusting from diffuse sources, such as tailings and ore pads where automatic
1147 controls do not apply, operators shall develop written operating procedures specifying the methods of
1148 control which will be utilized.

1149 Milling operations producing or involving uranium and thorium byproduct materials must be conducted in
1150 such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed 0.25
1151 millisievert (25 millirem) to the whole body, 0.75 millisievert (75 millirem) to the thyroid, and 0.25
1152 millisievert (25 millirem) to any other organ of any member of the public as a result of exposures to the
1153 planned discharge of radioactive material, radon and its progeny excepted, to the general environment.

1154 Uranium and thorium byproduct materials must be managed so as to conform to the applicable provisions
1155 of Title 40 of the *Code of Federal Regulations*, Part 440, "Ore Mining and Dressing Point Source
1156 Category: Effluent Limitations Guidelines and New Source Performance Standards, Subpart C, Uranium,
1157 Radium, and Vanadium Ores Subcategory", as codified on January 1, 1983.

1158 Criterion 8A. Inspections of tailings or waste retention systems must be conducted daily during
1159 operations, or at an alternate frequency approved by the Department for other conditions. Such

1160 inspections shall be conducted by, or under the supervision of, a qualified engineer or scientist, and
1161 documented. The licensee shall retain the documentation for each inspection as a record for three years
1162 after the documentation is made. The Department must be immediately notified of any failure in a tailings
1163 or waste retention system that results in a release of tailings or waste into unrestricted areas, or any
1164 unusual conditions (conditions not contemplated in the design of the retention system) that if not
1165 corrected could indicate the potential or lead to failure of the system and result in a release of tailings or
1166 waste into unrestricted areas.

1167 **Criterion 9.**

1168 Criterion 9A. These criteria relating to ownership of tailings and their disposal sites became effective on
1169 November 8, 1981, and apply to all licenses terminated, issued, or renewed after that date.

1170 Criterion 9B. Any uranium or thorium milling license or tailings license must contain such terms and
1171 conditions as the NRC and Department determine necessary to assure that prior to termination of the
1172 license, the licensee will comply with ownership requirements of this criterion for sites used for tailings
1173 disposal.

1174 Criterion 9C. Title to the byproduct material licensed under this Part 18 and land, including any interests
1175 therein (other than land owned by the United States or by the State), which is used for the disposal of any
1176 such byproduct material, or is essential to ensure the long-term stability of such disposal site, must be
1177 transferred to the United States or the State in which such land is located, at the option of such State. In
1178 view of the fact that physical isolation must be the primary means of long-term control, and Government
1179 land ownership is a desirable supplementary measure, ownership of certain severable subsurface
1180 interests (for example, mineral rights) may be determined to be unnecessary to protect the public health
1181 and safety and the environment. In any case, however, the applicant/operator must demonstrate a
1182 serious effort to obtain such subsurface rights, and must in the event that certain rights cannot be
1183 obtained, provide notification in local public land records of the fact that the land is being used for the
1184 disposal of radioactive material and is subject to either a NRC or Department general or specific license
1185 prohibiting the disruption and disturbance of the tailings. In some rare cases, such as may occur with
1186 deep burial where no ongoing site surveillance will be required, surface land ownership transfer
1187 requirements may be waived with the approval of the Department and NRC. For licenses issued before
1188 November 8, 1981, the Department and NRC may take into account the status of the ownership of such
1189 land, and interests therein, and the ability of a licensee to transfer title and custody thereof to the United
1190 States or the State.

1191 Criterion 9D. If the NRC, or the Department if title is held by the State, subsequent to title transfer
1192 determines that use of the surface or subsurface estates, or both, of the land transferred to the United
1193 States or to a State will not endanger the public health, safety, welfare, or environment, the NRC, or the
1194 Department if title is held by the State, may permit the use of the surface or subsurface estates, or both,
1195 of such and in a manner consistent with the provisions provided in these criteria. If the NRC, or the
1196 Department if title is held by the state, permits such use of such land, it will provide the person who
1197 transferred such land with the right of first refusal with respect to such use of such land.

1198 Criterion 9E. Material and land transferred to the United States or the State in accordance with this
1199 Criterion 9 must be transferred to the United States or the State without cost other than administrative or
1200 legal costs incurred in carrying out such transfer.

1201 Criterion 9F. The provisions of this part respecting transfer of title and custody to land and tailings and
1202 wastes do not apply in the case of lands held in trust by the United States for any Indian tribe or lands
1203 owned by such Indian tribe subject to a restriction against alienation imposed by the United States. In the
1204 case of such lands which are used for the disposal of uranium or thorium byproduct material, as defined
1205 in Part 1, the licensee shall enter into arrangements with the NRC as may be appropriate to assure the
1206 long-term surveillance of such lands by the United States.

