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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 Precious Metals

DEVELOPMENT DOCUMENT

for

EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

for the

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY

PHASE II

Secondary Precious Metals Supplement

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U.S. Environmental Protection Agency

SECONDARY PRECIOUS METALS SUBCATEGORY

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SECONDARY PRECIOUS METALS 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 precious metals 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 existing indirect dischargers (PSES), pretreatment standards for new indirect dischargers (PSNS), and standards of performance for new source direct dischargers (NSPS).

The secondary precious metals subcategory is comprised of 48 plants. Of the 48 plants, three discharge directly to rivers, lakes, or streams; 29 discharge to publicly owned treatment works (POTW); and 16 achieve zero discharge of process wastewater.

EPA first studied the secondary precious metals 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, 13 subdivisions have been identified for this subcategory that warrant separate effluent limitations. These include:

- Furnace wet air pollution control,
- Raw material granulation,
- Spent plating solutions,
- Spent cyanide stripping solutions,
- Refinery wet air pollution control,
- Gold solvent extraction raffinate and wash water,
- Gold spent electrolyte,
- Gold precipitation and filtration,
- Platinum precipitation and filtration,
- Palladium precipitation and filtration,

* Other platinum group metals (PGM) precipitation and filtration,
* Spent solution from PGC salt production, and
* Equipment and floor wash.

EPA also identified several distinct control and treatment technologies (both in-plant and end-of-pipe) applicable to the secondary precious metals 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. Cyanide precipitation was selected as the technology basis for cyanide limitations. To meet the BPT effluent limitations based on this technology, the secondary precious metals subcategory is expected to incur a capital and annual cost. These costs cannot be disclosed because the data on which they are based have been claimed to be confidential.

For BAT, the Agency has built upon the BPT technology basis by adding in-process control technologies which include recycle of process water from air pollution control waste streams. Filtration is added as an effluent polishing step to the end-of-pipe treatment scheme. To meet the BAT effluent limitations based on this technology, the secondary precious metals subcategory is expected to incur a capital and annual cost. These costs cannot be disclosed because the data on which they are based have been claimed to be confidential.

NSPS is equivalent to BAT, with one exception. The one exception is that dry air pollution control replaces a wet scrubber in one application. 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.

The technology basis for PSES is equivalent to BAT. To meet the pretreatment standards for existing sources, the secondary precious metals subcategory is estimated to incur a capital cost of $1,419,000 and an annual cost of $984,000. For PSNS, the Agency selected end-of-pipe treatment and in-process flow reduction control techniques equivalent to NSPS.

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

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

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION II

RECOMMENDATIONS

1. EPA has divided the secondary precious metals subcategory into 13 subdivisions for the purpose of effluent limitations and standards. These subdivisions are:

   (a) Furnace wet air pollution control,
   (b) Raw material granulation,
   (c) Spent plating solutions,
   (d) Spent cyanide stripping solutions,
   (e) Refinery wet air pollution control,
   (f) Gold solvent extraction raffinate and wash water,
   (g) Gold spent electrolyte,
   (h) Gold precipitation and filtration,
   (i) Platinum precipitation and filtration,
   (j) Palladium precipitation and filtration,
   (k) Other platinum group metals precipitation and filtration,
   (l) Spent solution from PGC salt production, and
   (m) Equipment and floor wash.

2. BPT is proposed based on the performance achievable by the application of chemical precipitation and sedimentation (lime and settle) technology, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following BPT effluent limitations are proposed:

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	136.400	71.800
Cyanide (total)	20.820	8.616
Zinc	104.800	43.800
Ammonia (as N)	9,571.000	4,207.000
Total suspended solids	2,944.000	1,400.000
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metal in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.900	1.000
Cyanide (total)	0.290	0.120
Zinc	1.460	0.610
Ammonia (as N)	133.300	58.600
Total suspended solids	41.000	19.500
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	2.090	1.100
Cyanide (total)	0.319	0.132
Zinc	1.606	0.671
Ammonia (as N)	146.600	64.460
Total suspended solids	45.100	21.450
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	39.900	21.000
Cyanide (total)	6.090	2.520
Zinc	30.660	12.810
Ammonia (as N)	2,799.000	1,231.000
Total suspended solids	861.000	409.500
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	1.197	0.630
Cyanide (total)	0.183	0.076
Zinc	0.920	0.384
Ammonia (as N)	83.980	36.920
Total suspended solids	25.830	12.290
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.017	0.009
Cyanide (total)	0.003	0.001
Zinc	0.013	0.005
Ammonia (as N)	1.160	0.510
Total suspended solids	0.357	0.170
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	8.360	4.400
Cyanide (total)	1.276	0.528
Zinc	6.424	2.684
Ammonia (as N)	586.500	257.800
Total suspended solids	180.400	85.800
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	9.880	5.200
Cyanide (total)	1.508	0.624
Zinc	7.592	3.172
Ammonia (as N)	693.200	304.700
Total suspended solids	213.200	101.400
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	6.650	3.500
Cyanide (total)	1.015	0.420
Zinc	5.110	2.135
Ammonia (as N)	466.600	205.100
Total suspended solids	143.500	68.250
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	9.880	5.200
Cyanide (total)	1.508	0.624
Zinc	7.592	3.172
Ammonia (as N)	693.200	304.700
Total suspended solids	213.200	101.400
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.710	0.900
Cyanide (total)	0.261	0.108
Zinc	1.314	0.549
Ammonia (as N)	120.000	52.740
Total suspended solids	36.900	17.550
pH	Within the range of 7.5 to 10.0 at all times	

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology and in-process flow reduction methods, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following BAT effluent limitations are proposed:

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	5.760	2.745
Cyanide (total)	0.900	0.360
Zinc	4.590	1.890
Ammonia (as N)	599.900	263.700

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

4. NSPS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, and in-process flow reduction control methods, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following effluent standards are proposed for new sources:

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 PRECIOUS METALS SUBCATEGORY

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600
Total suspended solids	15.000	12.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460
Total suspended solids	16.500	13.200
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600
Total suspended solids	15.000	12.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920
Total suspended solids	9.450	7.560
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510
Total suspended solids	0.131	0.104
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800
Total suspended solids	66.000	52.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700
Total suspended solids	78.000	62.400
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100
Total suspended solids	52.500	42.000
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700
Total suspended solids	78.000	62.400
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(l) Spent Solutions from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740
Total suspended solids	13.500	10.800
pH	Within the range of 7.5 to 10.0 at all times	

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, and in-process flow reduction control methods, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following pretreatment standards are proposed for existing sources:

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	5.760	2.745
Cyanide (total)	0.900	0.360
Zinc	4.590	1.890
Ammonia (as N)	599.900	263.700

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

6. PSNS are proposed based on the performance achievable by the application of chemical precipitation, sedimentation, and multimedia filtration (lime, settle, and filter) technology, and in-process flow reduction control methods, along with preliminary treatment consisting of ammonia steam stripping and cyanide precipitation for selected waste streams. The following pretreatment standards are proposed for new sources:

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

7. EPA is not proposing best conventional pollutant control technology (BCT) at this time.

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION III

INDUSTRY PROFILE

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

DESCRIPTION OF SECONDARY PRECIOUS METALS PRODUCTION

The secondary precious metals industry consists of plants which recover gold and platinum group metals from recycled materials. Platinum group metals, also known as PGM, consist of platinum, palladium, iridium, rhodium, osmium, and ruthenium. The production of secondary precious metals can be divided into two stages: raw material preparation steps and refining steps. Raw material preparation steps include grinding, crushing, incineration, smelting, granulation, cyanide stripping, and precipitation of precious metals from spent plating solutions. Refining steps include dissolution in either strong acid or base, precipitation, filtration, recycle, solvent extraction, electrolytic refining, salt manufacturing, casting, and granulation. The secondary precious metals production process is presented schematically in Figure III-1, and described below.

RAW MATERIALS

The principal raw materials used by plants recovering precious metals are jewelry scrap, dental scrap, optical scrap, electrical scrap, impure bullion, spent industrial and automotive catalysts, sweeps, and contaminated or spent electroplating solutions. Sweeps are usually low-grade precious metal-bearing residue generated from various raw materials, including floor sweepings (hence the name), waste treatment sludges and incinerated filter cakes. The various raw material preparation and refining steps a plant uses are dictated by the type and composition of raw materials being processed.

