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Development Document for Effluent Limitations Guidelines and Standards for the

Proposed

Nonferrous Metals

Point Source Category

Phase II

Supplemental Development
Document For:

Secondary Uranium

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Secondary Uranium Supplement

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U.S. Environmental Protection Agency

SECONDARY URANIUM SUBCATEGORY

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SECONDARY URANIUM SUBCATEGORY

SECTION I

SUMMARY AND CONCLUSIONS

Pursuant to Sections 301, 304, 306, 307, and 501 of the Clean Water Act and the provisions of the Settlement Agreement in Natural Resources Defense Council v. Train, 8 ERC 2120 (D.D.C. 1976) modified, 12 ERC 1833 (D.D.C. 1979), EPA has collected and analyzed data for plants in the secondary uranium subcategory. EPA has never proposed or promulgated effluent limitations or standards for this subcategory. This document and the administrative record provide the technical basis for proposing effluent limitations based on best practicable technology (BPT) and best available technology (BAT) for existing direct dischargers, pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The secondary uranium subcategory is comprised of three plants. Of the three plants, one discharges directly to a stream, and two operate dry processes.

EPA first studied the secondary uranium subcategory to determine whether differences in raw materials, final products, manufacturing processes, equipment, age and size of plants, or water usage required the development of separate effluent limitations and standards for different segments of the subcategory. This involved a detailed analysis of wastewater discharge and treated effluent characteristics, including (1) the sources and volume of water used, the processes used, and the sources of pollutants and wastewaters in the plant; and (2) the constituents of wastewaters, including toxic pollutants. As a result, seven subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Refinery filtrate,
- Slag leach slurry,
- Solvent extraction raffinate,
- Digestion operation wet air pollution control,
- Evaporation and calcination wet air pollution control,
- Hydrogen reduction and hydrofluorination KOH wet air pollution control, and
- Hydrofluorination wet air pollution control.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the secondary uranium subcategory. The Agency analyzed both historical

and newly generated data on the performance of these technologies, including their nonwater quality environmental impacts and air quality, solid waste generation, and energy requirements. EPA also studied various flow reduction techniques reported in the data collection portfolios (dcp) and plant visits.

Engineering costs were prepared for each of the control and treatment options considered for the subcategory. These costs were then used by the Agency to estimate the impact of implementing the various options on the subcategory. For each control and treatment option that the Agency found to be most effective and technically feasible in controlling the discharge of pollutants, we estimated the number of potential closures, number of employees affected, and impact on price. These results are reported in a separate document entitled "The Economic Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Nonferrous Smelting and Refining Industry."

After examining the various treatment technologies, the Agency has identified BPT to represent the average of the best existing technology. Metals removal based on chemical precipitation and sedimentation technology is the basis for the BPT limitations. Steam stripping was selected as the technology basis for ammonia limitations. To meet the BPT effluent limitations based on this technology, the secondary uranium subcategory is expected to incur an estimated capital cost of $28,600 and an annual cost of $73,644.

For BAT, filtration is added as an effluent polishing step to the BPT end-of-pipe treatment scheme. To meet the BAT effluent limitations based on this technology, the secondary uranium subcategory is estimated to incur a capital cost of $54,312 and an annual cost of $86,452.

NSPS is equivalent to BAT. In selecting NSPS, EPA recognizes that new plants have the opportunity to implement the best and most efficient manufacturing processes and treatment technology. As such, the technology basis of BAT has been determined as the best demonstrated technology.

PSES is not being proposed for this subcategory because there are no existing indirect dischargers in the secondary uranium subcategory. For PSNS, the Agency selected pretreatment and end-of-pipe treatment techniques equivalent to BAT.

The best conventional technology (BCT) replaces BAT for the control of conventional pollutants. BCT is not being proposed at this time because the methodology for BCT has not yet been finalized.

The mass limitations and standards for BPT, BAT, NSPS, and PSNS are presented in Section II.

SECONDARY URANIUM SUBCATEGORY

SECTION II

RECOMMENDATIONS

1. EPA has divided the secondary uranium subcategory into seven subdivisions for the purpose of effluent limitations and standards. These subdivisions are:

   (a) Refinery filtrate,
   (b) Slag leach slurry,
   (c) Solvent extraction raffinate,
   (d) Digestion operation wet air pollution control,
   (e) Evaporation and calcination wet air pollution control,
   (f) Hydrogen reduction and hydrofluorination KOH wet air pollution control, and
   (g) Hydrofluorination wet air pollution control.

2. BPT is proposed based on the performance achievable by the application of ammonia steam stripping pretreatment for removal of ammonia, followed by chemical precipitation and sedimentation technology. The following BPT effluent limitations are proposed:

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of uranium trioxide produced		
Chromium (total)	15.310	6.264
Copper	66.120	34.800
Nickel	66.820	44.200
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	139.200	78.300
Total Suspended Solids	1,427.000	678.600
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.672	0.684
Copper	7.220	3.800
Nickel	7.296	4.826
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	15.200	8.550
Total Suspended Solids	155.800	74.100
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	2.332	0.954
Copper	10.070	5.300
Nickel	10.180	6.731
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	21.200	11.930
Total Suspended Solids	217.300	103.400
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of uranium trioxide produced		
Chromium (total)	0.013	0.005
Copper	0.057	0.030
Nickel	0.058	0.038
Ammonia (as N)	3.900	1.758
Fluoride	1.050	0.600
Uranium	0.120	0.068
Total Suspended Solids	1.230	0.585
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/kg (lb/million lbs) of uranium trioxide produced		
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.009	0.004
Copper	0.038	0.020
Nickel	0.038	0.025
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.080	0.045
Total Suspended Solids	0.820	0.390
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

3. BAT is proposed based on the performance achievable by the application of ammonia steam stripping pretreatment for ammonia removal, followed by chemical precipitation, sedimentation, and multimedia filtration technology. The following BAT effluent limitations are proposed:

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	1,439.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.500
Fluoride	133.000	76.000
Uranium	10.180	5.738

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030

BAT MASS LIMITATIONS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

4. NSPS are proposed based on the performance achievable by the application of ammonia steam stripping pretreatment for removal of ammonia, followed by chemical precipitation, sedimentation, and multimedia filtration technology. The following effluent standards are proposed for new sources:

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550
Total Suspended Solids	522.000	417.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	10.180	5.738
Total Suspended Solids	57.000	45.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003
Total Suspended Solids	79.500	63.600
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045
Total Suspended Solids	0.450	0.360
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030
Total Suspended Solids	0.300	0.240
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

5. PSES is not being proposed for this subcategory at this time because there are no existing indirect dischargers in the secondary uranium subcategory.

6. PSNS are proposed based on the performance achievable by the application of ammonia steam stripping pretreatment for removal of ammonia, followed by chemical precipitation, sedimentation, and multimedia filtration technology. The following pretreatment standards are proposed for new sources:

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	10.180	5.738

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

7. EPA is not proposing BCT at this time for the secondary uranium subcategory.

SECONDARY URANIUM SUBCATEGORY

SECTION III

INDUSTRY PROFILE

This section of the secondary uranium supplement describes the raw materials and processes used in producing secondary uranium and presents a profile of the secondary uranium plants identified in this study. For discussion of the purpose, authority, and methodology for this study, and a general description of the non-ferrous metals manufacturing category, refer to Section III of the General Development Document.

The major use of depleted, or secondary, uranium is in ordnance applications. The source of secondary uranium is depleted uranium hexafluoride, UF_6, resulting from enrichment of natural uranium for nuclear applications. The high density and pyrophoricity of uranium metal reduced from depleted UF_6 make it ideal for use in antitank and antimissile ammunition. Depleted uranium metal is reportedly more effective than tungsten alloy ammunition. Other uses of secondary uranium are containers for spent nuclear reactor residues, radiation shielding applications, ballast and counterweights on aircraft control surfaces, and research.

DESCRIPTION OF SECONDARY URANIUM PRODUCTION

The production of secondary uranium can be divided into two distinct stages. The first stage is production of uranium tetrafluoride, UF_4, from secondary materials, and the second stage is magnesium reduction of uranium tetrafluoride to pure uranium metal. All the plants in this subcategory perform the second stage process, but only one plant produces uranium tetrafluoride from secondary materials. The secondary uranium production processes are shown schematically in Figures III-1 and III-2, and are described in the following paragraphs.

RAW MATERIALS

The raw material necessary for the production of uranium by the magnesium reduction process is uranium tetrafluoride, UF_4. This material is generally obtained from enrichment plants which produce uranium for nuclear energy applications. The enrichment process involves separation of enriched UF_6 from depleted UF_6. Much of the depleted uranium hexafluoride is converted to UF_4 which is subsequently used as a raw material in the magnesium reduction process. Uranium tetrafluoride is also produced from uranium-bearing scrap. One of the plants in this subcategory uses uranium scrap (mainly off-spec product or machining

scrap), residues, and magnesium reduction slag as raw materials in addition to using uranium tetrafluoride. The following discussions describe the production of uranium from secondary sources and the production of uranium metal from uranium tetrafluoride in more detail.

URANIUM TETRAFLUORIDE PRODUCTION

One plant in the secondary uranium subcategory has the capacity to manufacture uranium tetrafluoride from scrap uranium materials. This plant uses the manufactured UF_4 in its magnesium reduction operation as a supplement to UF_4 obtained from other sources. This process is primarily a uranium recovery operation, as the raw materials are scrap from machining operations, and slag generated by magnesium reduction. The magnesium fluoride slag is recycled to the recovery process whenever its residual uranium content is economically recoverable.

The first step in the recovery process is acid leaching of the raw materials to dissolve the uranium. Any remaining scrap or residue is filtered out and discarded. Next, ammonia is added to the uranium-bearing filtrate causing precipitation of an ammonium diuranate solid. This solid is filtered and the filtrate discharged to treatment. The precipitate is redissolved in acid so that the uranium compound in solution, uranyl nitrate, $UO_2(NO_3)_2$, can be extracted by an organic solvent such as kerosene/tributyl phosphate. Following the discharge to treatment of the solvent extraction raffinate, the purified uranyl nitrate solution is stripped into an aqueous solution. This solution is concentrated by evaporation and then calcined to burn off the nitrate, resulting in an end product of uranium trioxide, UO_3. The final stage includes a hydrogen reduction process which converts UO_3 to uranium dioxide, UO_2, followed by hydrofluorination. The hydrogen is produced by dissociating ammonia. UO_2 is contacted with vaporized hydrofluoric acid at elevated temperatures. The resulting product is uranium tetrafluoride, UF_4, which is then used in the magnesium reduction operation.

The potential waste streams associated with the production of uranium tetrafluoride are generated in the preliminary acid leaching steps and the solvent extraction and purification operations. Wet air pollution controls are also used in this process to scrub gases from the acid leaching, evaporation and calcination, and hydrogen reduction and hydrofluorination operations.

MAGNESIUM REDUCTION PROCESS

The magnesium reduction process is widely used to produce uranium metal from uranium tetrafluoride. Uranium tetrafluoride is mixed with magnesium and reduced to uranium metal in a thermite-type

bomb reduction vessel. The reduction reaction requires about three minutes and reaches a temperature around 1,900°C. The magnesium fluoride slag and uranium metal separate and are allowed to cool. No process water is associated with this process, therefore no waste streams are generated.

PROCESS WASTEWATER SOURCES

Although a variety of processes are involved in secondary uranium production, the process wastewater sources can be subdivided as follows:

1. Refinery filtrate,
2. Slag leach slurry,
3. Solvent extraction raffinate,
4. Digestion operation wet air pollution control,
5. Evaporation and calcination wet air pollution control,
6. Hydrogen reduction and hydrofluorination KOH wet air pollution control, and
7. Hydrofluorination wet air pollution control.

OTHER WASTEWATER SOURCES

There are other waste streams associated with the secondary uranium subcategory. These waste streams include, but are not limited to:

1. Stormwater runoff, and
2. Maintenance and cleanup water.

These waste streams are not considered as a part of this rulemaking. EPA believes that the flows and pollutant loadings associated with these waste streams are insignificant relative to the waste streams selected, or are best handled by the appropriate permit authority on a case-by-case basis under authority of Section 403 of the Clean Water Act.

AGE, PRODUCTION, AND PROCESS PROFILE

Figure III-3 shows the location of the three secondary uranium plants operating in the United States. All three plants are on the eastern part of the country. Table III-1 shows the relative ages of the three plants. This shows that two plants were built in the early years of the uranium industry, while the third plant was built in the early 70's. It was probably built in anticipation of the growth of the uranium industry due to commercial uses of uranium, primarily in power generation. Table III-2 gives the yearly production ranges for the three plants in this subcategory.

Table III-3 provides a summary of the number of plants generating wastewater for the waste streams associated with various processes and the number of plants with the process.

Table III-1

INITIAL OPERATING YEAR (RANGE) SUMMARY OF PLANTS
IN THE SECONDARY URANIUM SUBCATEGORY BY DISCHARGE TYPE

Type of Plant Discharge	Initial Operating Year (Range) Summary of Plants (Plant Age in Years) 1983-1974 (0-10)	1973-1969 (11-15)	1968-1959 (16-25)	1958-1954 (26-30)	1953-1949 (31-35)	Total
Direct	0	0	0	0	1	1
Indirect	0	0	0	0	0	0
Dry	0	1	0	1	0	2
TOTAL	0	1	0	1	1	3

Table III-2

PRODUCTION RANGES FOR THE SECONDARY URANIUM SUBCATEGORY

Type of Plant Discharge	Uranium Production Range for 1982				Total Number of Plants
	0-1,500 (tons/yr)	1,501-4,000 (tons/yr)	4,001-6,000 (tons/yr)	6,001-8,000 (tons/yr)	
Direct	0	0	0	1	1
Indirect	0	0	0	0	0
Dry	1	1	0	0	2
					3

Table III-3

SUMMARY OF SECONDARY URANIUM SUBCATEGORY PROCESS AND ASSOCIATED WASTE STREAMS

Process or Waste Stream	Number of Plants With Process or Waste Stream	Number of Plants Reporting Generation of Wastewater*
Uranium Tetrafluoride Production	1	
- Refinery Filtrate	1	1
- Slag Leach Slurry	1	1
- Solvent Extraction Raffinate	1	1
- Digestion Operation Wet Air Pollution Control	1	1
- Evaporation and Calcination Wet Air Pollution Control	1	0
- Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control	1	1
- Hydrofluorination Wet Air Pollution Control	1	0
Magnesium Reduction	3	

*Through reuse or evaporation practices, a plant may "generate" wastewater from a particular process but not discharge it.