1207 **Criterion 10.**

1208 Secondary ground-water protection standards required by Criterion 5 of this Appendix are concentration
1209 limits for individual hazardous constituents. The following list of constituents identifies the constituents for
1210 which standards must be set and complied with if the specific constituent is reasonably expected to be in
1211 or derived from the radioactive material and has been detected in ground water. For purposes of this
1212 Appendix, the property of gross alpha activity will be treated as if it is a hazardous constituent. Thus,
1213 when setting standards under paragraph 5B(5) of Criterion 5, the Department will also set a limit for gross
1214 alpha activity. The Department does not consider the following list imposed by 40 CFR Part 192 to be
1215 exhaustive and may determine other constituents to be hazardous on a case-by-case basis, independent
1216 of those specified by the U.S. Environmental Protection Agency in Part 192.

1217 **PART 18 - CRITERION 10 HAZARDOUS CONSTITUENTS**

- 1218 - Acetonitrile (Ethanenitrile)
- 1219 - Acetophenone (Ethanone, 1-phenyl)
- 1220 - 3-(alpha-Acetylbenzyl)-4-hydroxycoumarin and salts (Warfarin)
- 1221 - 2-Acetylaminofluorene (Acetamide, N-(9H-fluoren-2-yl)-)
- 1222 - Acetyl chloride (Ethanoyl chloride)
- 1223 - 1-Acetyl-2-thiourea (Acetamide, N-(aminothioxomethyl)-)
- 1224 - Acrolein (2-Propenal)
- 1225 - Acrylamide (2-Propenamide)
- 1226 - Acrylonitrile (2-Propenenitrile)
- 1227 - Aflatoxins
- 1228 - Aldrin (1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a,8b-hexahydro-endo,exo-1,4:5,8-
1229 Dimethanonaphthalene)
- 1230 - Allyl alcohol (2-Propen-1-ol)
- 1231 - Aluminum phosphide
- 1232 - 4-Aminobiphenyl ([1,1-Biphenyl]-4-amine)
- 1233 - 6-Amino-1,1a,2,8,8a,8b-hexahydro-8-(hydroxymethyl)-8a-methoxy-5-methyl-carbamate
1234 azirino(2,3:3,4)pyrrolo(1,2-a]indole-4,7-dione,(ester) (Mitomycin C) (Azirino[2,3:3,4]pyrrolo(1,2-
1235 a]indole-4,7-dione,6-amino-8-[(amino-carbonyl)oxy)methyl]-1,1a,2,8,8a,8b-hexahydro-8a
1236 methoxy-5-methyl-)
- 1237 - 5-(Aminomethyl)-3-isoxazolol (3(2H)-Isoxazolone, 5-(aminomethyl)-)4-Aminopyridine (4-
1238 Pyridinamine)
- 1239 - Amitrole (1H-1,2,4-Triazol-3-amine)
- 1240 - Aniline (Benzenamine)
- 1241 - Antimony and compounds, N.O.S. ³

- 1242 - Aramite (Sulfurous acid,2-chloroethyl-,2-(4-(1,1-dimethylethyl)phenoxy)-1-methylethyl ester)
- 1243 - Arsenic and compounds, N.O.S. ³
- 1244 - Arsenic acid (Orthoarsenic acid)
- 1245 - Arsenic pentoxide (Arsenic (V) oxide)
- 1246 - Arsenic trioxide (Arsenic (III) oxide)
- 1247 - Auramine (Benzenamine,4,4-carbonimidoylbis (N,N-Dimethyl-,monohydrochloride)
- 1248 - Azaserine (L-Serine, diazoacetate (ester))
- 1249 - Barium and compounds, N.O.S. ³
- 1250 - Barium cyanide
- 1251 - Benz(c)acridine (3,4-Benzacridine)
- 1252 - Benz(a)anthracene (1,2-Benzanthracene)
- 1253 - Benzene (Cyclohexatriene)
- 1254 - Benzenearsonic acid (Arsonic acid, phenyl-)
- 1255 - Benzene, dichloromethyl-(Benzal chloride)
- 1256 - Benzenethiol (Thiophenol)
- 1257 - Benzidine ([1,1-Biphenyl]-4,4 diamine)
- 1258 - Benzo(b)fluoranthene (2,3-Benzofluoranthene)
- 1259 - Benzo(j)fluoranthene (7,8-Benzofluoranthene)
- 1260 - Benzo(a)pyrene (3,4-Benzopyrene)
- 1261 - p-Benzoquinone (1,4-Cyclohexadienedione)
- 1262 - Benzotrichloride (Benzene, Trichloromethyl)
- 1263 - Benzyl chloride (Benzene, (chloromethyl)-)
- 1264 - Beryllium and compounds, N.O.S. ³
- 1265 - Bis(2-chloroethoxy)methane (Ethane,1,1-(methylenebis(oxy))bis[2-chloro-])
- 1266 - Bis(2-chloroethyl) ether (Ethane, 1,1-oxybis (2-chloro-))
- 1267 - N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine)
- 1268 - Bis(2-Chloroisopropyl) ether (Propane, 2,2-oxybis[2-chloro-])
- 1269 - Bis(chloromethyl) ether (methane,oxybis[chloro-])