RAW MATERIAL PREPARATION STEPS

Based on the source of raw materials, the raw material preparation steps can be divided into four basic processes for the recovery of precious metals: incineration and smelting (pyrometallurgical steps), raw material granulation, stripping with cyanide solutions, and recovering precious metals from spent plating solutions.

Incineration and Smelting

Dental scrap, optical scrap, electrical scrap, and catalysts may be ground and incinerated in a furnace in order to remove the carbonaceous material and volatile fraction. The temperature and rate of burning must be carefully controlled if high efficiency is to be maintained. Air emissions include vapors from the volatilization and decomposition of carbonaceous scrap contaminants, as well as combustion gases and dust. The emissions are usually controlled by afterburners in series with a baghouse or scrubber. Wet air pollution control techniques result in wastewater discharges. Precious metal-bearing residues may then be fed directly to the refinery for recovery of pure metals.

Smelting is generally used to produce a copper-based bullion which can either be sold or further processed to produce a pure metal. The raw material for smelting may be the precious metal-bearing residue produced in the incinerator, or it may be ground-up raw material. Like the incineration furnace, the smelting furnace may also have emissions which are controlled by a baghouse or scrubber. The furnace or incinerator scrubber results in a wastewater discharge.

Raw Material Granulation

Raw material may be granulated with water in order to make it easier to dissolve in acid in the refinery. Either solid scrap or incinerated residue may be melted in a furnace and granulated with water in a similar manner to shot casting. This operation produces wastewater discharge, consisting of the spent granulation water.

Stripping With Cyanide Solutions

Gold-containing electrical components, strip, or ceramics may be stripped with sodium or potassium cyanide solutions. The raw material may be ground-up prior to stripping in order to increase the exposed surface area. Cyanide attacks the gold which is exposed on the surface of the metal, but does not recover gold which is buried beneath a non-precious metal. Stripping with cyanide has limited application because of the relatively few types of scrap amenable to the process.

After the gold is stripped away from the base metal, it may be precipitated from solution with either sodium hydrosulfite or zinc. An oxidizing agent may be added to destroy the free cyanide. The solids, containing precious metals, are separated from the spent cyanide stripping solution by filtration. Filtration results in a wastewater stream which may be discharged. The product of cyanide stripping is a sludge containing high precious metal values which may go on for further processing.

Recovery From Spent Plating Solutions

Precious metals can be recovered from contaminated or spent electroplating solutions, which are cyanide-based, either by precipitation with sodium hydrosulfite or zinc, or by electrolysis. Electroplaters use cyanide solutions for plating precious metals onto base metals. The depleted or contaminated solutions still contain enough precious metal values to make recovery economical. Either gold, palladium, or rhodium can be recovered in this manner. The precipitation process for plating solutions is the same as cyanide stripping. Zinc or sodium hydrosulfite is added and the precious metals are recovered by filtration. For electrolytic recovery, the spent plating solution acts as the electrolyte, and the precious metal is recovered on the cathode. Wastewater may be generated by the discharge of barren solution after either precipitation or electrolytic recovery occurs. The resultant sludge from this process may be routed to the refinery for further processing.

REFINING STEPS

Refining steps are taken to recover high-purity precious metals (high-purity generally refers to 99.9 or 99.99 percent pure) from lower purity raw materials, which may or may not have undergone raw material preparation steps. The standard hydrometallurgical process includes dissolution in acid or base, combined with precipitation and filtration. Other hydrometallurgical refining steps include solvent extraction and electrolytic refining. After pure precious metals are produced, they may be further processed into a potassium cyanide-based salt, cast as bars, or granulated.

Hydrometallurgical Processing

Jewelry, dental, optical, electrical, and catalyst scrap, along with sludges generated from spent solutions, containing gold, platinum, palladium, and other platinum group metals (PGM), may be refined using hydrometallurgical processing. The first step usually consists of dissolving the raw material in aqua regia. Aqua regia (one part concentrated nitric acid:three to four parts concentrated hydrochloric acid) is the only known reagent that dissolves gold. Nitric acid alone cannot oxidize gold unless the chloride ion is present to complex the product. The net equation for dissolving gold in aqua regia can be written:

$$Au(s) + 3NO_3^- + 4Cl^- + 6H_3O^+ \rightarrow AuCl_4^- + 3NO_2(g) + 9H_2O$$

though a variety of nitrogen products are obtained.

After dissolving the raw material, the silver chloride solids are filtered away, and the gold is precipitated with sulfur dioxide, ferrous sulfate, or chlorine gas. The filtrate may be sent on for further recovery of platinum group metals. The platinum group metals are generally recovered by precipitating them as platinum and palladium chloride, often done with NH_4Cl, followed by filtration to remove the non-precious metals.

The filter cake (called "red salt") is then dissolved with ammonium hydroxide to separate the platinum (which does not dissolve) from the palladium. The platinum can then be purified with various acid dissolutions, precipitations, and filtrations, and finally thermally reduced to the pure metal. Similarly, palladium can be purified using various alkaline dissolutions, precipitations, filtrations, and finally reduced to the metal with a strong reducing agent. Each of the purification processes may be repeated via recycle to increase the purity of the refined metal. After each metal is recovered as either a final product or intermediate, it may be washed with water or an acid or base in order to remove residual acid or base from it and to further purify it. The wash water or solution is generally discharged with the precipitation and filtration water, and is considered as part of the same waste stream. The various hydrometallurgical processing steps a plant uses to recover precious metals may occur in any order. For example, one plant may recover gold prior to palladium prior to platinum, and another plant may recover platinum first, then gold, and finally palladium. The order of processing does not impact the wastewater generation at a refinery.

Based on the composition of the raw material, and the order of processing, the recovery of each precious metal may result in a wastewater discharge. There is variability in the types of raw materials processed within this subcategory; however, the basic processing steps and wastewaters generated are similar from one plant to another.

Acid fumes generated in the refinery may be controlled with a wet scrubber, resulting in a wastewater stream. This scrubber generally controls the fumes from all the reaction vessels, whether they are acid-, alkaline-, or cyanide-based. The scrubbing medium is usually an alkaline solution which neutralizes the acid fumes.

Solvent Extraction

Solvent extraction may be used to refine impure bullion to high purity gold. Solvent extraction consists of extracting the gold from an acid solution into the organic phase and subsequently recovering it. The aqueous solution which originally contained the dissolved impure bullion may be discharged as a waste stream. After recovery, the gold may be washed with water and the wash water may also be discharged. The aqueous raffinate and wash water may be considered as one waste stream.

Electrolytic Refining

Electrolytic refining is also used as a means of recovering high purity gold from precious metal-containing bullion, jewelry and dental scrap. First, the raw material is melted and cast as an anode. An acidic electrolyte is used, and gold is recovered on the cathode. In the electrolytic method, a current is passed between an anode and a cathode which are suspended in the electrolyte. A portion of the electrolyte is periodically discharged to maintain the purity of the solution.

Further Processing

Once the gold or platinum group metals have been refined to the pure state, they may be further processed. Gold may be reacted with potassium cyanide solution to produce a potassium gold cyanide salt (generally written $KAu(CN)_2$ or PGC) which is useful in the electroplating industry. There may be a waste stream associated with this process, consisting of excess cyanide solution.

Pure precious metals may either be cast as bars or granulated using a method similar to shot casting. In either case, the metal is melted in a furnace. Molten metal may be poured into molds which may be quenched with water, or it may be poured directly into a container of water, in which case it will be granulated. In either case, a waste stream is generated which may be discharged.

PROCESS WASTEWATER SOURCES

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

1. Furnace wet air pollution control,
2. Raw material granulation,
3. Spent plating solutions,
4. Spent cyanide stripping solutions,

5. Refinery wet air pollution control,
6. Gold solvent extraction raffinate and wash water,
7. Gold spent electrolyte,
8. Gold precipitation and filtration,
9. Platinum precipitation and filtration,
10. Palladium precipitation and filtration,
11. Other platinum group metals precipitation and filtration,
12. Spent solution from PGC salt production, and
13. Equipment and floor wash.