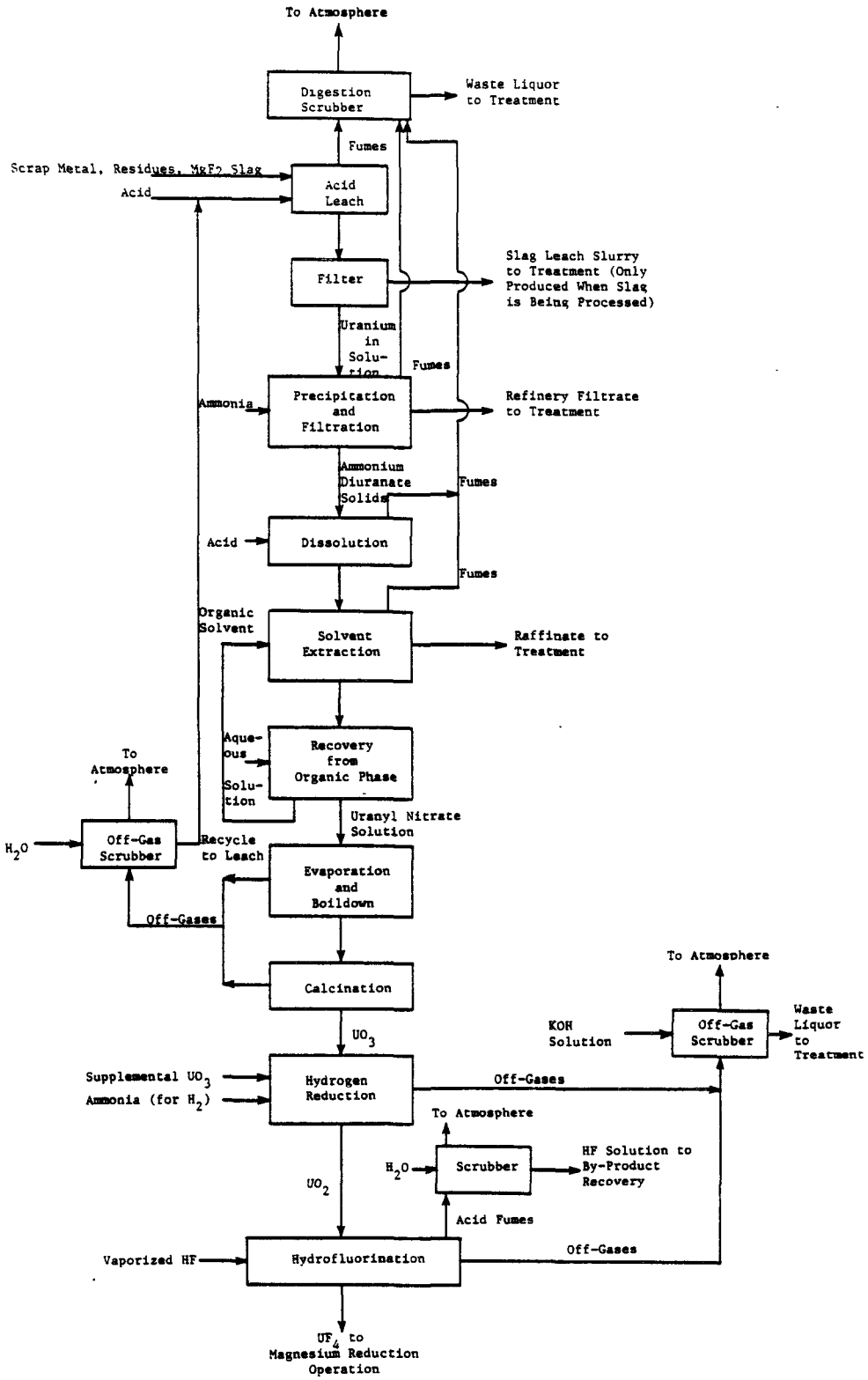

Figure III-1

URANIUM TETRAFLUORIDE PRODUCTION PROCESS
IN THE SECONDARY URANIUM SUBCATEGORY

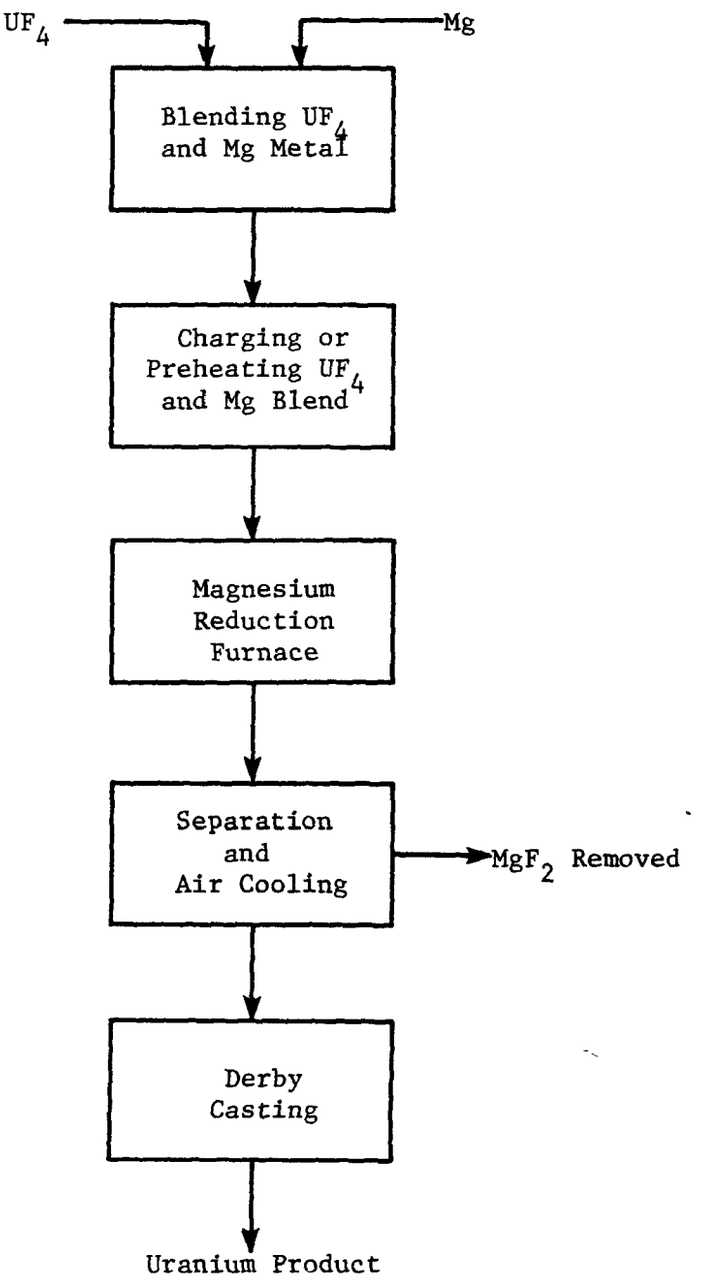

Figure III-2

MAGNESIUM REDUCTION PROCESS IN THE SECONDARY URANIUM SUBCATEGORY

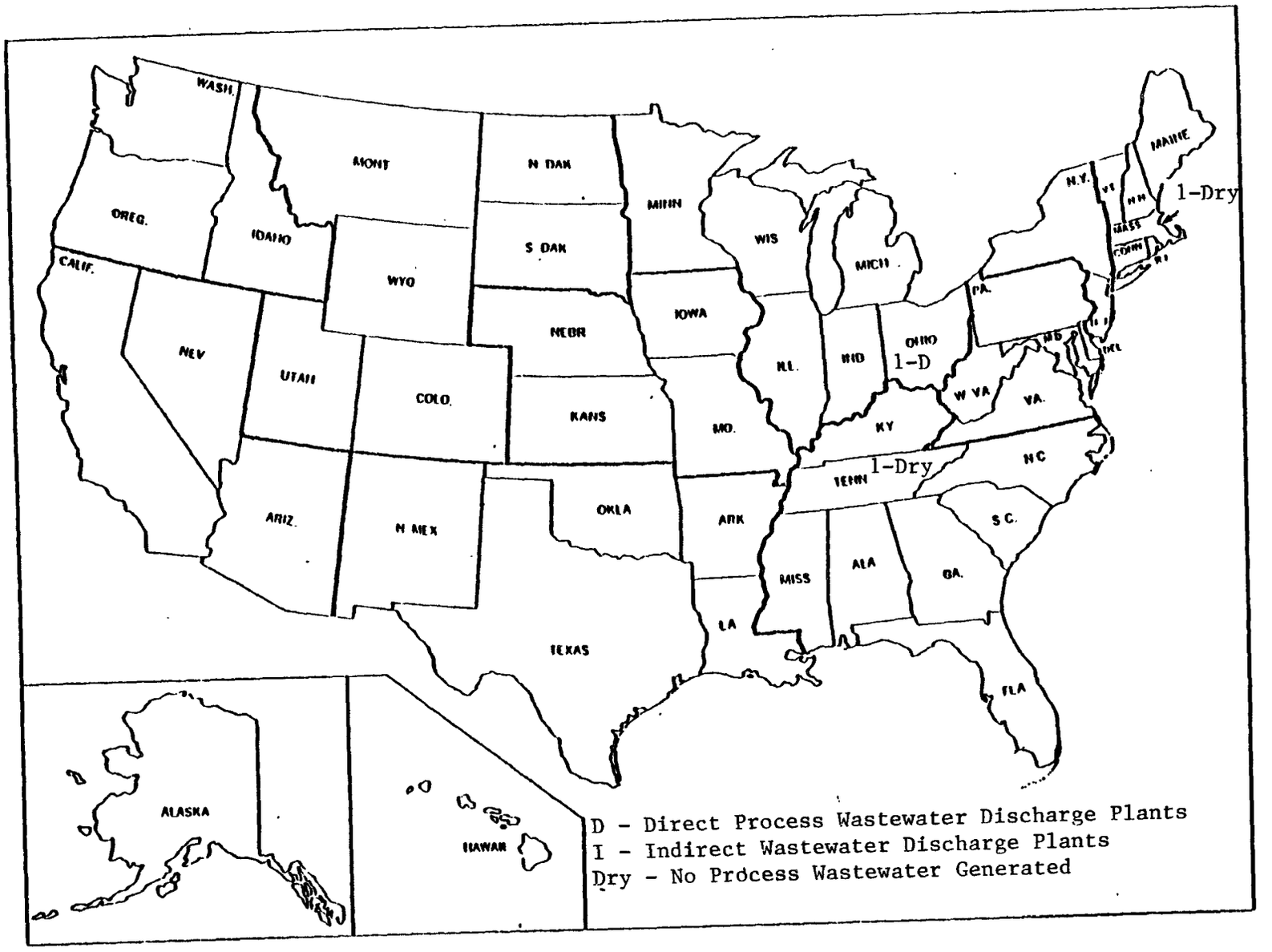

Figure III-3

GEOGRAPHIC LOCATIONS OF THE SECONDARY URANIUM SUBCATEGORY PLANTS

SECONDARY URANIUM SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

As discussed in Section IV of the General Development Document, the nonferrous metals manufacturing category has been subcategorized to take into account pertinent industry characteristics, which affect the ability of the facilities to achieve effluent limitations. This section summarizes the factors considered during the designation of the secondary uranium subcategory and its related subdivisions. Production normalizing parameters for each subdivision will also be discussed.

FACTORS CONSIDERED IN SUBCATEGORIZATION

The following factors were evaluated for use in subcategorizing the nonferrous metals manufacturing category:

1. Metal products, co-products, and by-products;
2. Raw materials;
3. Manufacturing processes;
4. Product form;
5. Plant location;
6. Plant age;
7. Plant size;
8. Air pollution control methods;
9. Meteorological conditions;
10. Treatment costs;
11. Nonwater quality aspects;
12. Number of employees;
13. Total energy requirements; and
14. Unique plant characteristics.

Evaluation of all factors that could warrant subcategorization resulted in the designation of the secondary uranium subcategory. Three factors were particularly important in establishing these classifications: the type of metal produced, the nature of the raw material used, and the manufacturing processes involved.

In Section IV of the General Development Document, each of these factors is described, and the rationale for selecting metal product, manufacturing process, and raw materials as the principal factors used for subcategorization is discussed. On this basis, the nonferrous metals manufacturing category (phase II) was divided into 21 subcategories, one of them being secondary uranium.

FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY URANIUM SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the secondary uranium subcategory. In the discussion that follows, the factors will be described as they pertain to this particular subcategory.

The rationale for considering further subdivision of the secondary uranium subcategory is based primarily on differences in the production processes and raw materials used. Within this subcategory a number of different operations are performed which may or may not have a water use or discharge, and which may require the establishment of separate effluent limitations. While secondary uranium is still considered a single subcategory, a more thorough examination of the production processes has illustrated the need for limitations and standards based on specific flow allowances for the following subdivisions:

1. Refinery filtrate,
2. Slag leach slurry,
3. Solvent extraction raffinate,
4. Digestion operation wet air pollution control,
5. Evaporation and calcination wet air pollution control,
6. Hydrogen reduction and hydrofluorination KOH wet air pollution control, and
7. Hydrofluorination wet air pollution control.

These subdivisions follow directly from differences within the process of refining scrap, residues, and slag to produce uranium tetrafluoride for use in magnesium reduction to uranium metal.

Leaching of the raw materials gives rise to the first, second, and fourth subdivisions. A major source of wastewater is the filtrate that is generated by leaching uranium from the raw materials and precipitating uranium diuranate. When slag is used, the residual solids are discharged as a slurry which may be a significant source of pollutants. Wastewater from scrubbers which are used to control acid fumes in the leaching operation is also a source of pollutants.

Solvent extraction is used in the refining process to purify a uranium intermediate product. Solvent extraction results in a raffinate waste stream that contains significant quantities of pollutants.

The last three subdivisions arise from wet air pollution controls which control emissions from the processes used to refine scrap, residues, and slag to a usable product. Evaporation, calcination, hydrogen reduction, and hydrofluorination are all operations that necessitate air pollution control systems. In some

cases, water use is recycled into the process rather than discharged. The potential sources of wastewater and associated pollutants require that each subdivision be examined and handled on an individual basis.

OTHER FACTORS

The other factors considered in this evaluation either support the establishment of the seven subdivisions or were shown to be inappropriate bases for subdivision. Air pollution control methods, treatment costs, and total energy requirements are functions of the selected subcategorization factors--metal product, raw materials, and production processes. Therefore, they are not independent factors and do not affect the subcategorization which has been applied. As discussed in Section IV of the General Development Document, certain other factors, such as plant age, plant size, and the number of employees, were also evaluated and determined to be inappropriate for use as bases for subdivision of nonferrous metals plants.

PRODUCTION NORMALIZING PARAMETERS

As discussed previously, the effluent limitations and standards developed in this document establish mass limitations on the discharge of specific pollutant parameters. To allow these regulations to be applied to plants with various production capacities, the mass of pollutant discharged must be related to a unit of production. This factor is known as the production normalizing parameter (PNP).

In general, for each production process which has a wastewater associated with it, the actual mass of uranium intermediate product produced will be used as the PNP. Thus, the PNPs for the seven subdivisions are as follows:

Subdivision	PNP
1. Refinery filtrate	kkg of uranium trioxide produced
2. Slag leach slurry	kkg of uranium trioxide produced
3. Solvent extraction raffinate	kkg of uranium trioxide produced
4. Digestion operation wet air pollution control	kkg of uranium trioxide produced

Subdivision	PNP
5. Evaporation and calcination wet air pollution control	kkg of uranium trioxide produced
6. Hydrogen reduction and hydrofluorination KOH wet air pollution control	kkg of uranium tetrafluoride produced
7. Hydrofluorination wet air pollution control	kkg of uranium tetrafluoride produced

SECONDARY URANIUM SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the secondary uranium subcategory. Water use and discharge rates are explained and then summarized in tables at the end of this section. Data used to characterize the wastewaters are presented. Finally, the specific source, water use and discharge flows, and wastewater characteristics for each separate wastewater source are discussed.

Section V of the General Development Document contains a detailed description of the data sources and methods of analysis used to characterize wastewater from the nonferrous metals manufacturing category. To summarize this information briefly, two principal data sources were used: data collection portfolios (dcp) and field sampling results. Data collection portfolios contain information regarding wastewater flows and production levels.