- 1270 - Bis(2-ethylhexyl) phthalate (1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester)
- 1271 - Bromoacetone (2-Propanone, 1-bromo-)
- 1272 - Bromomethane (Methyl bromide)
- 1273 - 4-Bromophenyl phenyl ether (Benzene, 1-bromo-4-phenoxy-)
- 1274 - Brucine (Strychnidin-10-one, 2,3-dimethoxy-)
- 1275 - 2-Butanone peroxide (Methyl ethyl ketone,peroxide)
- 1276 - Butyl benzyl phthalate (1,2-Benzenedicarboxylic acid, butylphenylmethyl ester)
- 1277 - 2-sec-Butyl-4,6-dinitrophenol (DNBP) (Phenol,2,4-dinitro-6-(1-methylpropyl)-)
- 1278 - Cadmium and compounds, N.O.S. ³
- 1279 - Calcium chromate (Chromic acid, calcium salt)
- 1280 - Calcium cyanide
- 1281 - Carbon disulfide (Carbon bisulfide)
- 1282 - Carbon oxyfluoride (Carbonyl fluoride)
- 1283 - Chloral (Acetaldehyde, trichloro-)
- 1284 - Chlorambucil (Butanoic acid, 4-(bis(2-chloroethyl)amino)benzene-)
- 1285 - Chlordane (alpha and gamma isomers)4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3,4,7,7a-
1286 tetrahydro-) (alpha and gamma isomers)
- 1287 - Chlorinated benzenes, N.O.S. ³
- 1288 - Chlorinated ethane, N.O.S. ³
- 1289 - Chlorinated fluorocarbons, N.O.S. ³
- 1290 - Chlorinated naphthalene, N.O.S. ³
- 1291 - Chlorinated phenol, N.O.S. ³
- 1292 - Chloroacetaldehyde (Acetaldehyde, chloro-)
- 1293 - Chloroalkyl ethers N.O.S. ³
- 1294 - p-Chloroaniline (Benzenamine, 4-chloro-)
- 1295 - Chlorobenzene (Benzene, chloro-)
- 1296 - Chlorobenzilate (Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-,ethyl ester)
- 1297 - p-Chloro-m-cresol (Phenol, 4-chloro-3-methyl)

- 1298 - 1-Chloro-2,3-epoxypropane (Oxirane, 2-(chloromethyl)-)
- 1299 - 2-Chloroethyl vinyl ether (Ethene, (2-chloroethoxy)-)
- 1300 - Chloroform (Methane, trichloro-)
- 1301 - Chloromethane (Methyl chloride)
- 1302 - Chloromethyl methyl ether (Methane, chloromethoxy-)
- 1303 - 2-Chloronaphthalene (Naphthalene, beta-chloro-)
- 1304 - 2-Chlorophenol (Phenol, o-chloro-)
- 1305 - 1-(o-Chlorophenyl) thiourea (Thiourea, (2-chlorophenyl)-)
- 1306 - 3-Chloropropionitrile (Propanenitrile, 3-chloro-)
- 1307 - Chromium and compounds, N.O.S. ³
- 1308 - Chrysene (1,2-Benzphenanthrene)
- 1309 - Citrus red No. 2 (2-Naphthol, 1-((2,5-dimethoxyphenyl)azo)-)
- 1310 - Coal tars
- 1311 - Copper cyanide
- 1312 - Creosote (Creosote, wood)
- 1313 - Cresols (Cresylic acid) (Phenol, methyl-)
- 1314 - Crotonaldehyde (2-Butenal)
- 1315 - Cyanides (soluble salts and complexes), N.O.S. ³
- 1316 - Cyanogen (Ethanedinitrile)
- 1317 - Cyanogen bromide (Bromine cyanide)
- 1318 - Cyanogen chloride (Chlorine cyanide)
- 1319 - Cycasin (beta-D-Glucopyranoside, (methyl-ONN-azoxy)methyl-)
- 1320 - 2-Cyclohexyl-4,6-dinitrophenol (phenol, 2-cyclohexyl-4,6-dinitro-)
- 1321 - Cyclophosphamide (2H-1,3,2-Oxazaphosphorine (bis(2-chloroethyl)amino)-tetrahydro-,2-oxide)
- 1322 - Daunomycin (5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-((3-amino-2,3,6-trideoxy)-alpha-L-
 1323 lyxo-hexopyranosyl)oxy)7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-)
- 1324 - DDD (Dichlorodiphenyldichloroethane)(Ethane, 1,1-dichloro-2,2-bis(p-chlorophenyl)-)
- 1325 - DDE (Ethylene, 1,1-dichloro-2,2-bis(4-chlorophenyl)-)