The sources of these wastewater streams are identified by their respective numbers in Figure III-1.

OTHER WASTEWATER SOURCES

There are other waste streams associated with the production of secondary precious metals. These waste streams include but are not limited to:

1. Casting contact cooling water,
2. Final product granulation water,
3. Acid storage area wet air pollution control, and
4. Pump seal water.

These waste streams are not considered as 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 the authority of Section 403(a) of the Clean Water Act.

Casting contact cooling water is not considered as part of this rulemaking because, although several plants do discharge this stream, sampling data indicate that this wastewater contains little or no pollutants and that the pollutant loadings are insignificant compared with the other waste streams selected. Sampling data for casting contact cooling water are presented in Table V-26 (see Section V).

AGE, PRODUCTION, AND PROCESS PROFILE

Forty-eight secondary precious metals plants were identified in this study. Figure III-2 shows that the plants are concentrated in the Northeast and California, with plants also located in Washington, Arizona, Minnesota, Illinois, Ohio, Virginia, and Florida.

Table III-1 summarizes the relative ages of the secondary precious metals plants by discharge status. Three plants discharge directly, 29 are indirect dischargers, 10 are zero dischargers, and six plants have no process wastewater. Most of the plants began operating within the last 15 years.

Table III-2 shows the production ranges for the 48 secondary precious metals plants. One-third of the plants that reported production data produce less than 10,000 troy ounces of total precious metals per year. All three of the direct dischargers produce in excess of 50,000 troy ounces per year, as do 10 of the indirect dischargers.

Table III-3 provides a summary of the plants having the various secondary precious metals processes. The number of plants generating wastewater from the processes is also shown.

Table III-1

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

Type of Plant Discharge	1983-1973 1-10	1972-1968 11-15	1967-1958 16-25	1957-1948 26-35	1947-1938 36-45	1937-1928 46-55	1927-1918 56-55	1917-1903 66-80	<1903 81+	Not Reported	Total
Direct	1	1							1		3
Indirect	8	8	4	2	1	1	1	2	1	1	29
Zero	4	2	1							3	10
Dry	2	—	1	—	1	—	1	1	—	—	6
Total	15	11	6	2	2	1	2	3	2	4	48

Table III-2

PRODUCTION RANGES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY DURING 1982 (TROY OUNCES OF TOTAL PRECIOUS METALS/YEAR)

Type of Plant	0-1,000	1,001-10,000	10,001-50,000	50,001-100,000	100,001-500,000	500,000+	Not Reported in dcp
Direct*							
Indirect	1	9	9	4	5	1	
Zero		3	1		4		2
Dry	1	1	1			2	1
Total	2	13	11	5	10	4	3

*Data for these plants are claimed to be confidential.

Table III-3

SUMMARY OF SECONDARY PRECIOUS METALS SUBCATEGORY PROCESSES AND ASSOCIATED WASTE STREAMS

Process	Number of Plants With Process	Number of Plants Reporting Generation of Wastewater*
Raw Materials Preparation Steps	28	
- Incineration and Smelting (Furnace Air Pollution Control)	16	5
- Raw Material Granulation	3	3
- Stripping With Cyanide Solutions	6	6
- Recovery From Spent Plating Solutions	12	12
Refining Steps (Hydrometallurgical Processing)	36	
- Gold Precipitation and Filtration	28	28
- Platinum Precipitation and Filtration	18	18
- Palladium Precipitation and Filtration	19	19
- Other Platinum Group Metals Precipitation and Filtration	3	3
- Solvent Extraction	1	1
- Electrolytic Refining	3	3
PGC Salt Production	3	3
Equipment and Floor Wash	3	3