Field sampling was not performed for the secondary uranium subcategory. In order to conduct an analysis of the subcategory waste streams, the concentrations of toxic pollutants in the wastewaters must be known. Since direct sampling data are not available, data for use in this subcategory was obtained from pilot plant raw wastewater characterization studies conducted at a uranium ore mill. The ore mill uses an acid leaching process to extract uranium from the ore. For this reason, it was judged that the data could be applied, with limitations, to the process waters generated in this subcategory. The data consist of analyses for two classes of pollutants: toxic metal pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants). Samples were not analyzed for toxic organic pollutants because it was not expected that organic pollutants would be present in wastewaters generated in uranium ore mill processing. For the same reason, cyanide, asbestos, and TCDD were not analyzed.

As described in Section IV of this supplement, the secondary uranium subcategory has been split into seven subdivisions or wastewater sources, so that the proposed regulation contains mass discharge limitations and standards for seven unit processes discharging process wastewater. Differences in the wastewater characteristics associated with these subdivisions are to be expected. For this reason, wastewater streams corresponding to each subdivision are addressed separately in the discussions that follow. These wastewater sources are:

1. Refinery filtrate,
2. Slag leach slurry,
3. Solvent extraction raffinate,
4. Digestion operation wet air pollution control,
5. Evaporation and calcination wet air pollution control,
6. Hydrogen reduction and hydrofluorination KOH wet air pollution control, and
7. Hydrofluorination wet air pollution control.

WASTEWATER FLOW RATES

Data supplied by dcp responses were evaluated, and two flow-to-production ratios, water use and wastewater discharge flow, were calculated for each stream. The two ratios are differentiated by the flow value used in calculation. Water use is defined as the volume of water or other fluid required for a given process per mass of uranium product and is therefore based on the sum of recycle and make-up flows to a given process. Wastewater flow discharged after pretreatment or recycle (if these are present) is used in calculating the production normalized flow--the volume of wastewater discharged from a given process to further treatment, disposal, or discharge per mass of uranium produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and carry-over on the product. The production values used in calculation correspond to the production normalizing parameter, PNP, assigned to each stream, as outlined in Section IV. As an example, refinery filtrate wastewater flow is related to the production of uranium trioxide. As such, the discharge rate is expressed in liters of refinery filtrate per metric ton of uranium trioxide produced (gallons of refinery filtrate per ton of uranium trioxide).

The production normalized discharge flows were compiled and statistically analyzed by stream type. These production normalized water use and discharge flows are presented by subdivision in Tables V-1 through V-7 at the end of this section. Where appropriate, an attempt was made to identify factors that could account for variations in water use and discharge rates. These variations are discussed later in this section by subdivision. A similar analysis of factors affecting the wastewater flows is presented in Sections X, XI, and XII where representative BAT, NSPS, and pretreatment flows are selected for use in calculating the effluent limitations.

The water use and discharge rates shown do not include nonprocess wastewater, such as rainfall runoff and noncontact cooling water.

WASTEWATER CHARACTERISTICS DATA

Data used to characterize the various wastewaters associated with secondary uranium production come from two sources--data collection portfolios and analytical data from sampling.

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the secondary uranium plants were asked to specify the presence or absence of toxic pollutants in their wastewater. Of the three secondary uranium plants, two plants do not generate process wastewater because they use a dry production process. The plant responding to this questionnaire did not report the presence of any toxic organic pollutants. The responses for the toxic metals and cyanide are summarized below:

Pollutant	Known Present	Believed Present (Based on Raw Materials and Process Chemicals Used)
Antimony	0	0
Arsenic	0	0
Beryllium	0	0
Cadmium	0	0
Chromium	1	0
Copper	1	0
Cyanide	0	0
Lead	0	0
Mercury	0	0
Nickel	1	0
Selenium	0	0
Silver	0	0
Thallium	0	0
Zinc	0	0

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from secondary uranium plants, analytical data are used. Since none of the secondary uranium plants were sampled, analytical data from a uranium ore mill are being used to characterize the wastewaters of the secondary uranium subcategory. A diagram indicating the sampling sites and contributing production processes is shown in Figure V-1 (at the end of this section).

Raw wastewater data are presented in Table V-8. In this table, analytical results are given for the combined wastewater influent to the treatment system. Table V-9 presents analytical data on the treated effluent prior to being discharged. Note that the stream numbers listed in the tables correspond to those given in

the plant sampling site diagram, Figure V-1. Where no data are listed for a specific day, the wastewater samples for the stream were not collected.

Several points regarding these tables should be noted. First, the data tables include some samples measured at concentrations considered not quantifiable. Toxic metal values reported as less than a certain value were considered not quantifiable.

Second, the detection limits shown on the data tables for toxic metals and conventional and nonconventional pollutants are not the same in all cases as the published detection limits for these pollutants by the same analytical methods. The detection limits used were reported with the analytical data and hence are the appropriate limits to apply to the data. Detection limit variation can occur as a result of a number of laboratory-specific, equipment-specific, and daily operator-specific factors. These factors can include day-to-day differences in machine calibration, variation in stock solutions, and variation in operators.

Third, the statistical analysis of data includes some samples measured at concentrations considered not quantifiable. For data considered as detected but below quantifiable concentrations, a value of zero is used for averaging. Nonconventional and conventional pollutant data reported with a "less than" sign are considered as detected, but not further quantifiable. A value of zero is used for averaging. Toxic metal values reported as less than a certain value were considered as below quantification, and consequently were assigned a value of zero in the calculation of the average.

WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION

Since secondary uranium production involves seven principal sources of wastewater and each has potentially different characteristics and flows, the wastewater characteristics and discharge rates corresponding to each subdivision will be described separately. A brief description of why the associated production processes generate a wastewater will also be discussed.

REFINERY FILTRATE

The source of this waste stream is in the refinery digestion operation. Here the uranium scrap, residues, and compounds are acid leached, dissolving the uranium into solution. The residual solids are filtered and disposed as a filter cake. Ammonia is then added to the filtrate to precipitate the uranium as an ammonium diuranate solid. This solid is filtered and further processed. The filtrate is discharged to the treatment system.

The production normalized water use and discharge rates for refinery filtrate are given in Table V-1 in liters per metric ton of uranium trioxide produced.

This waste stream was not sampled at a secondary uranium production plant. As previously mentioned, data were obtained from a uranium ore mill which uses an acid leaching operation to extract uranium from ore. Based on the similarities between these two waste streams, the refinery filtrate waste stream may be expected to contain treatable concentrations of toxic metals such as copper and nickel, treatable concentrations of suspended solids, ammonia, and an acidic pH.

SLAG LEACH SLURRY

This waste stream originates in the refinery digestion operation. The slag that is used in the leaching operation comes from the magnesium reduction process. The magnesium fluoride slag contains residual levels of uranium and when it is economically advantageous to do so, the slag is acid leached to recover the uranium. After leaching, the remaining slag solids are filtered and discharged to treatment as a slurry. The filtrate is then combined with the uranium-bearing spent acid from other leaching operations and goes through further processing. The production normalized water use and discharge rates for slag leach slurry are given in Table V-2 in liters per metric ton of uranium trioxide produced.

Since no sampling data are available from the secondary uranium industry, the wastewater characteristics of the slag leaching slurry will be based on sampling data from a uranium ore mill. Judging from the data, presented in Table V-8, the slag leach slurry can be characterized by treatable concentrations of toxic metals, fluoride, suspended solids, and acidic pH.

SOLVENT EXTRACTION RAFFINATE

Solvent extraction follows the acid leaching operation and is used for purification of the uranium compound. An organic solvent, tributyl phosphate in a kerosene carrier, is used to selectively extract the uranium compound from an acid solution. The solvent extraction raffinate is discharged to treatment. Table V-3 presents the production normalized water use and discharge rates for the solvent extraction raffinate in liters per metric ton of uranium trioxide produced.

Although this waste stream was not directly sampled, it can be expected, based on the materials present in the process and the process operation, that the solvent extraction raffinate waste stream can be characterized by acidic pH and significant concentrations of some toxic metal pollutants, as well as ammonia.

EPA also recognizes the possibility that organics from the solvent extraction process may be carried over to the raffinate stream and thus be present in the discharge. Based on data, comments, and other information to be received prior to promulgation, EPA may find it necessary to regulate toxic organics in this subcategory. The Agency solicits comments and data from the industry in this regard.

DIGESTION OPERATION WET AIR POLLUTION CONTROL

The acid leach operation, at the start of the uranium scrap, residue, and slag refining process, includes a water scrubbing system to control the discharge of acidic fumes and particulate matter. The scrubber liquor is completely recycled within the system until its scrubbing efficiency drops, then it is batch discharged to treatment. The production normalized water use and discharge flows for digestion operation scrubber water are presented in Table V-4 in liters per metric ton of uranium trioxide produced.

This waste stream was not sampled at a secondary uranium production plant. Although no data are available, it is expected, based on the process operation and the materials involved, that the digestion operation scrubber water would be characterized by acidic pH, treatable concentrations of suspended solids, and some toxic metal pollutants.

EVAPORATION AND CALCINATION WET AIR POLLUTION CONTROL

Multiple scrubbers are used to control vapors and fumes from the evaporation and calcination operations. Evaporation is used to concentrate the uranium solution (uranyl nitrate) after it has been stripped from the organic phase into an aqueous phase. After the evaporation operation, the concentrated intermediate uranium product is calcined to drive off the nitrate bound to the uranium and produce uranium trioxide in a dry form. The nitrates in the air react to form nitric acid, and the scrubbers are used to control these acid fumes. Table V-5 shows the production normalized water use and discharge rates for the combined system of scrubbers.

Because the scrubber liquor is relatively clean, and due to its acid content, it is recycled for use in the digestion operation. There it is used to dilute fresh acid that is used for acid leaching. Because the scrubber liquor is entirely reused, no discharge of wastewater is practiced in the evaporation and calcination operations.

HYDROGEN REDUCTION AND HYDROFLUORINATION KOH WET AIR POLLUTI N CONTROL

This scrubber handles gas emissions from both the hydrogen reduction and hydrofluorination operations. The first opera ion includes cracking ammonia so that uranium trioxide can be re uced by the hydrogen gas to uranium dioxide. This product then u der- goes hydrofluorination and is converted to uranium tetrafluc ide. The gases produced in both operations are scrubbed by this a r pollution control unit. Production normalized water use and dis- charge rates are presented in Table V-6 in liters per metric ton of uranium tetrafluoride produced.

This waste stream was not sampled in the secondary uranium s b- category. Considering the production processes contributing to the exhaust gases cleaned by this scrubber, it is expected t at this scrubber liquor would be characterized by suspended sol ds, fluoride, and acidic pH.

HYDROFLUORINATION WET AIR POLLUTION CONTROL

The hydrofluorination unit produces uranium tetrafluoride by contacting uranium dioxide with vaporized hydrofluoric acid t elevated temperatures. The off-gases from this operation cc tain significant quantities of unreacted hydrofluoric acid. The scrubber on this unit scrubs the acid fumes from the operati n by absorbing the hydrofluoric acid in the scrubber liquor. Tab e V-7 shows the production normalized water use and discharge ates in liters per metric ton of uranium tetrafluoride produced.

Since the hydrofluorination scrubber cleans what is predomin ntly vaporized unreacted hydrofluoric acid, the scrubber liquor c n- centrates this acid as it is recycled through the system. W en the desired concentration of hydrofluoric acid is attained, he liquor is drawn off and sold for industrial use. For this reason, no discharge of wastewater occurs from the hydroflu c - ination operation.

Table V-1

WATER USE AND DISCHARGE RATES FOR
REFINERY FILTRATE

(1,000 l/kkg of uranium trioxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	0	34.8	34.8

Table V-2

WATER USE AND DISCHARGE RATES FOR
SLAG LEACH SLURRY

(1,000 l/kkg of uranium trioxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	0	3.8	3.8

Table V-3

WATER USE AND DISCHARGE RATES FOR
SOLVENT EXTRACTION RAFFINATE

(1,000 l/kkg of uranium trioxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	0	5.3	5.3

Table V-4

WATER USE AND DISCHARGE RATES FOR
DIGESTION OPERATION WET AIR POLLUTION CONTROL

(1,000 l/kkg of uranium trioxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	NR	NR	0.030

NR - Present but data not reported in dcp.

Table V-5

WATER USE AND DISCHARGE RATES FOR
EVAPORATION AND CALCINATION WET AIR POLLUTION CONTROL

(1,000 l/kkg of uranium trioxide produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	100	NR	0

NR - Present but data not reported in dcp.

Table V-6

WATER USE AND DISCHARGE RATES FOR
HYDROGEN REDUCTION AND HYDROFLUORINATION
KOH WET AIR POLLUTION CONTROL

(1,000 l/kkg of uranium tetrafluoride produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	NR	NR	0.020

NR - Present but data not reported in dcp.

Table V-7

WATER USE AND DISCHARGE RATES FOR
HYDROFLUORINATION WET AIR POLLUTION CONTROL

(1,000 l/kkg of uranium tetrafluoride produced)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1175	100	NR	0

NR - Present but data not reported in dcp.

Table V-8

SECONDARY URANIUM SUBCATEGORY
TREATMENT PLANT INFLUENT*
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	113			<0.5		
115. arsenic	113			2.5		
117. beryllium	113			0.03		
118. cadmium	113			0.05		
119. chromium (total)	113			0.67	0.86	
120. copper	113			4.0	3.2	
122. lead	113			0.93	1.3	
123. mercury	113			<0.0002		
124. nickel	113			1.4	1.0	
125. selenium	113			2.0		
126. silver	113			<0.1		
127. thallium	113			<0.2		
128. zinc	113			6.1		

Table V-8 (Continued)

SECONDARY URANIUM SUBCATEGORY
TREATMENT PLANT INFLUENT*
RAW WASTEWATER SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
aluminum	113			786	1,840	
iron	113			1,900	3,670	
manganese	113			118	287	
molybdenum	113			10	17	
sulfate	113			21,760	19,600	
total dissolved solids (TDS)	113			32,200	31,520	
uranium	113			17	19.8	
vanadium	113			100	109	
Conventional Pollutants						
total suspended solids (TSS)	113			40	168	
pH (standard units)	113			1.7	1.6	

†Sample Type: Unknown.

*These data represent the influent from a uranium ore mill. EPA is assuming that secondary uranium industry raw wastewaters will be similar.

Table V-9

SECONDARY URANIUM SUBCATEGORY
TREATMENT PLANT EFFLUENT
SAMPLING DATA

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
119. chromium (total)	125			<0.050		
120. copper	125			0.11-0.18		
122. lead	125			<0.20		
124. nickel	125			<0.040		
128. zinc	125			0.10		
Nonconventional Pollutants						
aluminum	125			0.90-17		
iron	125			0.80-32		
manganese	125			0.88-4.9		
molybdenum	125			4.6		
total dissolved solids (TDS)	125			5,590-9,740		
uranium	125			0.30-2.5		
vanadium	125			0.20-1.3		

†Sample Type: Unknown.

Note: Ranges reported for several pollutants where five samples were analyzed.