- 1326 - DDT (Dichlorodiphenyltrichloroethane) (Ethane, 1,1,1-trichloro-2,2-bis (p-chlorophenyl)-)
- 1327 - Diallate (S-(2,3-dichloroallyl)diisopropylthiocarbamate)
- 1328 - Dibenz(a,h)acridine(1,2,5,6-Dibenzacridine)
- 1329 - Dibenz(a,j)acridine(1,2,7,8-Dibenzacridine)
- 1330 - Dibenz(a,h)anthracene (1,2,5,6-Dibenzanthracene)
- 1331 - 7H-Dibenzo(c,g)carbazole (3,4,5,6-Dibenzcarbazole)
- 1332 - Dibenzo(a,e)pyrene(1,2,4,5-Dibenzpyrene)
- 1333 - Dibenzo(a,h)pyrene(1,2,5,6-Dibenzpyrene)
- 1334 - Dibenzo(a,i)pyrene(1,2,7,8-Dibenzpyrene)
- 1335 - 1,2-Dibromo-3-chloropropane (Propane, 1,2-dibromo-3-chloro-)
- 1336 - 1,2 Dibromoethane (Ethylene dibromide)
- 1337 - Dibromomethane (Methylene bromide)
- 1338 - Di-n-butyl phthalate (1,2-Benzenedicarboxylic acid, dibutyl ester)
- 1339 - o-Dichlorobenzene (Benzene, 1,2-dichloro-)
- 1340 - m-Dichlorobenzene (Benzene, 1,3-dichloro-)
- 1341 - p-Dichlorobenzene (Benzene, 1,4-dichloro-)
- 1342 - Dichlorobenzene, N.O.S. ³ (Benzene, dichloro-N.O.S. ³)
- 1343 - 3,3-Dichlorobenzidine ([1,1, Biphenyl]-4,4-diamine, 3,3-dichloro-)
- 1344 - 1,4-Dichloro-2-butene (2-Butene, 1,4-dichloro-)
- 1345 - Dichlorodifluoromethane (Methane, dichlorodifluoro-)
- 1346 - 1,1 Dichloroethane (Ethylidene dichloride)
- 1347 - 1,2 Dichloroethane (Ethylene dichloride)
- 1348 - trans-1,2-Dichloroethene (1,2-Dichloroethylene)
- 1349 - Dichloroethylene, N.O.S. ³ (Ethene, dichloro-N.O.S. ³)
- 1350 - 1,1-Dichloroethylene (Ethene, 1,1-dichloro-)
- 1351 - Dichloromethane (Methylene chloride)
- 1352 - 2,4-Dichlorophenol (Phenol, 2,4-dichloro-)
- 1353 - 2,6-Dichlorophenol (Phenol, 2,6-dichloro-)

- 1354 - 2,4-Dichlorophenoxyacetic acid (2,4-D), salts and esters (Acetic acid, 2,4-dichlorophenoxy-, salts and esters)
1355
- 1356 - Dichlorophenylarsine (Phenyl dichloroarsine)
- 1357 - Dichloropropane, N.O.S. ³ (Propane, dichloro-N.O.S. ³)
- 1358 - 1,2-Dichloropropane (Propylene dichloride)
- 1359 - Dichloropropanol, N.O.S. ³ (Propanol, dichloro-N.O.S. ³)
- 1360 - Dichloropropene, N.O.S. ³ (Propene, dichloro-N.O.S. ³)
- 1361 - 1,3-Dichloropropene (1-Propene, 1,3-dichloro-)
- 1362 - Dieldin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octa-hydro-endo,exo-1,4:5,8-Dimethanonaphthalene)
1363
- 1364 - 1,2:3,4-Diepoxybutane (2,2,-Bioxirane)
- 1365 - Diethylarsine (Arsine, diethyl-)
- 1366 - N,N-Diethylhydrazine (Hydrazine, 1,2-diethyl)
- 1367 - O,O-Diethyl S-methyl ester of phosphorodithioic acid (Phosphorodithioic acid, O,O-diethyl S-methyl ester)
1368
- 1369 - O,O-Diethylphosphoric acid, O-p-nitrophenyl ester (Phosphoric acid, diethyl p-nitrophenyl ester)
- 1370 - Diethyl phthalate (1,2-Benzenedicarboxylic acid, diethyl ester)
- 1371 - O,O-Diethyl O-2-pyrazinyl phosphorothioate (Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester)
- 1372 - Diethylstilbesterol (4,4-Stilbenediol, alpha, alpha-diethyl, bis(dihydrogen phosphate, (E)-)
- 1373 - Dihydrosafrole (Benzene, 1,2-methylenedioxy-4-propyl-)
- 1374 - 3,4-Dihydroxy-alpha-(methylamino)methylbenzyl alcohol (1,2-Benzenediol, 4-(1-hydroxy-2
1375 (methylamino)ethyl))
- 1376 - Dilsopropylfluorophosphate (DFP) (Phosphorofluoridic acid, bis(1-methylethyl) ester)
- 1377 - Dimethoate (Phosphorodithioic acid, O,O-dimethyl S-(2-(methylamino)-2-oxoethyl) ester)
- 1378 - 3,3,-Dimethoxybenzidine ((1,1,-Biphenyl)-4,4,-diamine, 3-3,-dimethoxy-)
- 1379 - p-Dimethylaminoazobenzene (Benzenamine, N,N-dimethyl-4-(phenylazo)-)
- 1380 - 7,12-Dimethylbenz(a)anthracene(1,2-Benzathracene, 7,12-dimethyl-)
- 1381 - 3,3-Dimethylbenzidine (1,1-Biphenyl)-4,4,diamine, 3,3-dimethyl-)
- 1382 - Dimethylcarbamoyl chloride (Carbamoyl chloride, dimethyl)
- 1383 - 1,1 Dimethylhydrazine (Hydrazine, 1,1-dimethyl-)