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

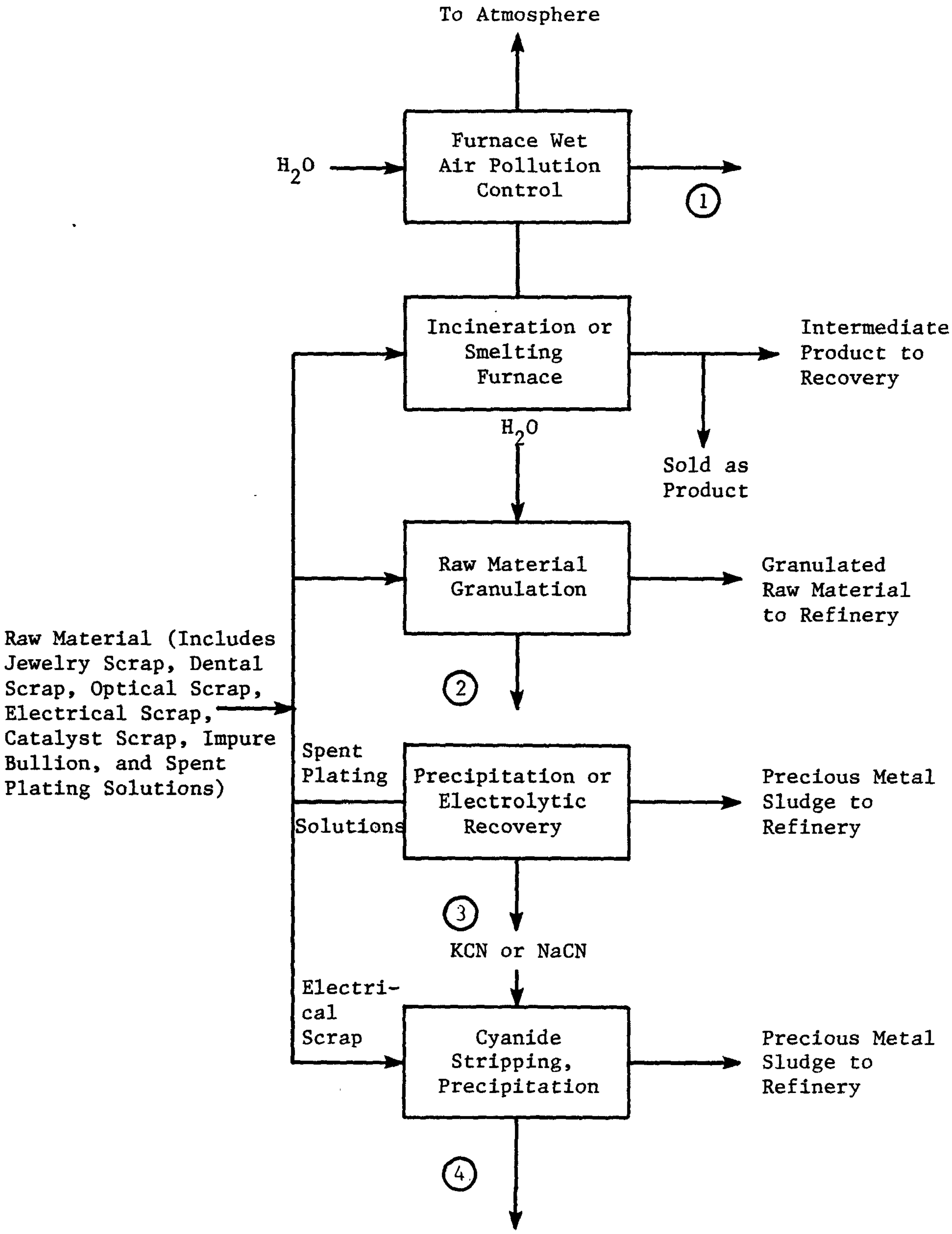

Figure III-1

RAW MATERIAL PREPARATION
SECONDARY PRECIOUS METALS PRODUCTION PROCESSES

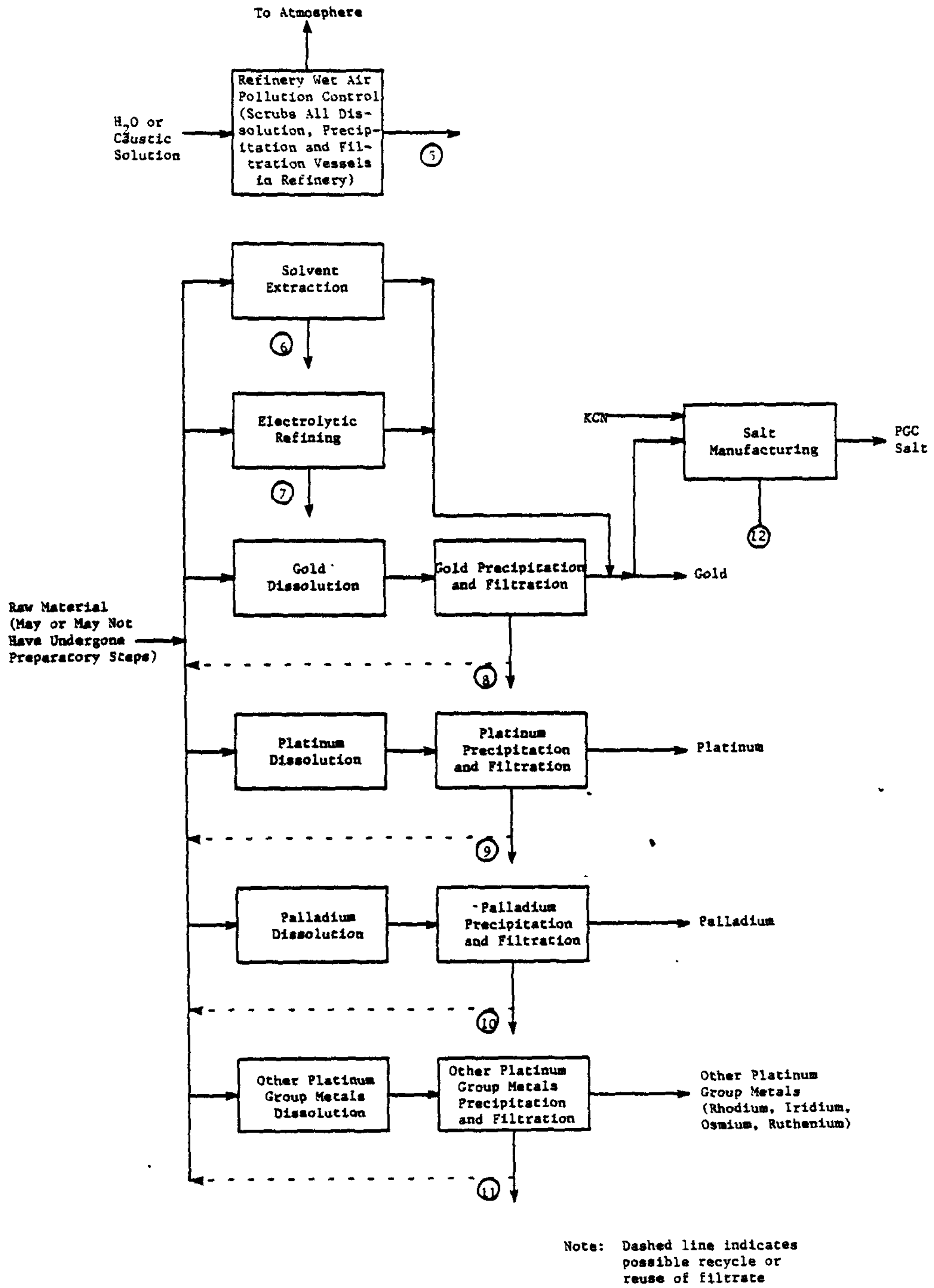

Figure III-1 (Continued)

REFINING STEPS
SECONDARY PRECIOUS METALS PRODUCTION PROCESSES

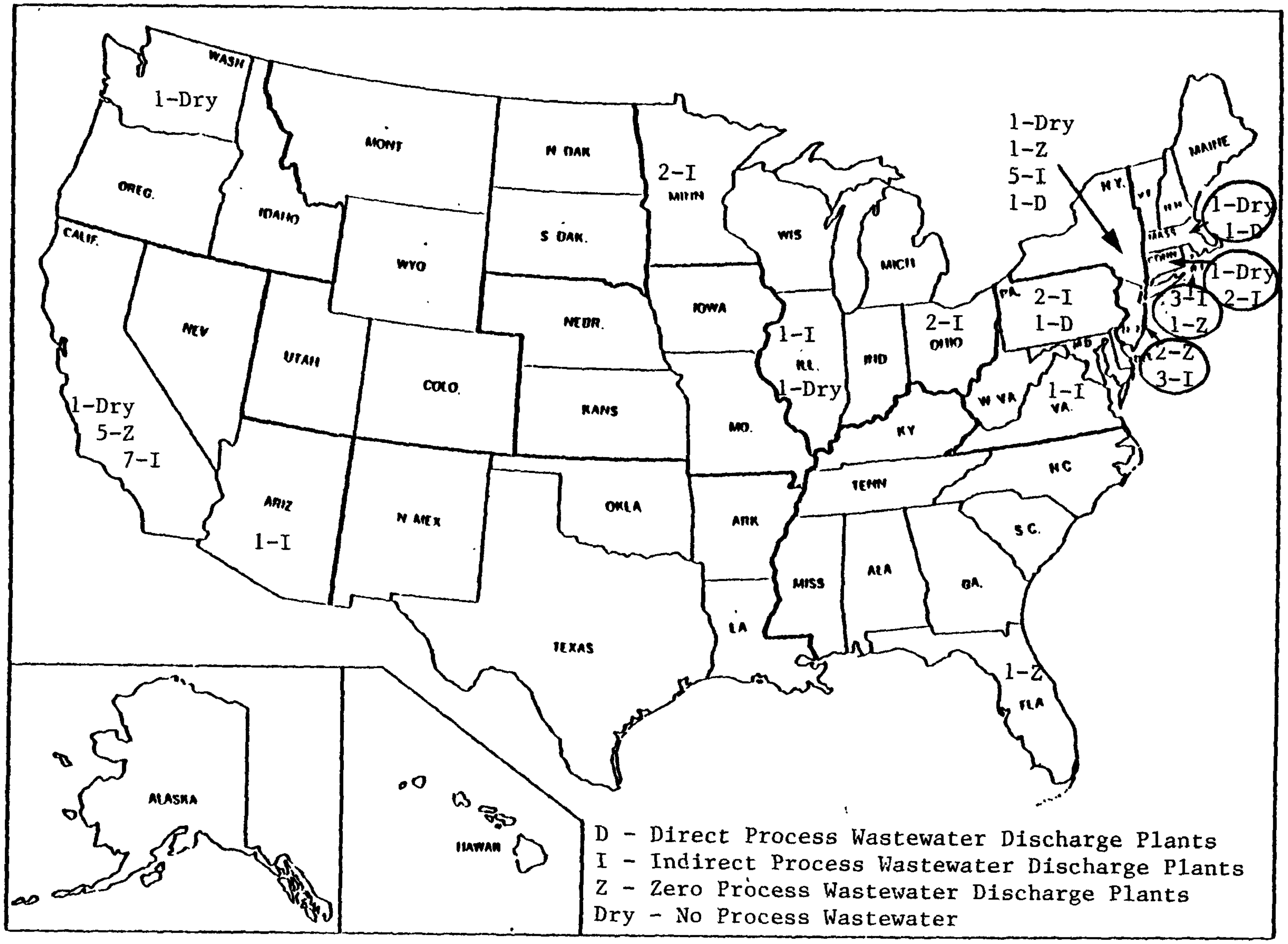

Figure III-2

GEOGRAPHIC LOCATIONS OF THE SECONDARY PRECIOUS METALS INDUSTRY

SECONDARY PRECIOUS METALS 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 category characteristics, manufacturing process variations, wastewater characteristics, and a number of other factors which affect the ability of the facilities to achieve effluent limitations. This section summarizes the factors considered during the designation of the secondary precious metals subcategory and its related subdivisions.

FACTORS CONSIDERED IN SUBCATEGORIZATION

The following factors were evaluated for use in determining appropriate subcategories for the nonferrous metals industry:

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 precious metals subcategory. Three factors were particularly important in establishing these classifications: the type of metal and co-products produced, the nature of raw materials 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 products, manufacturing processes and raw materials as the principal factors used for subcategorization is discussed. On the basis of these factors, the nonferrous metals manufacturing category (Phase II) was divided into 21 subcategories, one of them being secondary precious metals.