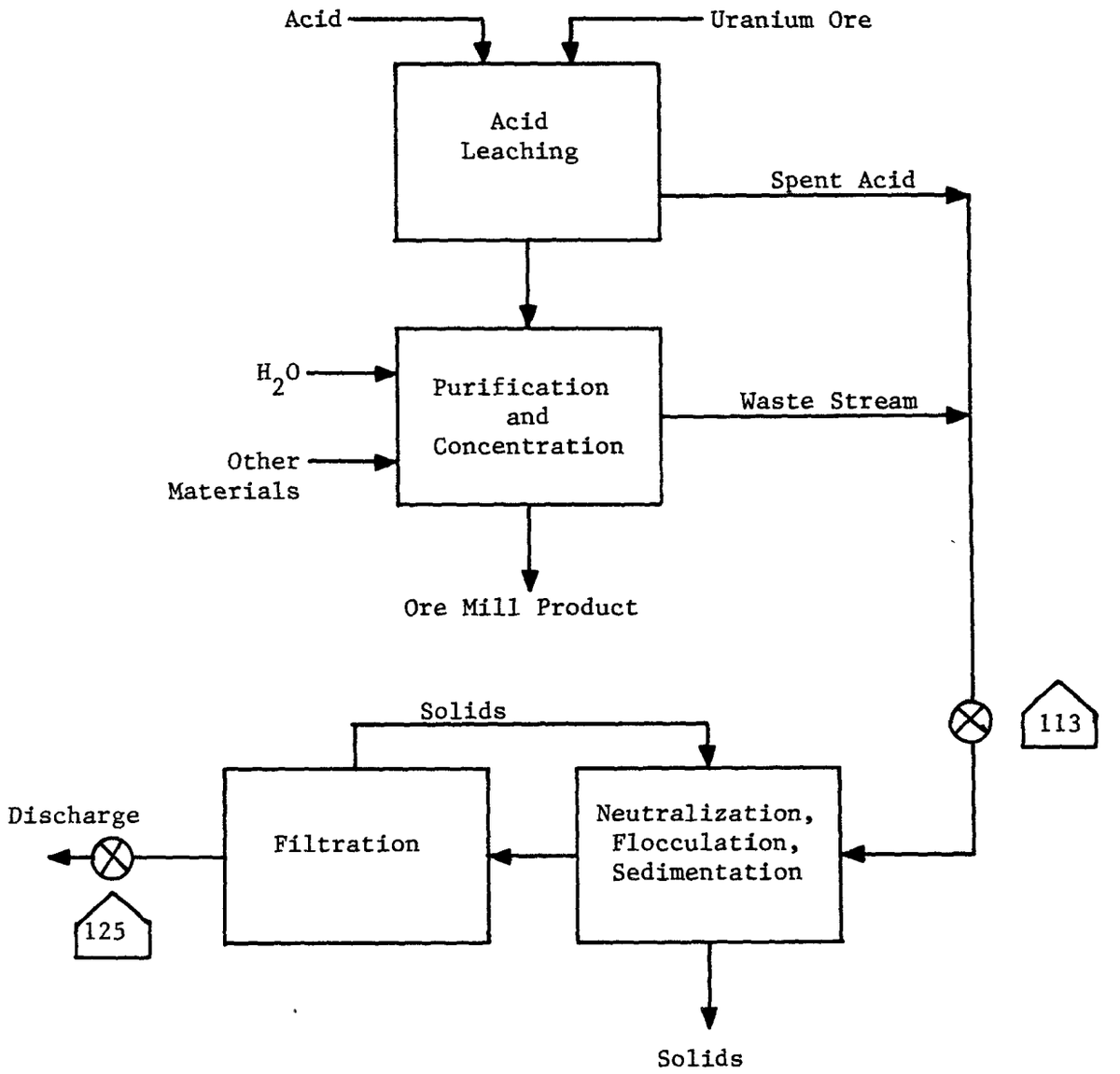

Figure V-1
SAMPLING SITES AT URANIUM ORE MILL

SECONDARY URANIUM SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data which were used for the secondary uranium subcategory. This section examines that data and discusses the selection or exclusion of pollutants for potential limitation.

Each pollutant selected for potential limitation is discussed in Section VI of the General Development Document. That discussion provides information concerning the nature of the pollutant (i.e., whether it is a naturally occurring substance, processed metal, or a manufactured compound); general physical properties and the form of the pollutant; toxic effects of the pollutant in humans and other animals; and behavior of the pollutant in POTW at the concentrations expected in industrial discharges.

The discussion that follows presents and briefly discusses the selection of conventional and nonconventional pollutants for effluent limitations. Also described is the analysis that was performed to select or exclude toxic pollutants for further consideration for limitations and standards. Pollutants will be considered for limitation if they are present in concentrations treatable by the technologies considered in this analysis. The treatable concentrations used for the toxic metals were the long-term performance values achievable by chemical precipitation, sedimentation, and filtration. The treatable concentrations used for the toxic organics were the long-term performance values achievable by carbon adsorption (see Section VII of the General Development Document - Combined Metals Data Base).

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS

This study examined samples for two conventional pollutant parameters (total suspended solids and pH) and several nonconventional pollutant parameters.

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

The conventional and nonconventional pollutants or pollutant parameters selected for limitation in the secondary uranium subcategory are:

ammonia
fluoride
uranium
total suspended solids (TSS)
pH

Ammonia is used in the uranium scrap processing operation following acid leaching. To extract dissolved uranium present in the spent leaching acid, ammonia is added to precipitate a uranium-ammonia complex. This precipitate is filtered and the filtrate discharged. Although there are no analytical data of this waste stream, it is expected that substantial concentrations of residual ammonia could be present in the filtrate and thus be discharged. For this reason, ammonia is selected for limitation in the secondary uranium subcategory.

Based on an examination of the raw materials and production processes employed in the secondary uranium subcategory, it is expected that significant concentrations of fluoride are present in the wastewater generated in this subcategory. To produce uranium tetrafluoride, uranium dioxide is reacted with hot vaporized hydrofluoric acid. The reaction gases, containing unreacted hydrofluoric acid, are scrubbed with either water or a caustic scrubber, the latter being discharged to treatment. It is in these liquors that fluoride is expected to be concentrated. For this reason, fluoride is selected for limitation in this subcategory.

Analytical data for uranium are present in the sampling data transferred to this subcategory from a uranium ore mill. The data show concentrations of uranium in the combined raw wastewater that are treatable by chemical precipitation and sedimentation technology (17 mg/l and 19.8 mg/l). It is expected that treatable concentrations of uranium will also be present in wastewaters of the secondary uranium subcategory because of uranium's solubility in acid. Acid solutions are commonly present in uranium scrap processing operations so it is likely that uranium is present in wastewaters from those operations. Therefore, uranium is selected for limitation in this subcategory.

TSS concentrations of 40 and 168 mg/l were observed in the two raw waste samples analyzed for this study. These concentrations are well above the 2.6 mg/l treatable concentration. Most of the specific methods used to remove toxic metals do so by converting these metals to precipitates, and these toxic-metal-containing precipitates should not be discharged. Meeting a limitation on total suspended solids helps ensure that removal of these precipitated toxic metals has been effective. For these reasons, total suspended solids are selected for limitation in this subcategory.

The pH values observed during this study were 1.6 and 1.7. Both of these values are outside the 7.5 to 10.0 range considered desirable for discharge to receiving waters. Many deleterious effects are caused by extreme pH values or rapid changes in pH. Also, effective removal of toxic metals by precipitation requires careful control of pH. Since pH control within the desirable limits is readily attainable by available treatment, pH is selected for limitation in this subcategory.

TOXIC POLLUTANTS

The frequency of occurrence of the toxic pollutants in the raw wastewater samples taken is presented in Table VI-1. Table VI-1 is based on the raw wastewater data from stream 113 (see Section V). These data provide the basis for the categorization of specific pollutants, as discussed below. Treatment plant samples were not considered in the frequency count. Note that sampling was not done for any organic toxic pollutants.

TOXIC POLLUTANTS NEVER DETECTED

The toxic pollutants listed below were not detected in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations:

1. acenaphthene*
2. acrolein*
3. acrylonitrile*
4. benzene*
5. benzidine*
6. carbon tetrachloride (tetrachloromethane)*
7. chlorobenzene*
8. 1,2,4-trichlorobenzene*
9. hexachlorobenzene*
10. 1,2-dichloroethane*
11. 1,1,1-trichloroethane*
12. hexachloroethane*
13. 1,1-dichloroethane*
14. 1,1,2-trichloroethane*
15. 1,1,2,2-tetrachloroethane*
16. chloroethane*
17. bis (chloromethyl) ether (deleted)*
18. bis (2-chloroethyl) ether*
19. 2-chloroethyl vinyl ether (mixed)*
20. 2-chloronaphthalene*
21. 2,4,6-trichlorophenol*
22. parachlorometa cresol*
23. chloroform (trichloromethane)*
24. 2-chlorophenol*
25. 1,2-dichlorobenzene*

26. 1,3-dichlorobenzene*
27. 1,4-dichlorobenzene*
28. 3,3'-dichlorobenzidine*
29. 1,1-dichloroethylene*
30. 1,2-trans-dichloroethylene*
31. 2,4-dichlorophenol*
32. 1,2-dichloropropane*
33. 1,2-dichloropropylene (1,3-dichloropropene)*
34. 2,4-dimethylphenol*
35. 2,4-dinitrotoluene*
36. 2,6-dinitrotoluene*
37. 1,2-diphenylhydrazine*
38. ethylbenzene*
39. fluoranthene*
40. 4-chlorophenyl phenyl ether*
41. 4-bromophenyl phenyl ether*
42. bis(2-chloroisopropyl) ether*
43. bis(2-choroethoxy) methane*
44. methylene chloride (dichloromethane)*
45. methyl chloride (chloromethane)*
46. methyl bromide (bromomethane)*
47. bromoform (tribromomethane)*
48. dichlorobromomethane*
49. trichlorofluoromethane (deleted)*
50. dichlorodifluoromethane (deleted)*
51. chlorodibromomethane*
52. hexachlorobutadiene*
53. hexachlorocyclopentadiene*
54. isophorone*
55. naphthalene*
56. nitrobenzene*
57. 2-nitrophenol*
58. 4-nitrophenol*
59. 2,4-dinitrophenol*
60. 4,6-dinitro-o-cresol*
61. N-nitrosodimethylamine*
62. N-nitrosodiphenylamine*
63. N-nitrosodi-n-propylamine*
64. pentachlorophenol*
65. phenol*
66. bis(2-ethylhexyl) phthalate*
67. butyl benzyl phthalate*
68. di-n-butyl phthalate*
69. di-n-octyl phthalate*
70. diethyl phthalate*
71. dimethyl phthalate*
72. benzo (a)anthracene (1,2-benzanthracene)*
73. benzo (a)pyrene (3,4-benzopyrene)*
74. 3,4-benzofluoranthene*
75. benzo(k)fluoranthane (11,12-benzofluoranthene)*

76. chrysene*
77. acenaphthylene*
78. anthracene*
79. benzo(ghi)perylene (1,11-benzoperylene)*
80. fluorene*
81. phenanthrene*
82. dibenzo (a,h)anthracene (1,2,5,6-dibenzanthracene)*
83. indeno (1,2,3-cd)pyrene (w,e,-o-phenylenepyrene)*
84. pyrene*
85. tetrachloroethylene*
86. toluene*
87. trichloroethylene*
88. vinyl chloride (chloroethylene)*
89. aldrin*
90. dieldrin*
91. chlordane (technical mixture and metabolites)*
92. 4,4'-DDT*
93. 4,4'-DDE(p,p'DDX)*
94. 4,4'-DDD(p,p'TDE)*
95. a-endosulfan-Alpha*
96. b-endosulfan-Beta*
97. endosulfan sulfate*
98. endrin*
99. endrin aldehyde*
100. heptachlor*
101. heptachlor epoxide*
102. a-Alpha-BHC*
103. b-Beta-BHC*
104. r-Gamma-BHC(lindane)*
105. g-Delta-BHC*
106. PCB-1242 (Arochlor 1242)*
107. PCB-1254 (Arochlor 1254)*
108. PCB-1221 (Arochlor 1221)*
109. PCB-1232 (Arochlor 1232)*
110. PCB-1248 (Arochlor 1248)*
111. PCB-1260 (Arochlor 1260)*
112. PCB-1016 (Arochlor 1016)*
113. toxaphene*
116. asbestos (Fibrous)
121. cyanide (Total)*
129. 2,3,7,8-tetra chlorodibenzo-p-dioxin (TCDD)

*We did not analyze for these pollutants in samples of raw wastewater from this subcategory. These pollutants are not believed to be present based on the Agency's best engineering judgement which includes consideration of raw materials and process operations.

TOXIC POLLUTANTS NEVER FOUND ABOVE THEIR ANALYTICAL QUANTIFICATION CONCENTRATION

The toxic pollutants listed below were never found above their analytical quantification concentration in any raw wastewater samples from this subcategory; therefore, they are not selected for consideration in establishing limitations.

114. antimony
123. mercury
126. silver
127. thallium

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

The toxic pollutant listed below is not selected for consideration in establishing limitations because it was not found in any raw wastewater samples from this subcategory above concentrations considered achievable by existing or available treatment technologies.

117. beryllium

Beryllium was detected below its treatability concentration of 0.20 mg/l in one raw wastewater sample analyzed. The sample contained 0.03 mg/l beryllium; therefore, there is no reason to further consider beryllium for limitation.

TOXIC POLLUTANTS SELECTED FOR FURTHER CONSIDERATION IN ESTABLISHING LIMITATIONS AND STANDARDS

The toxic pollutants listed below are selected for further consideration in establishing limitations and standards for this subcategory. The toxic pollutants selected for further consideration for limitation are each discussed following the list.

115. arsenic
118. cadmium
119. chromium
120. copper
122. lead
124. nickel
125. selenium
128. zinc

Arsenic was detected above its treatability concentration of 0.34 mg/l in one sample. This sample showed 2.5 mg/l arsenic in the raw wastewater. Therefore, arsenic is selected for further consideration for limitation.

Cadmium was detected slightly above its treatable concentration in a sample containing 0.05 mg/l. Treatability for cadmium begins at 0.049 mg/l; thus, cadmium is selected for further consideration for limitation.

Chromium was detected above its treatability concentration in two samples analyzed. The analytical data showed 0.67 mg/l and 0.86 mg/l chromium in the raw wastewater. Since the treatable concentration for chromium is 0.07 mg/l, chromium is selected for further consideration for limitation.

Copper has a treatability concentration of 0.07 mg/l. Two samples were analyzed showing copper concentrations of 3.2 mg/l and 4.0 mg/l. Both samples are significantly above treatable concentrations for copper; therefore, copper is selected for further consideration for limitation.

Lead was detected in treatable concentrations in both samples analyzed. The samples indicated 0.93 mg/l and 1.3 mg/l of lead in the raw wastewater. Lead concentrations starting at 0.08 mg/l are considered treatable. For this reason, lead is selected for further considered for limitation.

Nickel was detected above its treatability concentration in two samples analyzed. The analytical data showed 1.0 mg/l and 1.4 mg/l of nickel in the untreated wastewater. Since the treatable concentration for nickel is 0.22 mg/l, nickel is selected for further consideration for limitation.

Selenium was detected above its treatability concentration of 0.20 mg/l in one raw wastewater sample. The result showed 2.0 mg/l selenium in the untreated wastewater. Therefore, selenium is selected for further consideration for limitation.

Zinc has a treatability concentration of 0.23 mg/l. One sample analyzed showed zinc at a concentration of 6.1 mg/l in the raw wastewater. This sample is significantly above the treatable concentration for zinc; for this reason, zinc is selected for further consideration for limitation.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
SECONDARY URANIUM SUBCATEGORY
RAW WASTEWATER

Pollutant	Analytical Quantification Concentration (mg/l)(a)	Treatable Concentration (mg/l)(b)	Number of Streams Analyzed	Number of Samples Analyzed	ND	Detected Below Quantification Concentration	Detected Below Treatable Concentration	Detected Above Treatable Concentration
114. antimony	0.100	0.47	1	1		1		
115. arsenic	0.010	0.34	1	1				1
117. beryllium	0.010	0.20	1	1			1	
118. cadmium	0.002	0.049	1	1				1
119. chromium	0.005	0.07	1	2				2
120. copper	0.009	0.39	1	2				2
122. lead	0.020	0.08	1	2				2
123. mercury	0.0001	0.036	1	1		1		
124. nickel	0.005	0.22	1	2				2
125. selenium	0.01	0.20	1	1				1
126. silver	0.02	0.07	1	1		1		
127. thallium	0.100	0.34	1	1		1		
128. zinc	0.050	0.23	1	1				1

(a) Analytical quantification concentration was reported with the data (see Section V).