- 1384 - 1,2-Dimethylhydrazine (Hydrazine, 1,2-dimethyl-)
- 1385 - 3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino) carbonyl] oxime (Thiofanox)
- 1386 - alpha,alpha-Dimethylphenethylamine (Ethanamine, 1,1-dimethyl-2-phenyl-)
- 1387 - 2,4-Dimethylphenol (Phenol, 2,4-dimethyl-)
- 1388 - Dimethyl phthalate (1,2-Benzenedicarboxylic acid, dimethyl ester)
- 1389 - Dimethyl sulfate (Sulfuric acid, dimethyl ester)
- 1390 - Dinitrobenzene, N.O.S. ³ (Benzene, dinitro-N.O.S. ³)
- 1391 - 4,6-Dinitro-o-cresol and salts (Phenol, 2,4-dinitro-6-methyl-, and salts)
- 1392 - 2,4-Dinitrophenol (Phenol, 2,4-dinitro-)
- 1393 - 2,4-Dinitrotoluene (Benzene, 1-methyl-2,4-dinitro-)
- 1394 - 2,6-Dinitrotoluene (Benzene, 1-methyl 2,6-dinitro-)
- 1395 - Di-n-octyl phthalate (1,2-Benzenedicarboxylic acid, dioctyl ester)
- 1396 - 1,4-Dioxane (1,4-Diethylene oxide)
- 1397 - Diphenylamine (Benzenamine, N-phenyl-)
- 1398 - 1,2-Diphenylhydrazine (Hydrazine, 1,2-diphenyl-)
- 1399 - Di-n-propylnitrosamine (N-Nitroso-di-n-propylamine)
- 1400 - Disulfoton (O,O-diethyl S-(2-(ethylthio)ethyl) phosphorodithioate)
- 1401 - 2,4-Dithiobiuret (Thiomidodicarbonic diamide)
- 1402 - Endosulfan (5-Norbomene, 2,3-dimethanol,1,4,5,6,7,7-hexachloro-cyclic sulfite)
- 1403 - Endrin and metabolites (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,
1404 endo-1,4,5,8-dimethanonaphthalene, and metabolites)
- 1405 - Ethyl carbamate (Urethan) (Carbamic acid, ethyl ester)
- 1406 - Ethyl cyanide (Propanenitrile)
- 1407 - Ethylenebisdithiocarbamic acid, salts, and esters (1,2-Ethanediy-biscarbamodithioic acid, salts
1408 and esters)
- 1409 - Ethyleneimine (Aziridine)
- 1410 - Ethylene oxide (Oxirane)
- 1411 - Ethylenethiourea (2-Imidazolidinethione)
- 1412 - Ethyl methacrylate (2-Propenoic acid, 2-methyl-, ethyl ester)

- 1413 - Ethyl methanesulfonate (Methanesulfonic acid, ethyl ester)
- 1414 - Fluoranthene (Benzo[j,k]fluorene)
- 1415 - Fluorine
- 1416 - 2-Fluoroacetamide (Acetamide, 2-fluoro-)
- 1417 - Fluoroacetic acid, sodium salt (Acetic acid, fluoro-sodium salt)
- 1418 - Formaldehyde (Methylene oxide)
- 1419 - Formic acid (Methanoic acid)
- 1420 - Glycidylaldehyde (1-Propanol-2,3 epoxy)
- 1421 - Halomethane, N.O.S. ³
- 1422 - Heptachlor (4,7-Methano-1H-indene.1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-)
- 1423 - Heptachlor epoxide (alpha, beta, and gamma isomers) (4,7-Methano-1H-indene, 1,4,5,6,7,8,8-
- 1424 - heptachloro-2,3-epoxy-3a,4,7,7-tetrahydro-,alpha, beta, and gamma isomers)
- 1425 - Hexachlorobenzene (Benzene, hexachloro-)
- 1426 - Hexachlorobutadiene (1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)
- 1427 - Hexachlorocyclohexane (all isomers) (Lindane and isomers)
- 1428 - Hexachlorocyclopentadiene (1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-)
- 1429 - Hexachloroethane (Ethane, 1,1,1,2,2,2-hexachloro-)
- 1430 - 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,endo-dimethanonaphthalene
- 1431 - (Hexachlorohexa-hydro-endo,endo-dimethanonaphthalene)
- 1432 - Hexachlorophene (2,2,-Methylenebis(3,4,6-trichlorophenol)
- 1433 - Hexachloropropene (1-Propene, 1,1,2,3,3,3-hexachloro-)
- 1434 - Hexaethyl tetraphosphate (Tetraphosphoric acid, hexaethyl ester)
- 1435 - Hydrazine (Diamine)
- 1436 - Hydrocyanic acid (Hydrogen cyanide)
- 1437 - Hydrofluoric acid (Hydrogen fluoride)
- 1438 - Hydrogen sulfide (Sulfur hydride)
- 1439 - Hydroxydimethylarsine oxide (Cacodylic acid)
- 1440 - Indeno (1,2,3-cd)pyrene(1,10-(1,2-phenylene)pyrene)
- 1441 - Iodomethane (Methyl iodide)