FACTORS CONSIDERED IN SUBDIVIDING THE SECONDARY PRECIOUS METALS SUBCATEGORY

The factors listed previously were each evaluated when considering subdivision of the secondary precious metals 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 precious metals subcategory is based primarily on the production processes used. Within the 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 and standards. While secondary precious metals is still considered a single subcategory, a more thorough examination of the production processes, water use and discharge practices, and pollutant generation rates has illustrated the need for limitations and standards based on a specific set of waste streams. Limitations and standards will be based on specific flow allowances for the following subdivisions:

1. Furnace wet air pollution control,
2. Raw material granulation,
3. Spent plating solutions,
4. Spent cyanide stripping solutions,
5. Refinery wet air pollution control,
6. Gold solvent extraction raffinate and wash water,
7. Gold spent electrolyte,
8. Gold precipitation and filtration,
9. Platinum precipitation and filtration,
10. Palladium precipitation and filtration,
11. Other platinum group metals precipitation and filtration,
12. Spent solution from PGC salt production, and
13. Equipment and floor wash.

These subdivisions follow directly from differences within the various production stages of secondary precious metals: raw material preparation steps and refining steps. Depending on the type and composition of raw material, a plant may operate one or more raw material preparation or refining steps to recover gold, platinum, palladium, or other platinum group metals from scrap. Each of these operations may create a need for a subdivision.

Smelting or incinerating a raw material creates the need for the first subdivision--furnace wet air pollution control. Smelting or incineration furnaces produce dust and particulate emissions which need to be controlled prior to venting to the atmosphere. Other raw material preparation steps which create the need for subdivisions include raw material granulation, recovering gold or other precious metals from spent plating solutions, and cyanide stripping of gold from gold-plated scrap. Granulating a raw material involves melting the raw material in a furnace and pouring it into a container of water. This granulates the raw material, and the granulation water may be discharged, thus creating the need for a subdivision. Spent plating solutions may be treated with a precipitating agent such as zinc or sodium thiosulfate in order to precipitate the precious metals. Discharging the depleted solution creates a need for a separate subdivision. Stripping gold away from scrap with a cyanide solution and then precipitating the gold from solution creates a need for the fourth pre-refining subdivision.

Various refining operations create the need for the other nine subdivisions. Recovering gold by a solvent extraction process or an electrolytic refining process creates the need for two subdivisions: gold solvent extraction raffinate and wash water, and gold spent electrolyte. The wet chemistry technique of dissolution and selective precipitation creates the need for four subdivisions: gold precipitation and filtration, platinum precipitation and filtration, palladium precipitation and filtration, and other platinum group metals precipitation and filtration. Depending on the composition of the raw material being processed, and the manner in which each metal is recovered, any one or all of the precious metals may result in the discharge of a wastewater stream.

Acid fumes generated during dissolution and precipitation processes are generally controlled with a wet scrubber, creating the need for the seventh refining subdivision: refinery wet air pollution control. Washing the equipment and the floor of the refinery in order to recover any precious metals from spills and leaks creates a need for the equipment and floor wash subdivision. Finally, manufacturing gold into a PGC salt product by reacting it with potassium cyanide solution creates a need for the last subdivision: spent solution from PGC salt production.

OTHER FACTORS

The other factors considered in this evaluation either supported the establishment of the secondary precious metals subcategory and its subdivisions or were shown to be inappropriate bases for subcategorization. Air pollution control methods, treatment costs, nonwater quality aspects, and total energy requirements are functions of the selected subcategorization factors--raw materials and production processes. As such, they support the method of 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

The effluent limitations and standards developed in this document establish mass limitations on the discharge of specific pollutant parameters. To allow these limitations 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, the actual precious metals production from the respective manufacturing process is used as the PNP. This is based on the principle that the amount of water generated is proportional to the amount of product made. Therefore, the PNPs for the 13 secondary precious metals subdivisions are as follows:

Subdivision	PNP
1. Furnace wet air pollution control	Troy ounces of precious metals, including silver, incinerated or smelted
2. Raw material granulation	Troy ounces of precious metals in the granulated raw material
3. Spent plating solutions	Liters of spent plating solutions used as a raw material
4. Spent cyanide stripping solutions	Troy ounces of gold produced by cyanide stripping
5. Refinery wet air pollution control	Troy ounces of precious metals, including silver, produced in refinery
6. Gold solvent extraction raffinate and wash water	Troy ounces of gold produced by solvent extraction
7. Gold spent electrolyte	Troy ounces of gold produced by electrolysis
8. Gold precipitation and filtration	Troy ounces of gold precipitated
9. Platinum precipitation and filtration	Troy ounces of platinum precipitated
10. Palladium precipitation and filtration	Troy ounces of palladium precipitated

Subdivision	PNP
11. Other platinum group metals precipitation and filtration	Troy ounces of other platinum group metals precipitated
12. Spent solution from PGC salt production	Troy ounces of gold contained in PGC product
13. Equipment and floor wash	Troy ounces of precious metals, including silver, produced in refinery

Other PNPs were considered. The use of production capacity instead of actual production was eliminated from consideration because the mass of pollutant produced is more a function of true production than of installed capacity. The total precious metals produced in the refinery was eliminated from consideration because most of the operations generating wastewater in a refinery do so as a function of one metal being produced, rather than as a function of the total amount of metal produced in a refinery.

The PNP selected for spent plating solutions is liters of spent plating solution used as a raw material. The volumetric PNP was selected rather than a mass-based PNP because a plant cannot control the concentration of precious metals in the raw material spent plating solutions. One plant's raw material may be twice as concentrated as another's in precious metals, and therefore flow cannot be related to production for this unit operation. Wastewater discharge flow is directly related to volume of spent plating solution used as raw material, and not the quantity of precious metals in the solution.

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION V

WATER USE AND WASTEWATER CHARACTERISTICS

This section describes the characteristics of the wastewaters associated with the secondary precious metals 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.

In order to quantify the pollutant discharge from secondary precious metals plants, a field sampling program was conducted. A complete list of the pollutants considered and a summary of the techniques used in sampling and laboratory analyses are included in Section V of the General Development Document. Samples were analyzed for 124 of the 126 toxic pollutants and other pollutants deemed appropriate. (Because the analytical standard for TCDD was judged to be too hazardous to be made generally available, samples were never analyzed for this pollutant. Samples were also never analyzed for asbestos. There is no reason to expect that TCDD or asbestos would be present in nonferrous metals manufacturing wastewater.) A total of five plants were selected for sampling in the secondary precious metals subcategory. In general, the samples were analyzed for cyanide and three classes of pollutants: toxic organic pollutants, toxic metal pollutants, and criteria pollutants (which includes both conventional and nonconventional pollutants). Cyanide was analyzed for because it is present in raw materials for this subcategory.

As described in Section IV of this supplement, the secondary precious metals subcategory has been further split into 13 subdivisions, so that the proposed regulation contains mass discharge limitations and standards for 13 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.

The principal wastewater sources in the secondary precious metals subcategory are:

1. Furnace wet air pollution control,
2. Raw material granulation,
3. Spent plating solutions,
4. Spent cyanide stripping solutions,
5. Refinery wet air pollution control,
6. Gold solvent extraction raffinate and wash water,
7. Gold spent electrolyte,
8. Gold precipitation and filtration,
9. Platinum precipitation and filtration,
10. Palladium precipitation and filtration,
11. Other platinum group metals precipitation and filtration,
12. Spent solution from PGC salt production, and
13. Equipment and floor wash.

WASTEWATER FLOW RATES

Data supplied by dcp responses were evaluated, and two flow-to-production ratios were calculated for each stream. The two ratios, water use and wastewater discharge flow, 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 precious metals product and is therefore based on the sum of recycle and make-up flows to a given process. Wastewater flow discharged after preliminary treatment 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 precious metals produced. Differences between the water use and wastewater flows associated with a given stream result from recycle, evaporation, and carryover 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, gold precipitation and filtration wastewater flow is related to gold metal production. As such, the discharge rate is expressed in liters of filtration wastewater discharged per troy ounce of gold produced by precipitation.

The production normalized 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-13 at the end of this section. Where appropriate, an attempt was made to identify factors that could account for variations in water use. This information is summarized in this section. 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 and standards.