(b) Treatable concentrations are based on performance of chemical precipitation, sedimentation, and filtration.

SECONDARY URANIUM SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters from the secondary uranium plants. This section summarizes the description of these wastewaters and indicates the treatment technologies which are currently practiced in the secondary uranium subcategory for each waste stream. Secondly, this section presents the control and treatment technology options which were examined by the Agency for possible application to the secondary uranium subcategory.

CURRENT CONTROL AND TREATMENT PRACTICES

Control and treatment technologies are discussed in general in Section VII of the General Development Document. The basic principles of these technologies and the applicability to wastewater similar to that found in this subcategory are presented there. This section presents a summary of the control and treatment technologies that are currently being applied to each of the sources generating wastewater in this subcategory. As discussed in Section V, wastewater associated with the secondary uranium subcategory is characterized by the presence of the toxic metal pollutants and suspended solids. This analysis is supported by the raw (untreated) wastewater data, presented in Section V, from a uranium ore mill. It is expected that these pollutants are present in each of the waste streams at concentrations above treatability, and these waste streams are commonly combined for treatment. Construction of one wastewater treatment system for combined treatment allows plants to take advantage of economic scale and in some instances to combine streams of different alkalinity to reduce treatment chemical requirements. The direct discharging plant in this subcategory currently has a combined wastewater treatment system including chemical precipitation and sedimentation. The options selected for consideration for BPT, BAT, NSPS, and pretreatment will be summarized toward the end of this section.

REFINERY FILTRATE

Uranium production from scrap and residues begins with acid leaching the raw materials. This dissolves the uranium to facilitate separation from residual solids by filtration. Ammonia is added to the acid filtrate to precipitate dissolved uranium and the solids are again filtered, but this time retained for further processing. The filtrate is discharged, along with other process

wastewater, to treatment which consists of neutralization, flocculation and sedimentation, and discharge to a surface water.

SLAG LEACH SLURRY

In addition to solid uranium scrap and uranium residues, magnesium fluoride slag from the magnesium reduction operation is sometimes used as a raw material for uranium recovery. The recovery process also involves acid leaching of the slag which dissolves uranium so that it is carried away in the acid. Separation of the uranium-containing acid and the leached slag is done by filtration, after which the slag solids are discharged as a slurry. The slurry goes to the treatment system, along with other process wastewater, for lime and settle treatment, and final discharge to a surface water.

SOLVENT EXTRACTION RAFFINATE

Purification of the uranium compound that results from acid leaching is done by solvent extraction. An organic solvent is used to extract the uranium compound from the acid solution. The organic solvent selectively extracts the uranium compound. Thus, impurities from acid leaching are left in the acid solution. This solvent extraction raffinate is discharged to combined treatment consisting of neutralization and sedimentation, followed by discharge to a surface water.

DIGESTION OPERATION WET AIR POLLUTION CONTROL

The acid leaching operation includes a water scrubber for control of acid fumes generated by leaching. The system completely recirculates water to absorb particulates and acid gases until scrubbing efficiency drops, and then the scrubber liquor is batch dumped into a sump. In the sump, lime is added and the batch is allowed to settle. The settled solids are collected and recycled back into the digestion operation. The clarified liquid is discharged to combined treatment including neutralization and sedimentation, followed by discharge to a surface water.

EVAPORATION AND CALCINATION WET AIR POLLUTION CONTROL

Evaporation follows the purification step in which the uranium compound was extracted into an organic solvent. After re-extraction into aqueous solution it is concentrated by evaporation. The calcination step which follows converts the uranium compound to uranium trioxide. These off-gases contain much nitric acid. Since the scrubber liquor absorbs the nitric acid, the liquor is not discharged as a wastewater. Rather it is recycled to be used to dilute fresh acid in the digestion operation. Therefore, no wastewater is discharged from the evaporation and calcination operations.

HYDROGEN REDUCTION AND HYDROFLUORINATION KOH WET AIR POLLUTION CONTROL

Hydrogen reduction and hydrofluorination involve the final stages of preparing uranium tetrafluoride for the magnesium reduction operation. Hydrogen reduction converts uranium trioxide produced in the calcination step to uranium dioxide. Hydrofluorination involves contacting uranium dioxide with hydrofluoric acid to produce uranium tetrafluoride. The off-gases from these operations are scrubbed by a circulating KOH solution which neutralizes and scrubs the acidic fumes. The scrubber liquor is completely recycled until scrubber efficiency diminishes; then the liquor is batch discharged to combined treatment. Treatment consists of neutralization and sedimentation, followed by direct discharge to a surface water.

HYDROFLUORINATION WET AIR POLLUTION CONTROL

Hydrofluorination, as described above, involves contacting uranium dioxide with vaporized hydrofluoric acid at elevated temperatures. Within the off-gases is a substantial concentration of unreacted hydrofluoric acid. These fumes are passed through a water scrubber which absorbs much of the hydrofluoric acid. Some gases pass to the second scrubber noted above. Since the scrubber liquor over the hydrofluorination unit absorbs acid, and since there are not expected to be many contaminants in the acid fumes, the scrubber liquor is circulated until a desired concentration of hydrofluoric acid is attained. Then the solution is drawn off and sold for industrial use. Therefore, the hydrofluorination scrubber generates no wastewater that needs to be treated or discharged.

CONTROL AND TREATMENT OPTIONS

The Agency examined two control and treatment technology options that are applicable to the secondary uranium subcategory. The options selected for evaluation represent applicable end-of-pipe treatment technologies.

Examination of the waste streams in this subcategory shows that no further in-process flow reduction is achievable. Therefore, options including flow reduction were not considered. On the assumption that no organics are present (discussed in Section VI), options including activated carbon adsorption were not considered.

OPTION A

Option A for the secondary uranium subcategory requires control and treatment technologies to reduce the discharge of pollutant mass.

The Option A treatment scheme consists of chemical precipitation and sedimentation technology. Specifically, lime or some other alkaline compound is used to precipitate toxic metals as metal hydroxides. The metal hydroxides and suspended solids settle out and the sludge is collected. Vacuum filtration is used to dewater sludge.

Preliminary treatment consisting of ammonia steam stripping for waste streams containing treatable concentrations of ammonia is also included in Option A. Steam stripping is an efficient method for reducing the ammonia concentrations, as well as recovering ammonia as a by-product. Steam stripping also prevents the transfer of ammonia to the air.

OPTION C

Option C for the secondary uranium subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, chemical precipitation and sedimentation) plus multi-media filtration technology added at the end of the Option A treatment scheme. Multimedia filtration is used to remove suspended solids, including precipitates of metals, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed- media type, although other forms of filters, such as rapid sand filters or pressure filters would perform satisfactorily. The addition of filters also provides consistent removal during periods of time in which there are rapid increases in flows or loadings of pollutants to the treatment system.

EPA is investigating whether organic solvent is discharged as part of the solvent extraction raffinate waste stream. If so, the Agency will consider including organic removal technologies such as activated carbon or chemical oxidation in the Option C treatment scheme at promulgation.

SECONDARY URANIUM SUBCATEGORY

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the secondary uranium subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant removal performance presented in Section X of this supplement, these cost estimates provide a basis for evaluating each regulatory option. These cost estimates are also used in determining the probable economic impact of regulation on the subcategory at different pollutant discharge levels. In addition, this section addresses nonwater quality environmental impacts of wastewater treatment and control alternatives, including air pollution, solid wastes, and energy requirements, which are specific to the secondary uranium subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, two treatment options have been developed and considered in proposing limitations and standards for the secondary uranium subcategory. These options are summarized below and schematically presented in Figures X-1 and X-2.

OPTION A

The Option A treatment scheme consists of chemical precipitation and sedimentation technology.

Preliminary treatment consisting of ammonia steam stripping for waste streams containing treatable concentrations of ammonia is also included in Option A.

OPTION C

Option C for the secondary uranium subcategory consists of all control and treatment requirements of Option A (ammonia steam stripping, chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option A treatment scheme.

COST METHODOLOGY

A detailed discussion of the methodology used to develop the compliance costs is presented in Section VIII of the General Development Document. Plant-by-plant compliance costs have been

estimated for the nonferrous metals manufacturing category and are presented in the administrative record supporting this regulation. The costs developed for the proposed regulation are presented in Table VIII-1 for the direct dischargers in this subcategory.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. No subcategory-specific assumptions were used in developing compliance costs for the secondary uranium subcategory.

NONWATER QUALITY ASPECTS

A general discussion of the nonwater quality aspects of the control and treatment options considered for the nonferrous metals category is contained in Section VIII of the General Development Document. Nonwater quality impacts specific to the secondary uranium subcategory, including energy requirements, solid waste and air pollution are discussed below.

ENERGY REQUIREMENTS

The methodology used for determining the energy requirements for the various options is discussed in Section VIII of the General Development Document. Energy requirements for Option A are estimated at 76,000 kWh/yr, and for Option C the estimated requirement is 85,000 kWh/yr. Option C energy requirements increased over those for Option A because filtration is being added as an end-of-pipe treatment technology. Since recycle and reuse of scrubber liquor is already practiced in this subcategory, energy requirement savings resulting from flow reduction measures are not reflected in this analysis. Both Option A and Option C energy requirements represent less than 1 percent of the energy usage in the secondary uranium industry. It is therefore concluded that the energy requirements of the treatment options considered will have no significant impact on total plant energy consumption.

SOLID WASTE

Sludge generated in the secondary uranium subcategory is due to the precipitation of metals as hydroxides and carbonates using lime. Sludges associated with the secondary uranium subcategory will necessarily contain quantities of toxic metal pollutants. Wastes generated by secondary metal industries can be regulated as hazardous. However, the Agency examined the solid wastes that would be generated at secondary nonferrous metals manufacturing plants by the suggested treatment technologies and believes they are not hazardous wastes under the Agency's regulations implementing Section 3001 of the Resource Conservation and Recovery

Act. None of the secondary uranium subcategory wastes are listed specifically as hazardous, nor are they likely to exhibit a characteristic of hazardous waste. This judgement is made based on the recommended technology of lime precipitation and filtration. By the addition of a small excess of lime during treatment, similar sludges, specifically toxic metal bearing sludges, generated by other industries such as the iron and steel industry passed the Extraction Procedure (EP) toxicity test. See 40 CFR §261.24. Thus, the Agency believes that the wastewater sludges will similarly not be EP toxic if the recommended technology is applied.

Although it is the Agency's view that solid wastes generated as a result of these guidelines are not expected to be hazardous, generators of these wastes must test the waste to determine if the wastes meet any of the characteristics of hazardous waste (see 40 CFR 262.11).

If these wastes should be identified or are listed as hazardous, they will come within the scope of RCRA's "cradle to grave" hazardous waste management program, requiring regulation from the point of generation to point of final disposition. EPA's generator standards would require generators of hazardous nonferrous metals manufacturing wastes to meet containerization, labeling, recordkeeping, and reporting requirements; if plants dispose of hazardous wastes off-site, they would have to prepare a manifest which would track the movement of the wastes from the generator's premises to a permitted off-site treatment, storage, or disposal facility. See 40 CFR 262.20 45 FR 33142 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). The transporter regulations require transporters of hazardous wastes to comply with the manifest system to assure that the wastes are delivered to a permitted facility. See 40 CFR 263.20 45 FR 33151 (May 19, 1980), as amended at 45 FR 86973 (December 31, 1980). Finally, RCRA regulations establish standards for hazardous waste treatment, storage, and disposal facilities allowed to receive such wastes. See 40 CFR Part 464 46 FR 2802 (January 12, 1981), 47 FR 32274 (July 26, 1982).

Even if these wastes are not identified as hazardous, they still must be disposed of in compliance with the Subtitle D open dumping standards, implementing 4004 of RCRA. See 44 FR 53438 (September 13, 1979). It is estimated that the secondary uranium subcategory will generate 262 metric tons of sludge per year when implementing the proposed BPT treatment technology. The Agency has calculated as part of the costs for wastewater treatment the cost of hauling and disposing of these wastes. For more details, see Section VIII of the General Development Document.

AIR POLLUTION

There is no reason to believe that any substantial air pollution problems will result from implementation of ammonia steam stripping, chemical precipitation, sedimentation, and multimedia filtration. Ammonia steam stripping yields an aqueous ammonia stream. The other technologies transfer pollutants to solid waste and are not likely to transfer pollutants to air.

Table VIII-1

COST OF COMPLIANCE FOR THE SECONDARY URANIUM SUBCATEGORY
DIRECT DISCHARGERS

(March 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	28,600	73,644
C	54,312	86,452

SECONDARY URANIUM SUBCATEGORY

SECTION IX

BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

This section defines the effluent characteristics attainable through the application of best practicable control technology currently available (BPT), Section 301(b)(a)(A). BPT reflects the existing performance by plants of various sizes, ages, and manufacturing processes within the secondary uranium subcategory, as well as the established performance of the recommended BPT systems. Particular consideration is given to the treatment already in place at plants within the data base.

The factors considered in identifying BPT include the total cost of applying the technology in relation to the effluent reduction benefits from such application, the age of equipment and facilities involved, the manufacturing processes used, nonwater quality environmental impacts (including energy requirements), and other factors the Administrator considers appropriate. In general, the BPT level represents the average of the existing performances of plants of various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, BPT may be transferred from a different subcategory or category. Limitations based on transfer of technology are supported by a rationale concluding that the technology is, indeed, transferable, and a reasonable prediction that it will be capable of achieving the prescribed effluent limits (see Tanner's Council of America v. Train, 540 F.2d 1188 (4th Cir. 1176). BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except where such practices are common industry practice.

TECHNICAL APPROACH TO BPT

The Agency studied the nonferrous metals category to identify the processes used, the wastewaters generated, and the treatment processes installed. Information was collected from industry using data collection portfolios, and specific plants were sampled and the wastewaters analyzed. In making technical assessments of data, reviewing manufacturing processes, and assessing wastewater treatment technology options, both indirect and direct dischargers have been considered as a single group. An examination of plants and processes did not indicate any process differences based on the type of discharge, whether it be direct or indirect.

As explained in Section IV, the secondary uranium subcategory has been subdivided into seven potential wastewater sources. Since the water use, discharge rates, and pollutant characteristics of each of these wastewaters is potentially unique, effluent limitations will be developed for each of the seven subdivisions.

For each of the subdivisions, a specific approach was followed for the development of BPT mass limitations. The first requirement to calculate these limitations is to account for production and flow variability from plant to plant. Therefore, a unit of production or production normalizing parameter (PNP) was determined for each waste stream which could then be related to the flow from the process to determine a production normalized flow. Selection of the PNP for each process element is discussed in Section IV. Each plant within the subcategory was then analyzed to determine (1) which subdivisions were present, (2) the specific flow rates generated for each subdivision, and (3) the specific production normalized flows for each subdivision. This analysis is discussed in detail in Section V. Nonprocess wastewaters such as rainfall runoff and noncontact cooling water are not considered in the analysis.

Production normalized flows for each subdivision were then analyzed to determine the flow to be used as part of the basis for BPT mass limitations. The selected flow (sometimes referred to as the BPT regulatory flow or BPT discharge rate) reflects the water use controls which are common practices within the category. The BPT regulatory flow is based on the average of all applicable data. Plants with normalized flows above the average may have to implement some method of flow reduction to achieve the BPT limitations.