- 1442 - Iron dextran (Ferric dextran)
- 1443 - Isocyanic acid, methyl ester (Methyl isocyanate)
- 1444 - Isobutyl alcohol (1-Propanol, 2-methyl-)
- 1445 - Isosafrole (Benzene, 1,2-methylenedioxy-4-allyl-)
- 1446 - Kepone (decachlorooctahydro-1,3,4-Methano-2H-cyclobuta[cd]pentalen-2-one)
- 1447 - Lasiocarpine (2-Butenoic acid, 2-methyl-,7-[(2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy) methyl]2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl-ester)
- 1448
- 1449 - Lead and compounds, N.O.S. ³
- 1450 - Lead acetate (Acetic acid, lead salt)
- 1451 - Lead phosphate (Phosphoric acid, lead salt)
- 1452 - Lead subacetate (Lead, bis(acetato-O)tetrahydroxytri-)
- 1453 - Maleic anhydride (2,5-Furandione)
- 1454 - Maleic hydrazide (1,2-Dihydro-3,6-pyridazinedione)
- 1455 - Malononitrile (Propanedinitrile)
- 1456 - Melphalan (Alanine, 3-(p-bis(2-chloroethyl)amino)phenyl-L-)- Mercury fulminate (Fulminic acid, mercury salt)
- 1457
- 1458 - Mercury and compounds, N.O.S. ³
- 1459 - Methacrylonitrile (2-Propenenitrile,2-methyl-)
- 1460 - Methanethiol (Thiomethanol)
- 1461 - Methapyrilene (Pyridine, 2-[(2-dimethylamino)ethyl]-2-thenylamino-)
- 1462 - Metholmyl (Acetimidic acid, N-[(methylcarbamoyl)oxy] thio-,methyl ester)
- 1463 - Methoxychlor (Ethane, 1,1,1-trichloro-2,2,-bis(p-methoxyphenyl)-)
- 1464 - 2-Methylaziridine (1,2-Propylenimine)
- 1465 - 3-Methylcholanthrene (Benz[j]aceanthrylene,1,2-dihydro-3-methyl-)
- 1466 - Methyl chlorcarbonate (Carbonochloridicacid, methyl ester)
- 1467 - 4,4-Methylenebis (2-chloroaniline) Benzenamine, 4,4-methylenebis-(2-chloro-)
- 1468 - Methyl ethyl ketone (MEK) (2-Butanone)
- 1469 - Methyl hydrazine (Hydrazine methyl-)
- 1470 - 2-Methylactonitrile (Propanenitrile 2-hydroxy-2-methyl-)

- 1471 - Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)
- 1472 - Methyl methanesulfonate Methanesulfonicacid, methyl ester)
- 1473 - 2-Methyl-2-(methylthio)propionaldehyde-o-(methylcarbonyl) oxime (Propanal,2-methyl-
- 1474 - 2(methylthio-0-[(methylamino)carbonyl]oxime)
- 1475 - N-Methyl-N,-nitro-N-nitrosoguanidine (Guanidine, N-nitroso-N-methyl-N,-nitro-)
- 1476 - Methyl parathion (0,0-dimethyl 0-(40 nitrophenyl) phosphorothioate)
- 1477 - Methylthiouracil (4-IH-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)
- 1478 - Molybdenum and compounds, N.O.S. ³
- 1479 - Mustard gas (Sulfide, bis(2-chloroethyl)-)
- 1480 - Naphthalene
- 1481 - 1,4-Naphthoquinone (1,4-Naphthalenedione)
- 1482 - 1-Naphthylamine (alpha-Naphthylamine)
- 1483 - 2-Naphthylamine (beta-Naphthylamine)
- 1484 - 1-Naphthyl-2-thiourea (Thiourea, 1-naphthalenyl-)
- 1485 - Nickel and compounds, N.O.S. ³
- 1486 - Nickel carbonyl (Nickel tetracarbonyl)
- 1487 - Nickel cyanide (Nickel (II) cyanide)
- 1488 - Nicotine and salts (Pyridine, (S)-3-(1-methyl-2-pyrrolidinyl)-, and salts)
- 1489 - Nitric oxide (Nitrogen (II) oxide)
- 1490 - p-Nitroaniline (Benzenamine, 4-nitro-)
- 1491 - Nitrobenzine (Benzene, nitro-)
- 1492 - Nitrogen dioxide (Nitrogen (IV) oxide)
- 1493 - Nitrogen mustard and hydrochloride salt (Ethanamine, 2-chloro-,N-(2-chloroethyl)-N-methyl-, and
- 1494 - hydrochloride salt)
- 1495 - Nitrogen mustard N-Oxide and hydrochloride salt (Ethanamine, 2-chloro-,N-(2-chloroethyl)-N-
- 1496 - methyl-and hydrochloride salt)
- 1497 - Nitroglycerine (1,2,3-Propanetriol, trinitrate)
- 1498 - 4-Nitrophenol (Phenol, 4-nitro)
- 1499 - 4-Nitroquinoline-1-oxide (Quinoline,4-nitro-1-oxide-)