WASTEWATER CHARACTERIZATION DATA

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

DATA COLLECTION PORTFOLIOS

In the data collection portfolios, the secondary precious metals plants which discharge wastewater were asked to specify the presence of toxic pollutants in their effluent. Of the 48 secondary precious metals plants, 12 did not respond to this portion of the questionnaire. No plant responding to this portion of the questionnaire reported that any toxic organic pollutants were known to be or believed to be present in their wastewater.

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	3
Arsenic	1	5
Beryllium	2	3
Cadmium	7	5
Chromium	9	6
Copper	20	17
Cyanide	10	10
Lead	11	8
Mercury	3	2
Nickel	16	19
Selenium	0	3
Silver	14	18
Thallium	0	2
Zinc	20	15

FIELD SAMPLING DATA

In order to quantify the concentrations of pollutants present in wastewater from secondary precious metals plants, wastewater samples were collected at five plants. Diagrams indicating the sampling sites and contributing production processes are shown in Figures V-1 through V-5 (at the end of this section).

The raw wastewater sampling data for the secondary precious metals subcategory are presented in Tables V-14 through V-21 (at the end of this section). Treated and combined wastewater sampling data are shown in Tables V-22 through V-25. The stream codes presented in the tables may be used to identify the location of each of the samples on the process flow diagrams in Figures V-1 through V-5. Where no data are listed for a specific day of sampling, 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. The base-neutral extractable, acid fraction extractable, and volatile organics are generally considered not quantifiable at concentrations equal to or less than 0.010 mg/l. Below this concentration, organic analytical results are not quantitatively accurate; however, the analyses are useful to indicate the presence of a particular pollutant. The pesticide fraction is considered not quantifiable a concentrations equal to or less than 0.005 mg/l.

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. Toxic organic, nonconventional, and conventional pollutant data reported with a "less than" sign are considered as detected, but not further quantifiable. A value of zero is also used for averaging. If a pollutant is reported as not detected, it is assigned a value of zero in calculating the average. Finally, toxic metal values reported as less than a certain value were considered as not quantifiable, and consequently were assigned a value of zero in the calculation of the average.

Finally, appropriate source water concentrations are presented with the summaries of the sampling data. The method by which each sample was collected is indicated by number, as follows:

1 - One-time grab
2 - Manual composite during intermittent process operation
3 - 8-hour manual composite
4 - 8-hour automatic composite
5 - 24-hour manual composite
6 - 24-hour automatic composite

WASTEWATER CHARACTERISTICS AND FLOWS BY SUBDIVISION

Since secondary precious metals production involves 13 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 and explanations for variations of water use within each subdivision will also be discussed.

FURNACE WET AIR POLLUTION CONTROL

Of the secondary precious metals plants with furnaces, smelters, or incinerators, 16 control off-gas emissions. Five plants use wet scrubbers, three of these discharging wastewater, as shown in Table V-1. This table shows the water discharge rates in liters per troy ounce of precious metals, including silver, processed through the furnace. Of the five plants using wet scrubbers, two plants practice 100 percent recycle, one plant practices greater than 90 percent recycle, and two plants do not recycle this water.

The Agency sampled the wastewater from two of the three discharging plants, one of which does not practice recycle and the other practices greater than 90 percent recycle. The Agency also sampled the wastewater at another secondary precious metals plant which did not practice recycle. Furnace wet air pollution control raw wastewater contains toxic metals, cyanide, and suspended solids above treatable concentrations, as well as quantifiable concentrations of phenolics. Raw wastewater sampling data are presented in Table V-14.

RAW MATERIAL GRANULATION

Raw material may be melted in a furnace and then poured into a container of standing water in order to granulate it. This process is similar to shot casting. The purpose of this operation is to make it easier to dissolve the raw material in the acid dissolution process. Of the 30 plants which hydrometallurgically refine precious metals, three plants granulate the raw material prior to dissolution. Two plants discharge this wastewater, as shown in Table V-2. The third plant practices 100 percent recycle of granulation water.

The Agency believes the furnace air pollution control wastewater is similar to raw material granulation water because both are waste streams associated with the raw material prior to its entering the refinery. This wastewater is expected to contain toxic metals, cyanide, and TSS above treatable concentrations, as well as quantifiable concentrations of phenolics.

SPENT PLATING SOLUTIONS

Spent or contaminated electroplating solutions with a high precious metal content may be recycled to recover the precious metals value. After recovering this value, the depleted solution may be discharged. Twelve plants recover precious metals from spent plating solutions. Discharge rates for these 12 plants are presented in Table V-3, in liters of wastewater per liter of raw material spent plating solution.

The Agency sampled two plants for this waste stream, and the results are presented in Table V-15. This raw wastewater contains toxic metals, free and complexed cyanide, and TSS above treatable concentrations.

SPENT CYANIDE STRIPPING SOLUTIONS

Six plants use sodium or potassium cyanide solutions to strip gold away from electronic scrap and other raw materials. After precipitating the gold, the spent cyanide solution may be discharged. Six plants use this technique as shown in Table V-4. Water use and discharge rates are shown in liters per troy ounce of gold produced by cyanide stripping. Gold production is measured as the product from the precipitation operation.

The Agency sampled one plant for this waste stream, and the results are presented in Table V-16. This waste stream contains toxic metals, free and complexed cyanide, and TSS above treatable concentrations.

REFINERY WET AIR POLLUTION CONTROL

All of the acid dissolution vessels, alkaline dissolution vessels, cyanide vessels, and precipitation vessels located in the refinery are vented to the refinery scrubber. Of the 28 plants using emissions control, 25 discharge wastewater. The other three plants practice 100 percent recycle. Seventeen of the 25 discharging plants practice recycle of 90 percent or greater. Table V-5 shows water discharge rates in liters per troy ounce of precious metals, including silver, produced in the refinery.

The Agency sampled the wastewater from four discharging plants, three of which practice recycle of at least 90 percent. This raw wastewater contains toxic metals and suspended solids above treatable concentrations. Raw wastewater sampling data are presented in Table V-17.

GOLD SOLVENT EXTRACTION RAFFINATE AND WASH WATER

Gold can be extracted from an impure raw material using an organic solvent and then recovered from the solvent as pure gold. The raffinate generated by this process can be discharged, and one plant discharges this waste stream as shown in Table V-6. After the pure gold is recovered, it is washed with water and this wash water is also discharged. Although the Agency did not sample this combined waste stream, it is believed to have similar characteristics to gold precipitation and filtration wastewater, because of the similar raw materials and processing steps. It is not, however, expected to have treatable concentrations of ammonia. This wastewater should contain toxic metals and TSS above treatable concentrations.

GOLD SPENT ELECTROLYTE

Three plants use electrolytic refining as a purification step in secondary gold processing and discharge the spent electrolyte wastewater associated with this process. Water use and discharge rates are shown in Table V-7. No samples were taken of this waste stream, however, the Agency believes it should be similar to gold precipitation and filtration wastewater because of similar raw materials except it should not contain treatable concentrations of ammonia. This wastewater should contain toxic metals and TSS above treatable concentrations.

GOLD PRECIPITATION AND FILTRATION

Gold may be recovered by dissolving the raw material in strong acid such as aqua regia, filtering away the silver chloride, and precipitating the gold with a strong reducing agent such as chlorine, ferrous sulfate or sulfur dioxide gas. Gold sponge is recovered by filtering away the wastewater and washing the sponge with water one or more times to remove residual acid. This combined filtrate-wash water waste stream may be discharged via a cementation tank where either zinc or iron is added to recover additional precious metals, and then to treatment. The 28 plants with this waste stream are shown in Table V-8.

The Agency sampled this waste stream at four plants, one prior to cementation, and all four as combined wastewater after cementation. Only the plant sampled prior to cementation is presented in Table V-18 to characterize this raw wastewater because of the metallic replacement reactions and commingling of wastewater taking place in the cementation tank. As shown in Table V-22, the post-cementation data support the general characterization of gold precipitation and filtration wastewater data. Both show high toxic metal concentrations, along with ammonia and TSS above treatable concentrations. If a plant cements this wastewater with zinc, the effluent from cementation should contain high zinc concentrations.