The second requirement to calculate mass limitations is the set of concentrations that are achievable by application of the BPT level of treatment technology. Section VII discusses the various control and treatment technologies which are currently in place for each wastewater source. In most cases, the current control and treatment technologies consist of chemical precipitation and sedimentation (lime and settle technology) and a combination of reuse and recycle to reduce flow. Ammonia steam stripping is applied to streams with treatable concentrations of ammonia.

Using these regulatory flows and the achievable concentrations, the next step is to calculate mass loadings for each wastewater source or subdivision. This calculation was made on a stream-by-stream basis, primarily because plants in this subcategory may perform one or more of the operations in various combinations. The mass loadings (milligrams of pollutant per kilogram of production - mg/kg) were calculated based on the BPT regulatory flow (l/kkg) and the concentration achievable by the BPT level of

treatment technology (mg/l) for each pollutant parameter to be limited under BPT. These mass loadings are published in the Federal Register and in CFR Part 400 as the effluent limitations guidelines.

The mass loadings which are allowed under BPT for each plant will be the sum of the individual mass loadings for the various wastewater sources which are found at particular plants. Accordingly, all the wastewater generated within a plant may be combined for treatment in a single or common treatment system, but the effluent limitations for these combined wastewaters are based on the various wastewater sources which actually contribute to the combined flow. This method accounts for the variety of combinations of wastewater sources and production processes which may be found at secondary uranium plants.

The Agency usually establishes wastewater limitations in terms of mass rather than concentration. This approach prevents the use of dilution as a treatment method (except for controlling pH). The production normalized wastewater flow (l/kkg) is a link between the production operations and the effluent limitations. The pollutant discharge attributable to each operation can be calculated from the normalized flow and effluent concentration achievable by the treatment technology and summed to derive an appropriate limitation for each plant.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

In balancing costs in relation to pollutant removal estimates, EPA considers the volume and nature of existing discharges, the volume and nature of discharges expected after application of BPT, the general environmental effects of the pollutants, and the cost and economic impacts of the required pollution control level. The Act does not require or permit consideration of water quality problems attributable to particular point sources or industries, or water quality improvements in particular water quality bodies. Accordingly, water quality considerations were not the basis for selecting the proposed BPT. See Weyerhaueser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978).

The methodology for calculating pollutant removal estimates and plant compliance costs is discussed in Section X. Table X-1 shows the pollutant removal estimates for each treatment option for direct dischargers. Compliance costs for direct dischargers are presented in Table X-2.

BPT OPTION SELECTION

The technology basis for the BPT limitations is Option A, chemical precipitation and sedimentation technology to remove metals and solids from combined wastewaters and to control pH, and

ammonia steam stripping preliminary treatment to remove ammonia. These technologies are demonstrated and economically achievable since they are already in place at several discharging plants throughout the nonferrous metals manufacturing category.

Ammonia steam stripping is demonstrated at seven facilities in the nonferrous metals manufacturing category. These facilities are treating ammonia bearing wastewaters associated with the production of primary tungsten, primary columbium and tantalum, primary molybdenum, secondary tungsten and cobalt, secondary molybdenum and vanadium, and primary zirconium and hafnium. EPA believes that performance data from the iron and steel manufacturing category provide a valid measure of this technology's performance on nonferrous metals manufacturing category wastewater because raw wastewater concentrations of ammonia are of the same order of magnitude in the respective raw wastewater matrices.

Chemical analysis data were collected of raw waste (treatment influent) and treated waste (treatment effluent) from one coke plant of the iron and steel manufacturing category. A contractor for EPA, using EPA sampling and chemical analysis protocols, collected six paired samples in a two-month period. These data are the data base for determining the effectiveness of ammonia steam stripping technology and are contained within the public record supporting this document. Ammonia treatment at this coke plant consisted of two steam stripping columns in series with steam injected countercurrently to the flow of the wastewater. A lime reactor for pH adjustment separated the two stripping columns.

The Agency has verified the proposed steam stripping performance values using steam stripping data collected at a primary zirconium and hafnium plant which has raw ammonia levels as high as any in the nonferrous metals manufacturing category. Data collected by the plant represent almost two years of daily operations, and support the long-term mean used to establish treatment effectiveness.

Implementation of the proposed BPT limitations will remove annually an estimated 1,280 kg of toxic metals, 283 kg of uranium, and 1,763 kg of TSS. While the one discharging plant has most of the equipment in-place to comply with BPT, EPA does not believe that the plant is currently achieving the proposed BPT limitations. The Agency projects capital and annual costs of $28,600 and $73,644 (1982 dollars) respectively for modifications to technology presently in-place at the discharging facility to achieve proposed BPT regulations. The end-of-pipe treatment configuration for Option A is presented in Figure IX-1.

WASTEWATER DISCHARGE RATES

A BPT discharge rate is calculated for each subdivision based on the average of the flows of the existing plants, as determined from analysis of data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BPT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the seven wastewater sources are discussed below and summarized in Table IX-1. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the intermediate product which is produced by the process associated with the waste stream in question. These production normalizing parameters, or PNPs, are also listed in Table IX-1.

Section V of this document further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision in Tables V-1 through V-7.

REFINERY FILTRATE

The BPT wastewater discharge rate for refinery filtrate is 34,800 l/kkg (8,350 gal/ton) of uranium trioxide produced. This rate is allocated for those plants that acid leach scrap uranium materials to recover the uranium. After the dissolved uranium in the acid is precipitated and filtered, the filtrate is discharged to treatment. Only one plant in this subcategory employs this operation. This plant is a direct discharger and the waste generated is treated with lime and settle technology prior to discharge to a surface water. Production normalized flows for this waste stream are presented in Table V-1.

SLAG LEACH SLURRY

The BPT wastewater discharge rate for slag leach slurry is 3,800 l/kkg (910 gal/ton) of uranium trioxide produced. This rate is allocated only for those plants which leach magnesium fluoride slag, recycled from the magnesium reduction operation, to recover the residual uranium in the slag. The method of recovery is by dissolving the uranium by acid leaching the slag, then separating the uranium-containing acid from the leached slag. The solution goes to further processing while the slag is discharged as a slurry and undergoes neutralization and sedimentation treatment. Water use and wastewater discharge rates for slag leach slurry are presented in Table V-2.

SOLVENT EXTRACTION RAFFINATE

The BPT wastewater discharge rate for solvent extraction raffinate is 5,300 l/kkg (1,270 gal/ton) of uranium trioxide produced.

This rate is allocated for those plants which purify the acid-dissolved uranium compound by extracting the uranium compound into an organic solvent, leaving behind all impurities that were leached along with the uranium. One plant in this subcategory employs such a purification process and it discharges the extraction raffinate to its lime and settle treatment system before direct discharge. The production normalized flows for this subdivision are presented in Table V-3.

DIGESTION OPERATION WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for digestion operation wet air pollution control is 30 l/kkg (7.2 gal/ton) of uranium trioxide produced based on partial recycle of scrubber liquor. This rate is allocated only for those plants that incorporate a water scrubber on the acid leaching system. The plant in this subcategory that has a scrubber over its acid leaching operation presently practices complete recycling of the scrubber liquor until scrubber efficiency drops and the solution is batch dumped. Because recycle was already in use by the plant, the BPT discharge rate was based on recycle. The wastewater from this scrubber is pretreated to recover solids which are reused in the digestion operation. The remainder of the wastewater is treated and discharged. Water use and discharge rates for the digestion operation scrubber are presented in Table V-4.

EVAPORATION AND CALCINATION WET AIR POLLUTION CONTROL

No BPT wastewater discharge rate is provided for evaporation and calcination wet air pollution control. This requirement is applicable to those plants that use evaporators and calcinators to respectively concentrate an intermediate uranium compound and then effectively burn it to convert it to uranium trioxide. The BPT discharge rate is proposed as zero because the one discharging plant in this subcategory that uses these operations recycles all their scrubber liquor to the digestion operation to use for dilution of fresh leaching acid. Because 100 percent recycle is demonstrated in this subcategory, the BPT discharge rate reflects this capability. This production normalized discharge rate is also presented in Table V-5.

HYDROGEN REDUCTION AND HYDROFLUORINATION KOH WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for hydrogen reduction and hydrofluorination KOH wet air pollution control is 20 l/kkg (4.8 gal/ton) of uranium tetrafluoride produced based on partial recycle. This rate is allocated only for those plants that use hydrogen reduction to convert uranium trioxide to uranium dioxide and then hydrofluorinate uranium dioxide to produce uranium

tetrafluoride, and scrub the gases from these operations with a KOH scrubber. Since this plant presently operates the scrubber at a high recycle rate, the BPT discharge rate reflects this demonstrated performance. Table V-6 also presents the water use and discharge rates for this waste stream.

HYDROFLUORINATION WET AIR POLLUTION CONTROL

No BPT wastewater discharge rate is proposed for hydrofluorination wet air pollution control. This requirement is applicable only to those plants which use a water scrubber to control acid fumes from the hydrofluorination unit. The BPT discharge rate is proposed as zero because the one plant in this subcategory that operates such a scrubber recycles the scrubber liquor to absorb the hydrofluoric acid fumes until a desired concentration of hydrofluoric acid is attained. Then the scrubber solution is drawn off and sold for industrial use. Since this recycle technology is demonstrated within this subcategory, the BPT discharge rate reflects that capability. Table V-7 also presents the water use and discharge rate for the hydrofluorination wet air pollution control system.

REGULATED POLLUTANT PARAMETERS

The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutant parameters for limitation. This examination and evaluation was presented in Section VI. A total of eight pollutants or pollutant parameters are selected for limitation under BPT and are listed below:

119. chromium
120. copper
124. nickel
ammonia
fluoride
uranium
TSS
pH

EFFLUENT LIMITATIONS

The treatable concentrations achievable by application of the proposed BPT are discussed in Section VII of the General Development Document and summarized there in Table VII-19. These treatable concentrations (both one day maximum and monthly average values) are multiplied by the BPT normalized discharge flows summarized in Table IX-1 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per kilogram of product represent the BPT effluent limitations and are presented in Table IX-2 for each individual waste stream.

Table IX-1

BPT WASTEWATER DISCHARGE RATES FOR THE SECONDARY URANIUM SUBCATEGORY

Wastewater Stream	BPT Normalized Discharge Rate l/kkg	BPT Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Refinery filtrate	34,800	8,350	Uranium trioxide produced
Slag leach slurry	3,800	910	Uranium trioxide produced
Solvent extraction raffinate	5,300	1,270	Uranium trioxide produced
Digestion operation wet air pollution control	30	7.2	Uranium trioxide produced
Evaporation and calcination wet air pollution control	0	0	Uranium trioxide produced
Hydrogen reduction and hydrofluorination KOH wet air pollution control	20	4.8	Uranium tetrafluoride produced
Hydrofluorination wet air pollution control	0	0	Uranium tetrafluoride produced

Table IX-2

BPT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	15.310	6.264
Copper	66.120	34.800
Nickel	66.820	44.200
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	139.200	78.300
Total Suspended Solids	1,427.000	678.600
pH	Within the range of 7.5 to 10.0 at all times	

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.672	0.684
Copper	7.220	3.800
Nickel	7.296	4.826
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	15.200	8.550
Total Suspended Solids	155.800	74.100
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	2.332	0.954
Copper	10.070	5.300
Nickel	10.180	6.731
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	21.200	11.930
Total Suspended Solids	217.300	103.400
pH	Within the range of 7.5 to 10.0 at all times	

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.013	0.005
Copper	0.057	0.030
Nickel	0.058	0.038
Ammonia (as N)	3.900	1.758
Fluoride	1.050	0.600
Uranium	0.120	0.068
Total Suspended Solids	1.230	0.585
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.009	0.004
Copper	0.038	0.020
Nickel	0.038	0.025
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.080	0.045
Total Suspended Solids	0.820	0.390
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

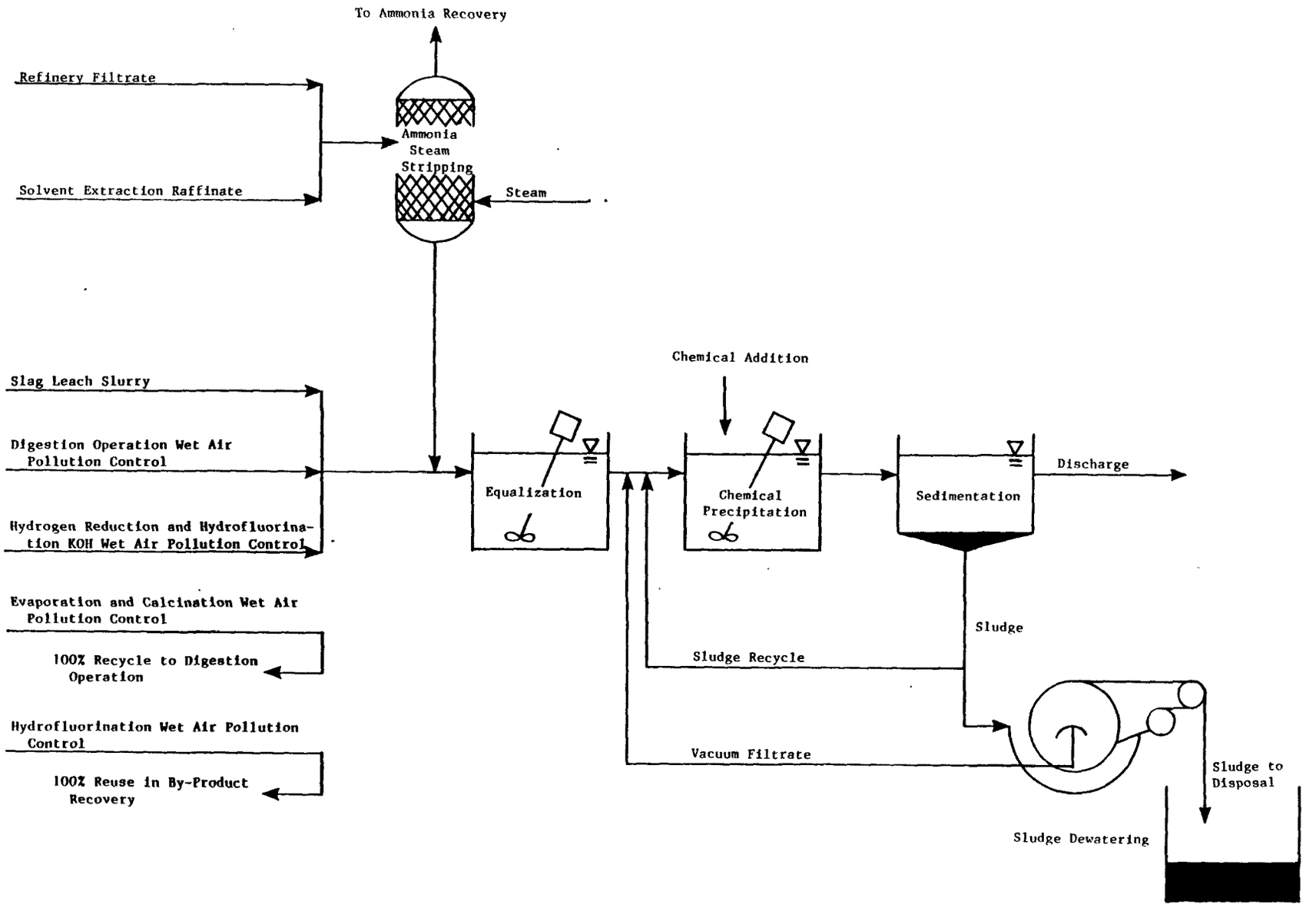

Figure IX-1

BPT TREATMENT SCHEME FOR THE SECONDARY URANIUM SUBCATEGORY

SECONDARY URANIUM SUBCATEGORY

SECTION X

BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

The effluent limitations which must be achieved by July 1, 1984 are based on the best control and treatment technology used by a specific point source within the industrial category or subcategory, or by another industry where it is readily transferable. Emphasis is placed on additional treatment techniques applied at the end of the treatment systems currently used, as well as reduction of the amount of water used and discharged, process control, and treatment technology optimization.