- 1500 - Nitrosamine, N.O.S. ³
- 1501 - N-Nitrosodi-n-butylamine (1-Butanamine,N-butyl-N-nitroso-)
- 1502 - N-Nitrosodiethanolamine (Ethanol, 2,2-(nitrosoimino)bis-)
- 1503 - N-Nitrosodiethylamine (Ethanamine, N-ethyl-N-nitroso-)
- 1504 - N-Nitrosodimethylamine (Dimethylnitrosamine)
- 1505 - N-Nitroso-N-ethylurea (Carbamide, N-ethyl-N-nitroso-)
- 1506 - N-Nitrosomethylethylamine (Ethanamine, N-methyl-N-nitroso-)
- 1507 - N-Nitroso-N-methylurea (Carbamide, N-methyl-N-nitroso-)
- 1508 - N-Nitroso-N-methylurethane (Carbamic acid, methylnitroso-, ethyl ester)
- 1509 - N-Nitrosomethylvinylamine (Ethenamine,N-methyl-N-nitroso-)
- 1510 - N-Nitrosomorpholine (Morpholine,-N-nitroso-)
- 1511 - N-Nitrosonomicotine (Nornicotine,-N-nitroso-)
- 1512 - N-Nitrosopiperidine (Pyridine, hexahydro-,N-nitroso-)
- 1513 - Nitrosopyrrolidine (Pyrrole, tetrahydro-N-nitroso-)
- 1514 - N-Nitrososarcosine (Sarcosine,-N-nitroso-)
- 1515 - 5-Nitro-o-toluidine (Benzenamine, 2-methyl-5-nitro-)
- 1516 - Octamethylpyrophosphoramidate (Diphosphoramidate, octamethyl-)
- 1517 - Osmium tetroxide (Osmium(VIII)oxide)
- 1518 - 7-Oxabicyclo(2,2,1)heptane-2,3-dicarboxylic acid (Endothal)
- 1519 - Paraldehyde (1,3,5-Trioxane, 2,4,6-trimethyl-)
- 1520 - Parathion (Phosphorothioic acid O,O-diethylO-(p-nitrophenyl) ester)
- 1521 - Pentachlorobenzene (Benzene, pentachloro-)
- 1522 - Pentachloroethane (Ethane, pentachloro-)
- 1523 - Pentachloronitrobenzene (PCNB) (Benzene, Pentachloronitro-)
- 1524 - Pentachlorophenol (Phenol, pentachloro-)
- 1525 - Phenacetin (Acetamide, N-(4-ethoxyphenyl)-)
- 1526 - Phenol (Benzene, hydroxy-)
- 1527 - Phenylenediamine (Benzenediamine)

- 1528 - Phenylmercury acetate (Mercury acetatophenyl-)
- 1529 - N-Phenylthiourea (Thiourea, phenyl-)
- 1530 - Phosgene (Carbonyl chloride)
- 1531 - Phosphine (Hydrogen phosphide)
- 1532 - Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl]ester (Phorate)
- 1533 - Phosphorothioic acid, O,O-dimethyl O-(p-[(dimethylamino)sulfonyl]phenyl)ester (Famphur)
- 1534 - Phthalic acid esters, N.O.S. ³ (Benzene, 1,2-dicarboxylic acid, esters, N.O.S. ³)
- 1535 - Phthalic anhydride (1,2-Benzenedicarboxylic acid anhydride)
- 1536 - 2-Picoline (Pyridine, 2-methyl-)
- 1537 - Polychlorinated biphenyl, N.O.S. ³
- 1538 - Potassium cyanide
- 1539 - Potassium silver cyanide (Argentate(1-),dicyano-,potassium)
- 1540 - Pronamide (3,5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide)
- 1541 - 1,3 Propane sultone (1,2-Oxathiolane, 2,2-dioxide)
- 1542 - n-Propylamine (1-Propanamine)
- 1543 - Propylthiouracil (Undecamethylenediamine,N,N-bis(2-chlorobenzyl-),dihydrochloride)
- 1544 - 2-Propyn-1-ol (Propargyl alcohol)
- 1545 - Pyridine
- 1546 - Radium-226 and -228
- 1547 - Reserpine (Yohimban-16-carboxylic acid,11,17-dimethoxy-18-[3,4,5-trimethoxybenzoyl]oxy]-,
1548 methyl ester)
- 1549 - Resorcinol (1,3-Benzenediol)
- 1550 - Saccharin and salts (1,2-Benzoisothiazolin-3-one, 1,1-dioxide, and salts)
- 1551 - Safrele (Benzene, 1,2-methylenedioxy-4-allyl-)
- 1552 - Selenious acid (Selenium dioxide)
- 1553 - Selenium and compounds, N.O.S. ³
- 1554 - Selenium sulfide (Sulfur selenide)
- 1555 - Selenourea (Carbamimidoseleoic acid)