PLATINUM PRECIPITATION AND FILTRATION

Platinum may be recovered by dissolving the raw material in acid, filtering away the impurities, and precipitating the platinum as a chloride. The platinum chloride is then separated from the solution by filtration. The filtrate may be combined with wash water, and sent via cementation to treatment. Eighteen plants recover platinum in this manner as shown in Table V-9.

Although the Agency did not sample this wastewater, the platinum precipitation and filtration wastewater should have similar characteristics to palladium precipitation and filtration wastewater, based on raw materials and processing steps. The raw wastewater is expected to contain toxic metals, ammonia, and TSS above treatable concentrations.

PALLADIUM PRECIPITATION AND FILTRATION

Palladium may be recovered by dissolving the raw material in strong base, filtering away impurities, precipitating the palladium as a chloride, and filtering away the solution to produce a yellow cake. This yellow cake may be reduced with a strong reducing agent to the pure metal sponge. The filtrate may be combined with wash water, and sent via cementation to treatment. Nineteen plants recover palladium in this manner as shown in Table V-10.

The Agency sampled one of the discharging plants for three palladium batch discharges, as shown in Table V-19. The raw wastewater shows toxic metals, ammonia, and TSS above treatable concentrations.

OTHER PLATINUM GROUP METALS PRECIPITATION AND FILTRATION

Three plants use a wet chemistry process similar to the type used to recover either platinum or palladium, to recover other platinum group metals including rhodium and iridium. All three plants discharge wastewater as shown in Table V-11.

The Agency believes palladium precipitation and filtration wastewater should be similar to this waste stream. This wastewater is expected to contain toxic metals, ammonia, and TSS above treatable concentrations.

SPENT SOLUTION FROM PGC SALT PRODUCTION

Three plants manufacture potassium gold cyanide (PGC) salt from pure gold and potassium cyanide solution. Excess cyanide solution may be discharged from this process. Water use and discharge rates are shown in Table V-12.

The Agency sampled one plant for this waste stream, and the results are presented in Table V-20. Raw wastewater contains toxic metals, and free and complexed cyanide above treatable concentrations.

EQUIPMENT AND FLOOR WASH

Three plants reported an equipment and floor wash waste stream. This waste stream is discharged via cementation, to treatment. Table V-13 shows water use and discharge rates in liters per troy ounce of precious metals, including silver, produced in the refinery. The Agency sampled this waste stream at one plant, and the data are presented in Table V-21. This wastewater contains toxic metals, ammonia, and TSS above treatable concentrations.

Table V-1

WATER USE AND DISCHARGE RATES FOR
FURNACE WET AIR POLLUTION CONTROL

(liters/troy ounce of precious metals, including silver, incinerated or smelted)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1034	0	116	116
1138	0	27.6	27.6
1105	≥90	NR	4.5
1094	100	NR	0
1084	100	NR	0
1095	Dry		
1153	Dry		
1163	Dry		
1020	Dry		
1019	Dry		
1082	Dry		
1134	Dry		
1071	Dry		
1088	Dry		
1051	Dry		
1045	Dry		

NR - Data not reported.

Table V-2

WATER USE AND DISCHARGE RATES FOR
RAW MATERIAL GRANULATION

(liters/troy ounce of precious metals
in the granulated raw material)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1008	0	8.67	8.67
1094	0	4.0	4.0
1082	100	Unknown	0

Table V-3

WATER USE AND DISCHARGE RATES FOR
SPENT PLATING SOLUTIONS

(liters/liter of raw material spent plating solution)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1002	0	1.0	1.0
1163	0	1.0	1.0
1094	0	1.0	1.0
1092	0	1.0	1.0
1023	0	1.0	1.0
1128	0	1.0	1.0
1083	0	1.0	1.0
1167	NR	NR	NR
1071	0	1.0	1.0
1034	0	1.0	1.0
1067	0	1.0	1.0
1065	0	1.0	1.0

NR - Data not reported.

Table V-4

WATER USE AND DISCHARGE RATES FOR
SPENT CYANIDE STRIPPING SOLUTIONS

(liters/troy ounce of gold produced by cyanide stripping)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1100	0	78.3	78.3
1034	0	7.63	7.63
1163	0	6.04	6.04
1067	0	2.92	2.92
1083	0	1.14	1.14
1026	0	0.631	0.631

Table V-5

WATER USE AND DISCHARGE RATES FOR REFINERY WET AIR POLLUTION CONTROL

(liters/troy ounce of precious metals, including silver, produced in refinery)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1100	0	107	107
1117	0	42	42
1029	0	32.8	32.8
1020	≥90	NR	14.2
1051	0	13.2	13.2
1147	75	39.4	9.85
1065	0	6.8	6.8
1067	90	46.4	4.64
1091	NR	NR	3.32
1071	0	2.4	2.4
1105	≥90	NR	2.3
1080	≥90	NR	1.75
1115	≥90	NR	1.665
1069	≥90	NR	1.41
1008	≥90	NR	1.1
1164	90	7.0	0.7
1083	≥90	NR	0.67
1104	≥90	NR	0.234
1138	≥90	NR	0.21

Table V-5 (Continued)

WATER USE AND DISCHARGE RATES FOR
REFINERY WET AIR POLLUTION CONTROL

(liters/troy ounce of precious metals, including silver, produced in refinery)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1094	≥90	NR	0.19
1165	≥90	NR	0.172
1082	99	7.2	0.072
1026	≥90	NR	0.06
1072	≥90	NR	0.036
1167	95	0.6	0.03
1053	100	NR	0
1128	100	NR	0
1034	100	NR	0

NR - Data not reported.

Table V-6

WATER USE AND DISCHARGE RATES FOR
GOLD SOLVENT EXTRACTION RAFFINATE AND WASH WATER

(liters/troy ounce of gold produced by solvent extraction)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1094	0	0.63	0.63

Table V-7

WATER USE AND DISCHARGE RATES FOR GOLD SPENT ELECTROLYTE

(liters/troy ounce of gold produced by electrolysis)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1071	0	0.294	0.294
1084	0	0.0087	0.0087
1088	NR	NR	NR

NR - Data not reported.

Table V-8

WATER USE AND DISCHARGE RATES FOR GOLD PRECIPITATION AND FILTRATION WASTEWATER

(liters/troy ounce of gold precipitated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1034	0	560.5	560.5
1100	0	404	404
1091	0	69.1	69.1
1053	0	24.3	24.3
1165	0	7.98	7.98
1083	0	4.1	4.1
1067	0	3.34	3.34
1063	0	2.65	2.65
1082	0	2.5	2.5
1147	0	1.86	1.86
1110	0	0.815	0.815
1008	0	0.63	0.63
1138	0	0.341	0.341
1065	0	0.312	0.312
1117	0	0.27	0.27
1153	0	0.144	0.144
1026	0	0.05	0.05
1020	NR	NR	0
1069	NR	NR	0

Table V-8 (Continued)

WATER USE AND DISCHARGE RATES FOR
GOLD PRECIPITATION AND FILTRATION WASTEWATER

(liters/troy ounce of gold precipitated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1018	NR	NR	NR
1104	NR	NR	NR
1128	NR	NR	NR
1164	NR	NR	NR
1029	NR	NR	NR
1167	NR	NR	NR
1072	NR	NR	NR
1115	NR	NR	NR
1071	NR	NR	NR

NR - Data not reported.

Table V-9

WATER USE AND DISCHARGE RATES FOR
PLATINUM PRECIPITATION AND FILTRATION

(liters/troy ounce of platinum precipitated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1020	0	354	354
1082	0	30.2	30.2
1069	0	10.4	10.4
1105	0	4.5	4.5
1147	0	0.58	0.58
1051	NR	NR	NR
1018	NR	NR	NR
1063	NR	NR	NR
1072	NR	NR	NR
1115	NR	NR	NR
1117	NR	NR	NR
1104	NR	NR	NR
1156	NR	NR	NR
1138	NR	NR	NR
1080	NR	NR	NR
1088	NR	NR	NR
1153	NR	NR	NR
1134	NR	NR	NR

NR - Data not reported.