The factors considered in assessing best available technology economically achievable (BAT) include the age of equipment and facilities involved, the process used, process changes, nonwater quality environmental impacts (including energy requirements), and the costs of application of such technology (Section 304(b)(2)(B) of the Clean Water Act). At a minimum, BAT represents the best available technology economically achievable at plants of various ages, sizes, processes, or other characteristics. Where the Agency has found the existing performance to be uniformly inadequate, BAT may be transferred from a different subcategory or category. BAT may include feasible process changes or internal controls, even when not in common industry practice.

The required assessment of BAT considers costs, but does not require a balancing of costs against pollutant removals (see Weyerhaeuser v. Costle, 11 ERC 2149 (D.C. Cir. 1978)). However, in assessing the proposed BAT, the Agency has given substantial weight to the economic achievability of the technology.

TECHNICAL APPROACH TO BAT

The Agency reviewed a wide range of technology options and evaluated the available possibilities to ensure that the most effective and beneficial technologies were used as the basis of BAT. To accomplish this, the Agency elected to examine two technology options which could be applied to the secondary uranium subcategory as alternatives for the basis of BAT effluent limitations.

For the development of BAT effluent limitations, mass loadings were calculated for each wastewater source or subdivision in the subcategory using the same technical approach as described in Section IX for BPT limitations development. The differences in the mass loadings for BPT and BAT are due to increased treatment

effectiveness achievable with the more sophisticated BAT treatment technology.

The treatment technologies considered for BAT are summarized below:

Option A (Figure X-1):

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation

Option C (Figure X-2):

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- Multimedia filtration

The two options examined for BAT are discussed in greater detail below. The first option considered (Option A) is the same as the BPT treatment and control technology which was presented in the previous section. The second option represents substantial progress toward the reduction of pollutant discharges above and beyond the progress achievable by BPT.

OPTION A

Option A for the secondary uranium subcategory is equivalent to the control and treatment technologies which were analyzed for BPT in Section IX (see Figures IX-1 or X-1). The BPT end-of-pipe treatment scheme includes chemical precipitation and sedimentation, with ammonia steam stripping preliminary treatment of wastewaters containing treatable concentrations of ammonia. The discharge rates for Option A are equal to the discharge rates allocated to each stream as a BPT discharge flow.

OPTION C

Option C for the secondary uranium subcategory consists of all control and treatment requirements of Option A (chemical precipitation and sedimentation, with ammonia steam stripping preliminary treatment of wastewaters containing treatable concentrations of ammonia) plus multimedia filtration technology added at the end of the Option A treatment scheme (see Figure X-2). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond the concentrations attainable by gravity sedimentation. The filter suggested is of the gravity, mixed media type, although other forms of filters, such as rapid sand filters or pressure filters, would perform satisfactorily.

EPA is investigating whether organic solvent is discharged as part of the solvent extraction raffinate waste stream. If so, the Agency will consider including organics removal technologies such as activated carbon or chemical oxidation in the Option C treatment scheme at promulgation.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

As one means of evaluating each technology option, EPA developed estimates of the pollutant removals and the compliance costs associated with each option. The methodologies are described below.

POLLUTANT REMOVAL ESTIMATES

A complete description of the methodology used to calculate the estimated pollutant removal, or benefit, achieved by the application of the various treatment options is presented in Section X of the General Development Document. In short, sampling data collected during the field sampling program were used to characterize the major waste streams considered for regulation. At each sampled facility, the sampling data were production normalized for each unit operation (i.e., mass of pollutant generated per mass of product manufactured). This value, referred to as the raw waste, was used to estimate the mass of toxic pollutants generated within the secondary uranium subcategory. The pollutant removal estimates were calculated for each plant by first estimating the total mass of each pollutant in the untreated wastewater. This was calculated by first multiplying the raw waste values by the corresponding production value for that stream and then summing these values for each pollutant for every stream generated by the plant.

Next, the volume of wastewater discharged after the application of each treatment option was estimated for each operation at each plant by comparing the actual discharge to the regulatory flow. The smaller of the two values was selected and summed with the other plant flows. The mass of pollutant discharged was then estimated by multiplying the achievable concentration values attainable with the option (mg/l) by the estimated volume of process wastewater discharged by the subcategory. The mass of pollutant removed is the difference between the estimated mass of pollutant generated by each plant in the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the secondary uranium subcategory are presented in Table X-1.

COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost estimation model, relating the total costs

associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model to each plant. The plant's investment and operating costs are determined by what treatment it has in place and by its individual process wastewater discharge flow. As discussed above, this flow is either the actual or the BAT regulatory flow, whichever is lesser. The final step was to annualize the capital costs, and to sum the annualized capital costs, and the operating and maintenance costs for each plant, yielding the cost of compliance for the subcategory. The compliance costs associated with the various options are presented in Table X-2 for direct discharges in the secondary uranium subcategory. These costs were used in assessing economic achievability.

BAT OPTION SELECTION

EPA has selected Option C which includes chemical precipitation, sedimentation, and multimedia filtration, with ammonia steam stripping preliminary treatment of wastewater containing treatable concentrations of ammonia. The estimated capital cost of proposed BAT is $54,312 (1982 dollars) and the annual cost is $86,452 (1982 dollars). The end-of-pipe treatment configuration for Option C is presented in Figure X-2.

EPA is proposing multimedia filtration as part of the BAT technology because this technology is demonstrated by 25 plants in the nonferrous metals manufacturing category, and results in additional removal of toxic metals. In addition, filtration adds reliability to the treatment system by making it less susceptible to operator error and to sudden changes in raw wastewater flow and concentrations.

Implementation of the control and treatment technologies of Option C would remove annually an estimated 1,304 kilograms of toxic metal pollutants and 289 kilograms of uranium, which is 24 kilograms of toxic metal pollutants over the estimated BPT removal.

WASTEWATER DISCHARGE RATES

A BAT discharge rate was calculated for each subdivision based upon the flows of the existing plants, as determined from analysis of the data collection portfolios. The discharge rate is used with the achievable treatment concentrations to determine BAT effluent limitations. Since the discharge rate may be different for each wastewater source, separate production normalized discharge rates for each of the seven wastewater sources were determined and are summarized in Table X-3. The discharge rates are normalized on a production basis by relating the amount of wastewater generated to the mass of the intermediate product which is produced by the process associated with the waste stream

in question. These production normalizing parameters, or PNPs, are also listed in Table X-3.

The BAT discharge rates reflect no flow reduction requirements as compared to the BPT option flows. In-process flow reduction was not achievable for any waste streams in this subcategory. As an example, the acid leach scrubber used at one of the secondary uranium plants already operates with extensive recycle. Consequently, the BAT and BPT production normalized discharge flows are identical.

REGULATED POLLUTANT PARAMETERS

In implementing the terms of the Consent Agreement in NRDC v. Train, Op. Cit., and 33 U.S.C. 1314(b)(2)(A and B) (1976), the Agency placed particular emphasis on the toxic pollutants. The raw wastewater concentrations from individual operations and the subcategory as a whole were examined to select certain pollutants and pollutant parameters for limitation. This examination and evaluation was presented in Section VI. The Agency, however, has chosen not to regulate all eight toxic pollutants selected in this analysis.

The high cost associated with analysis for toxic metal pollutants has prompted EPA to develop an alternative method for regulating and monitoring toxic pollutant discharges from the nonferrous metals manufacturing category. Rather than developing specific effluent mass limitations and standards for each of the toxic metals found in treatable concentrations in the raw wastewater from a given subcategory, the Agency is proposing effluent mass limitations only for those pollutants generated in the greatest quantities as shown by the pollutant removal estimate analysis. The pollutants selected for specific limitation are listed below:

119. chromium
120. copper
124. nickel
ammonia
fluoride
uranium

By establishing limitations and standards for certain toxic metal pollutants, dischargers will attain the same degree of control over toxic metal pollutants as they would have been required to achieve had all the toxic metal pollutants been directly limited.

This approach is technically justified since the treatable concentrations used for chemical precipitation and sedimentation technology are based on optimized treatment for concomitant multiple metals removal. Thus, even though metals have somewhat different theoretical solubilities, they will be removed at very

nearly the same rate in a chemical precipitation and sedimentation treatment system operated for multiple metals removal. Filtration as part of the technology basis is likewise justified because this technology removes metals non-preferentially.

The toxic metal pollutants selected for specific limitation in the secondary uranium subcategory to control the discharges of toxic metal pollutants are chromium, copper, and nickel. Ammonia is also selected for limitation since the methods used to control chromium, copper, and nickel are not effective in the control of ammonia. The following toxic metal pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for chromium, copper, and nickel:

115. arsenic
118. cadmium
122. lead
125. selenium
128. zinc

EFFLUENT LIMITATIONS

The concentrations achievable by application of BAT are discussed in Section VII of the General Development Document and summarized there in Table VII-19. The treatable concentrations both one day maximum and monthly average values are multiplied by the BAT normalized discharge flows summarized in Table X-3 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per kilogram of product represent the BAT effluent limitations and are presented in Table X-4 for each waste stream.

Table X-1

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	0	0	0	0	0
Arsenic	48.09	10.10	37.99	6.51	41.58
Cadmium	0.96	0.96	0	0.93	0.04
Chromium (total)	14.72	1.66	13.05	1.34	13.38
Copper	69.25	11.49	57.76	7.47	61.78
Cyanide (total)	0	0	0	0	0
Lead	21.45	2.38	19.07	1.53	19.92
Mercury	6.51	1.19	5.33	0.69	5.83
Nickel	26.93	14.65	12.28	4.21	22.72
Selenium	38.47	5.94	32.53	3.83	34.64
Silver	0	0	0	0	0
Thallium	0	0	0	0	0
Zinc	1,108.88	6.53	1,102.35	4.40	1,104.48
TOTAL TOXICS	1,335.26	54.90	1,280.36	30.90	1,304.35
Ammonia (as N)	*	*	*	*	*
Fluoride	*	*	*	*	*
Uranium	302.93	20.25	282.68	13.5	289.43
TSS	2,000.48	237.63	1,762.86	49.77	1,950.71

*Specific removals cannot be estimated at this time.

Table X-2

COST OF COMPLIANCE FOR THE
SECONDARY URANIUM SUBCATEGORY

Direct Dischargers

Option	Total Required Capital Cost (1982 dollars)	Total Annual Cost (1982 dollars)
A	28,600	73,644
C	54,312	86,452

Table X-3

BAT WASTEWATER DISCHARGE RATES FOR THE SECONDARY URANIUM SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate l/kkg	BAT Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Refinery filtrate	34,800	8,350	Uranium trioxide produced
Slag leach slurry	3,800	910	Uranium trioxide produced
Solvent extraction raffinate	5,300	1,270	Uranium trioxide produced
Digestion operation wet air pollution control	30	7.2	Uranium trioxide produced
Evaporation and calcination wet air pollution control	0	0	Uranium trioxide produced
Hydrogen reduction and hydrofluorination KOH wet air pollution control	20	4.8	Uranium tetrafluoride produced
Hydrofluorination wet air pollution control	0	0	Uranium tetrafluoride produced

Table X-4

BAT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	1,439.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.500
Fluoride	133.000	76.000
Uranium	10.180	5.738