- 1556 - Silver and compounds, N.O.S. ³
- 1557 - Silver cyanide
- 1558 - Sodium cyanide
- 1559 - Streptozotocin (D-Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-)
- 1560 - Strontium sulfide
- 1561 - Strychnine and salts (Strychnidin-10-one, and salts)
- 1562 - 1,2,4,5-Tetrachlorobenzene (Benzene,1,2,4,5-tetrachloro-)
- 1563 - 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (Dibenzo-p-dioxin, 2,3,7,8-tetrachloro-)
- 1564 - Tetrachloroethane, N.O.S. ³ (Ethane, tetrachloro-N.O.S. ³)
- 1565 - 1,1,1,2-Tetrachlorethane (Ethane, 1,1,1,2-tetrachloro-)
- 1566 - 1,1,2,2-Tetrachlorethane (Ethane 1,1,2,2-tetrachloro-)
- 1567 - Tetrachlorethane (Ethene, 1,1,2,2-tetrachloro-)
- 1568 - Tetrachloromethane (Carbon tetrachloride)
- 1569 - 2,3,4,6-Tetrachlorophenol (Phenol 2,3,4,6-tetrachloro-)
- 1570 - Tetraethyldithiopyrophosphate (Dithiopyrophosphoric acid, tetraethyl-ester)
- 1571 - Tetraethyl lead (Plumbane, tetraethyl-)
- 1572 - Tetraethylpyrophosphate (Pyrophosphoricacide, tetraethyl ester)
- 1573 - Tetranitromethane (Methane, tetranitro-)
- 1574 - Thallium and compounds, N.O.S. ³
- 1575 - Thallic oxide (Thallium (III) oxide)
- 1576 - Thallium (I) acetate (Acetic acid, thallium (I) salt)
- 1577 - Thallium (I) carbonate (Carbonic acid dithallium (I) salt)
- 1578 - Thallium (I) chloride
- 1579 - Thallium (I) nitrate (Nitric acid, thallium (I) salt)
- 1580 - Thallium selenite
- 1581 - Thallium (I) sulfate (Sulfuric acid, thallium (I) salt)
- 1582 - Thioacetamide (Ethanethioamide)
- 1583 - Thiosemicarbazide (Hydrazinecarbothioamide)

- 1584 - Thiourea (Carbamide thio-)
- 1585 - Thiuram (Bis(dimethylthiocarbamoyl) disulfide)
- 1586 - Thorium and compounds, N.O.S. ³ when producing thorium byproduct material
- 1587 - Toluene (Benzene, methyl-)
- 1588 - Toluenediamine (Diaminotoluene)
- 1589 - o-Toluidine hydrochloride (Benzenamine, 2-methyl-,hydrochloride)
- 1590 - Tolyene diisocyanate (Benzene, 1,3-diisocyanatomethyl-)
- 1591 - Toxaphene (Camphene, octachloro-)
- 1592 - Tribromomethane (Bromoform)
- 1593 - 1,2,4-Trichlorobenzene (Benzene, 1,2,4-trichloro-)
- 1594 - 1,1,1-Trichloroethane (Methyl chloroform)
- 1595 - 1,1,2-Trichloroethane (Ethane, 1,1,2-trichloro-)
- 1596 - Trichloroethene (Trichloroethylene)
- 1597 - Trichloromethanethiol (Methanethiol, trichloro-)
- 1598 - Trichloromonofluoromethane (Methane, trichlorofluoro-)
- 1599 - 2,4,5-Trichlorophenol (Phenol, 2,4,5-trichloro-)
- 1600 - 2,4,6-Trichlorophenol (Phenol, 2,4,6-trichloro-)
- 1601 - 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) (Acetic acid, 2,4,5-trichlorophenoxy-)
- 1602 - 2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex) (Propionic acid, 2-(2,4,5-
- 1603 - trichlorophenoxy)-)
- 1604 - Trichloropropane, N.O.S. ³ (Propane, trichloro-, N.O.S. ³)
- 1605 - 1,2,3-Trichloropropane (Propane, 1,2,3-trichloro-)
- 1606 - O,O,O-Triethyl phosphorothioate (Phosphorothioic acid, O,O,O-triethyl ester)
- 1607 - sym-Trinitrobenzene (Benzene, 1,3,5-trinitro-)
- 1608 - Tris(1-aziridinyl) phosphine sulfide (Phosphine sulfide, tris(1-aziridinyl-)
- 1609 - Tris(2,3-dibromopropyl) phosphate (1-Propanol, 2,3-dibromo-, phosphate)
- 1610 - Trypan blue (2,7-Naphthalenedisulfonic acid, 3,3,-((3,3,-dimethyl (1,1,-biphenyl)-
- 1611 - 4,4,diyl)bis(azo))bis(5-amino-4-hydroxy-tetrasodium salt)
- 1612 - Uracil mustard (Uracil-5-[bis(2-chloroethyl)amino]-)

- 1613 - Uranium and compounds, N.O.S. ³
- 1614 - Vanadic acid, ammonium salt (ammonium vanadate)
- 1615 - Vanadium pentoxide (Vanadium (V) oxide)
- 1616 - Vinyl chloride (Ethene, chloro-)
- 1617 - Zinc cyanide
- 1618 - Zinc phosphide
- 1619 3 The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by
- 1620 name in this list.