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003

Table X-4 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030

Table X-4 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

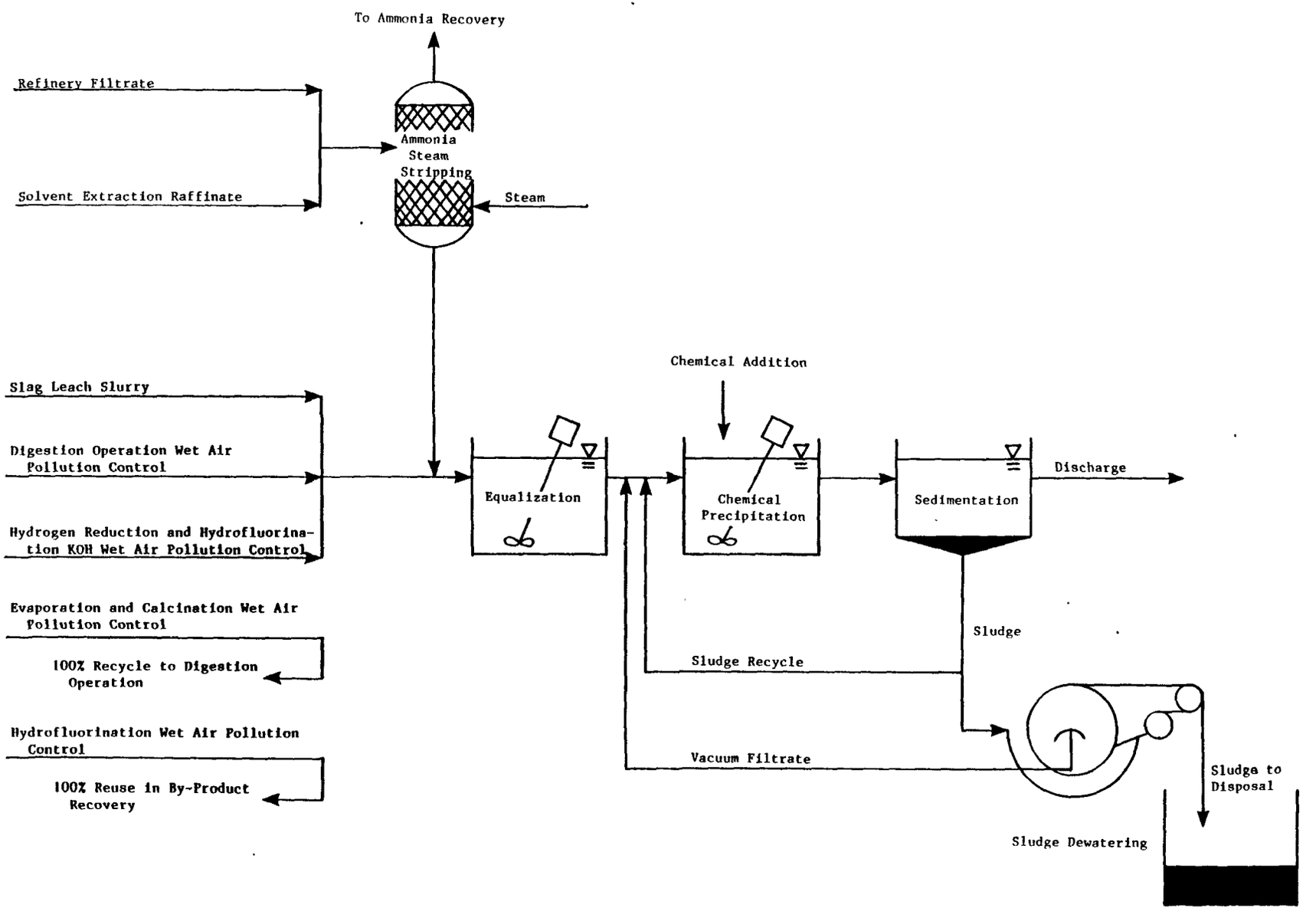

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

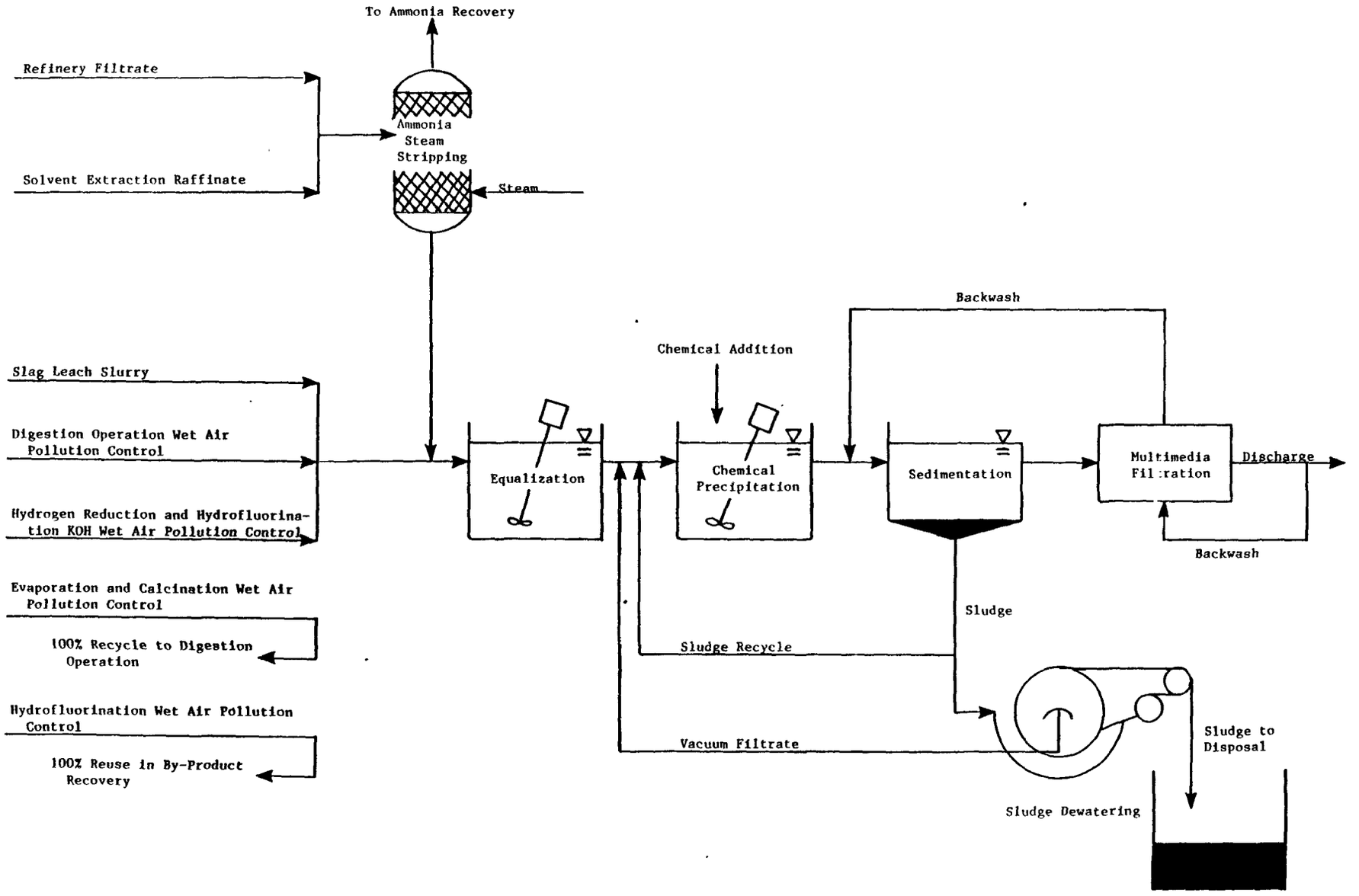

Figure X-2

BAT TREATMENT SCHEME FOR OPTION C

SECONDARY URANIUM SUBCATEGORY

SECTION XI

NEW SOURCE PERFORMANCE STANDARDS

The basis for new source performance standards (NSPS) under Section 306 of the Act is the best available demonstrated technology (BDT). New plants have the opportunity to design the best and most efficient production processes and wastewater treatment technologies without facing the added costs and restrictions encountered in retrofitting an existing plant. Therefore, Congress directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies which reduce pollution to the maximum extent feasible.

This section describes the technologies for treatment of wastewater from new sources and presents mass discharge standards for regulatory pollutants for NSPS in the secondary uranium subcategory, based on the selected treatment technology.

TECHNICAL APPROACH TO NSPS

New source performance standards are equivalent to the best available technology (BAT) selected for currently existing secondary uranium plants. This result is a consequence of careful review by the Agency of a wide range of technical options for new source treatment systems which is discussed in Section XI of the General Development Document. This review of the secondary uranium subcategory found no new, economically feasible, demonstrated technologies which could be considered an improvement over those chosen for consideration for BAT. Additionally, there was nothing found to indicate that the wastewater flows and characteristics of new plants would not be similar to those from existing plants, since the processes used by new sources are not expected to differ from those used at existing sources. Consequently, BAT production normalized discharge rates, which are based on the best existing practices of the subcategory, can also be applied to new sources. These rates are presented in Table X-3.

Treatment technologies considered for the NSPS options are identical to the treatment technologies considered for the BAT options. These options are:

OPTION A

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation

OPTION C

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- Multimedia filtration

EPA is investigating whether organic solvent is discharged as part of the solvent extraction raffinate waste stream. If so, the Agency will consider including organics removal technologies such as activated carbon or chemical oxidation in the Option C treatment scheme at promulgation.

NSPS OPTION SELECTION

EPA proposed that the best available demonstrated technology for the secondary uranium subcategory be equivalent to Option C (ammonia steam stripping, chemical precipitation, sedimentation, and multimedia filtration). Filtration technology is demonstrated in 25 plants in the nonferrous metals manufacturing category. Ammonia steam stripping technology is transferred from the iron and steel category as noted in the discussion of the BAT option selection in Section X.

The wastewater flow rates for NSPS are the same as the BAT flow rates. Flow reduction measures for NSPS are not feasible as a review of the industry indicates that no new demonstrated technologies that improve on BAT technology exist. EPA does not believe that new plants could achieve any additional flow reduction beyond the 90 to 100 percent scrubber effluent recycle presently practiced in the industry.

REGULATED POLLUTANT PARAMETERS

The Agency has no reason to believe that the pollutants that will be found in treatable concentrations in processes within new sources will be any different than with existing sources. Accordingly, pollutants and pollutant parameters selected for limitation under NSPS, in accordance with the rationale of Sections VI and X, are identical to those selected for BAT. The conventional pollutant parameters TSS and pH are also selected for limitation.

NEW SOURCE PERFORMANCE STANDARDS

The NSPS discharge flows for each wastewater source are the same as the discharge rates for BAT and are shown in Table XI-1. The mass of pollutant allowed to be discharged per mass of product is based on the product of the appropriate treatable concentration (mg/l) and the production normalized wastewater discharge flows (l/kkg). The treatable concentrations are listed in Table VII-19 of the General Development Document. The results of these calculations are the production-based new source performance standards. These standards are presented in Tables XI-2.

Table XI-1

NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY URANIUM SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate l/kkg	NSPS Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Refinery filtrate	34,800	8,350	Uranium trioxide produced
Slag leach slurry	3,800	910	Uranium trioxide produced
Solvent extraction raffinate	5,300	1,270	Uranium trioxide produced
Digestion operation wet air pollution control	30	7.2	Uranium trioxide produced
Evaporation and calcination wet air pollution control	0	0	Uranium trioxide produced
Hydrogen reduction and hydrofluorination KOH wet air pollution control	20	4.8	Uranium tetrafluoride produced
Hydrofluorination wet air pollution control	0	0	Uranium tetrafluoride produced

Table XI-2

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550
Total Suspended Solids	522.000	417.600
pH	Within the range of 7.5 to 10.0 at all times	

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	10.180	5.738
Total Suspended Solids	57.000	45.600
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003
Total Suspended Solids	79.500	63.600
pH	Within the range of 7.5 to 10.0 at all times	

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045
Total Suspended Solids	0.450	0.360
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030
Total Suspended Solids	0.300	0.240
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000
Total Suspended Solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

SECONDARY URANIUM SUBCATEGORY

SECTION XII

PRETREATMENT STANDARDS

Section 307(b) of the Act requires EPA to promulgate pretreatment standards for existing sources (PSES), which must be achieved within three years of promulgation. PSES are designed to prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation of publicly owned treatment works (POTW). The Clean Water Act of 1977 requires pretreatment for pollutants, such as heavy metals, that limit POTW sludge management alternatives. Section 307(c) of the Act requires EPA to promulgate pretreatment standards for new sources (PSNS) at the same time that it promulgates NSPS. New indirect discharge facilities, like new direct discharge facilities, have the opportunity to incorporate the best available demonstrated technologies, including process changes, in-plant controls, and end-of-pipe treatment technologies, and to use plant site selection to ensure adequate treatment system installation. Pretreatment standards are to be technology based, analogous to the best available technology for removal of toxic pollutants.

Pretreatment standards for existing sources (PSES) will not be proposed for the secondary uranium subcategory because there are no existing indirect dischargers in this subcategory. However, pretreatment standards for new sources (PSNS) will be proposed.

This section describes the control and treatment technologies for pretreatment of process wastewaters from new sources in the secondary uranium subcategory. Pretreatment standards for regulated pollutants are presented based on the selected control and treatment technology.

TECHNICAL APPROACH TO PRETREATMENT

Before proposing and promulgating pretreatment standards, the Agency examines whether the pollutants discharged by the industry pass through the POTW or interfere with the POTW operation or its chosen sludge disposal practices. In determining whether pollutants pass through a well-operated POTW achieving secondary treatment, the Agency compares the percentage of a pollutant removed by POTW with the percentage removed by direct dischargers applying the best available technology economically achievable. A pollutant is deemed to pass through the POTW when the average percentage removed nationwide by well-operated POTW meeting

secondary treatment requirements, is less than the percentage removed by direct dischargers complying with BAT effluent limitations guidelines for that pollutant. (See generally, 46 FR at 9415-16 (January 28, 1981)).

This definition of pass through satisfies two competing objectives set by Congress: (1) that standards for indirect dischargers be equivalent to standards for direct dischargers while at the same time, (2) that the treatment capability and performance of the POTW be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers.

The Agency compares percentage removal rather than the mass or concentration of pollutants discharged because the latter would not take into account the mass of pollutants discharged to the POTW from non-industrial sources or the dilution of the pollutants in the POTW effluent to lower concentrations due to the addition of large amounts of non-industrial wastewater.

PRETREATMENT STANDARDS FOR NEW SOURCES

Options for pretreatment of wastewaters from new sources are based on increasing the effectiveness of end-of- pipe treatment technologies. All in-plant changes and applicable end-of-pipe treatment processes have been discussed previously in Sections X and XI. The options for PSNS, therefore, are the same as the BAT options discussed in Section X.

A description of each option is presented in Section X, while a more detailed discussion, including pollutants controlled by each treatment process is presented in Section VII of the General Development Document.

Treatment technologies considered for the PSNS options are:

OPTION A

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation

OPTION C

- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- Multimedia filtration

EPA is investigating whether organic solvent is discharged as part of the solvent extraction raffinate waste stream. If so, the Agency will consider including organics removal technologies such as activated carbon or chemical oxidation in the Option C treatment scheme at promulgation.

PSNS OPTION SELECTION

Option C (ammonia steam stripping pretreatment, chemical precipitation, sedimentation, and multimedia filtration) has been selected as the regulatory approach for pretreatment standards for new sources. The basis of this selection is in accordance with the rationale for selection of the BAT option in Section X.

The wastewater discharge rates for PSNS are identical to the BAT discharge rates for each waste stream. The PSNS discharge rates are shown in Table XII-1. No additional flow reduction measures for PSNS are feasible; EPA does not believe that new plants should achieve flow reduction beyond the 90 to 100 percent scrubber effluent recycle presently practiced in the industry.

REGULATED POLLUTANT PARAMETERS

Pollutants selected for limitation, in accordance with the rationale of Sections VI and X, are identical to those selected for limitation for BAT. It is necessary to propose PSNS to prevent the pass-through of chromium, copper, nickel, ammonia, fluoride, and uranium, which are the limited pollutants.

PRETREATMENT STANDARDS FOR NEW SOURCES

Pretreatment standards for new sources are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Section X for BAT. A mass of pollutant per mass of product (mg/kg) allocation is given for each subdivision within the subcategory. This pollutant allocation is based on the product of the treatable concentration from the proposed treatment (mg/l) and the production normalized wastewater discharge rate (l/kkg). The achievable treatment concentrations for BAT are identical to those for PSNS. These concentrations are listed in Table VII-19 of the General Development Document. PSNS are presented in Table XII-2.

Table XII-1

PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY URANIUM SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate l/kkg	PSNS Normalized Discharge Rate gal/ton	Production Normalizing Parameter
Refinery filtrate	34,800	8,350	Uranium trioxide produced
Slag leach slurry	3,800	910	Uranium trioxide produced
Solvent extraction raffinate	5,300	1,270	Uranium trioxide produced
Digestion operation wet air pollution control	30	7.2	Uranium trioxide produced
Evaporation and calcination wet air pollution control	0	0	Uranium trioxide produced
Hydrogen reduction and hydrofluorination KOH wet air pollution control	20	4.8	Uranium tetrafluoride produced
Hydrofluorination wet air pollution control	0	0	Uranium tetrafluoride produced

Table XII-2

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(a) Refinery Filtrate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	12.880	5.220
Copper	44.550	21.230
Nickel	19.140	12.880
Ammonia (as N)	4,639.000	2,039.000
Fluoride	1,218.000	696.000
Uranium	93.260	52.550

(b) Slag Leach Slurry

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.406	0.570
Copper	4.864	2.318
Nickel	2.090	1.406
Ammonia (as N)	506.500	222.700
Fluoride	133.000	76.000
Uranium	10.180	5.738

(c) Solvent Extraction Raffinate

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	1.961	0.795
Copper	6.784	3.233
Nickel	2.915	1.961
Ammonia (as N)	706.500	310.600
Fluoride	185.500	106.000
Uranium	14.200	8.003

Table XII-2 (Continued)

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(d) Digestion Operation Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.011	0.005
Copper	0.038	0.018
Nickel	0.017	0.011
Ammonia (as N)	3.999	1.758
Fluoride	1.050	0.600
Uranium	0.080	0.045

(e) Evaporation and Calcination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium trioxide produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

(f) Hydrogen Reduction and Hydrofluorination KOH Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.007	0.003
Copper	0.026	0.012
Nickel	0.011	0.007
Ammonia (as N)	2.666	1.172
Fluoride	0.700	0.400
Uranium	0.054	0.030

Table XII-2 (Continued)

PSNS FOR THE SECONDARY URANIUM SUBCATEGORY

(g) Hydrofluorination Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
	mg/kg (lb/million lbs) of uranium tetrafluoride produced	
Chromium (total)	0.000	0.000
Copper	0.000	0.000
Nickel	0.000	0.000
Ammonia (as N)	0.000	0.000
Fluoride	0.000	0.000
Uranium	0.000	0.000

SECONDARY URANIUM SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

EPA is not proposing best conventional pollutant control technology (BCT) for the secondary uranium subcategory at this time.