Table V-10

WATER USE AND DISCHARGE RATES FOR
PALLADIUM PRECIPITATON AND FILTRATION

(liters/troy ounce of palladium precipitated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1069	0	15.8	15.8
1147	0	4.58	4.58
1105	0	4.4	4.4
1082	0	3.4	3.4
1138	0	1.53	1.53
1020	NR	NR	0
1153	NR	NR	NR
1018	NR	NR	NR
1128	NR	NR	NR
1029	NR	NR	NR
1072	NR	NR	NR
1115	NR	NR	NR
1117	NR	NR	NR
1104	NR	NR	NR
1156	NR	NR	NR
1080	NR	NR	NR
1071	NR	NR	NR
1088	NR	NR	NR
1051	NR	NR	NR

NR - Data not reported.

Table V-11

WATER USE AND DISCHARGE RATES FOR
OTHER PLATINUM GROUP METALS PRECIPITATION AND FILTRATION

(liters/troy ounce of other platinum group metals precipitated)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1115	NR	NR	NR
1051	NR	NR	NR
1156	NR	NR	NR

NR - Data not reported.

Table V-12

WATER USE AND DISCHARGE RATES FOR
SPENT SOLUTION FROM PGC SALT PRODUCTION

(liters/troy ounce of gold contained in PGC product)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1100	0	260	260
1034	0	0.90	0.90
1128	NR	NR	NR

Table V-13

WATER USE AND DISCHARGE RATES FOR EQUIPMENT AND FLOOR WASH

(liters/troy ounce of precious metals, including silver, produced in refinery)

Plant Code	Percent Recycle	Production Normalized Water Use	Production Normalized Discharge Flow
1020	0	14.2	14.2
1105	0	1.0	1.0
1138	0	0.97	0.97

Table V-14

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	189	1	ND			ND
	5	2	ND	ND	ND	ND
2. acrolein	189	1	ND			ND
	5	1	ND	ND	ND	ND
3. acrylonitrile	189	1	ND			ND
	5	1	ND	ND	ND	ND
4. benzene	189	1	ND			ND
	5	1	ND	ND	ND	ND
5. benzidine	189	1	ND			ND
	5	2	ND	ND	ND	ND
6. carbon tetrachloride	189	1	ND			ND
	5	1	ND	ND	ND	ND
7. chlorobenzene	189	1	ND			ND
	5	1	ND	ND	ND	<0.010
8. 1,2,4-trichlorobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND
9. hexachlorobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
10. 1,2-dichloroethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
11. 1,1,1-trichloroethane	189	1	0.01			0.015
	5	1	ND	ND	ND	ND
12. hexachloroethane	189	1	ND			ND
	5	2	ND	ND	ND	ND
13. 1,1-dichloroethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
14. 1,1,2-trichloroethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
15. 1,1,2,2-tetrachloroethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
16. chloroethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
17. bis(chloromethyl)ether	189	1	ND			ND
	5	1	ND	ND	ND	ND
18. bis(2-chloroethyl)ether	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
19. 2-chloroethyl vinyl ether	189	1	ND			ND
	5	1	ND	ND	ND	ND
20. 2-chloronaphthalene	189	1	ND			ND
	5	2	ND	ND	ND	ND
21. 2,4,6-trichlorophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
22. p-chloro-m-cresol	189	1	ND			ND
	5	2	ND	ND	ND	ND
23. chloroform	189	1	ND			ND
	5	1	0.050	0.010	<0.010	0.020
24. 2-chlorophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
25. 1,2-dichlorobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND
26. 1,3-dichlorobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND
27. 1,4-dichlorobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	189	1	ND			ND
	5	2	ND	ND	ND	ND
29. 1,1-dichloroethylene	189	1	ND			ND
	5	1	ND	ND	ND	ND
30. 1,2-*trans*-dichloroethylene	189	1	ND			ND
	5	1	ND	ND	ND	ND
31. 2,4-dichlorophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
32. 1,2-dichloropropane	189	1	ND			ND
	5	1	ND	ND	ND	ND
33. 1,3-cichloropropene	189	1	ND			ND
	5	1	ND	ND	ND	ND
34. 2,4-dimethylphenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
35. 2,4-dinitrotoluene	189	1	ND			ND
	5	2	ND	ND	ND	ND
36. 2,6-dinitrotoluene	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
37. 1,2-diphenylhydrazine	189	1	ND			ND
	5	2	ND	ND	ND	ND
38. ethylbenzene	189	1	ND			ND
	5	1	ND	ND	ND	ND
39. fluoranthene	189	1	ND			ND
	5	2	ND	ND	ND	ND
40. 4-chlorophenyl phenyl ether	189	1	ND			ND
	5	2	ND	ND	ND	ND
41. 4-bromophenyl phenyl ether	189	1	ND			ND
	5	2	ND	ND	ND	ND
42. bis(2-chloroisopropyl)ether	189	1	ND			ND
	5	2	ND	ND	ND	ND
43. bis(2-choroethoxy)methane	189	1	ND			ND
	5	2	ND	ND	ND	ND
44. methylene chloride	189	1	ND			ND
	5	1	<0.01	<0.01	<0.01	<0.01
45. methyl chloride (chloromethane)	189	1	ND			ND
	5	1	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
46. methyl bromide (bromomethane)	189	1	ND			ND
	5	1	ND	ND	ND	ND
47. bromoform (tribromomethane)	189	1	ND			ND
	5	1	ND	ND	ND	ND
48. dichlorobromomethane	189	1	ND			ND
	5	1	<0.01	<0.01	<0.01	ND
49. trichlorofluoromethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
50. dichlorodifluoromethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
51. chlorodibromomethane	189	1	ND			ND
	5	1	ND	ND	ND	ND
52. hexachlorobutadiene	189	1	ND			ND
	5	2	ND	ND	ND	ND
53. hexachlorocyclopentadiene	189	1	ND			ND
	5	2	ND	ND	ND	ND
54. isophorone	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
55. naphthalene	189	1	ND			ND
	5	2	ND	ND	ND	ND
56. nitrobenzene	189	1	ND			ND
	5	2	ND	ND	ND	ND
57. 2-nitrophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
58. 4-nitrophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
59. 2,4-dinitrophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
60. 4,6-dinitro-o-cresol	189	1	ND			ND
	5	2	ND	ND	ND	ND
61. N-nitrosodimethylamine	189	1	ND			ND
	5	2	ND	ND	ND	ND
62. N-nitrosodiphenylamine	189	1	ND			0.01
	5	2	ND	ND	ND	ND
63. N-nitrosodi-n-propylamine	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	189	1	ND			ND
	5	2	ND	ND	ND	ND
65. phenol	189	1	ND			0.013
	5	2	ND	<0.01	<0.01	ND
66. bis(2-ethylhexyl) phthalate	189	1	0.026			0.034
	5	2	0.02	<0.01	<0.01	<0.01
67. butyl benzyl phthalate	189	1	ND			ND
	5	2	ND	ND	ND	ND
68. di-n-butyl phthalate	189	1	ND			0.002
	5	2	<0.01	<0.01	<0.01	<0.01
69. di-n-octyl phthalate	189	1	ND			0.003
	5	2	ND	ND	ND	ND
70. diethyl phthalate	189	1	ND			ND
	5	2	<0.01	<0.01	<0.01	<0.01
71. dimethyl phthalate	189	1	ND			0.006
	5	2	ND	ND	ND	ND
72. benzo(a)anthracene	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
73. benzo(a)pyrene	189	1	ND			ND
	5	2	ND	ND	ND	ND
74. benzo(b)fluoranthene	189	1	ND			ND
	5	2	ND	ND	ND	ND
75. benzo(k)fluoranthane	189	1	ND			ND
	5	2	ND	ND	ND	ND
76. chrysene	189	1	ND			ND
	5	2	ND	ND	ND	ND
77. acenaphthylene	189	1	ND			ND
	5	2	ND	ND	ND	ND
78. anthracene (a)	189	1	ND			ND
	5	2	ND	ND	ND	ND
79. benzo(ghi)perylene	189	1	ND			ND
	5	2	ND	ND	ND	ND
80. fluorene	189	1	ND			ND
	5	2	ND	ND	ND	ND
81. phenanthrene (a)	189	1	ND			ND
	5	2	ND	ND	ND	ND

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
82. dibenzo(a,h)anthracene	189	1	ND			ND
	5	2	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	189	1	ND			ND
	5	2	ND	ND	ND	ND
84. pyrene	189	1	ND			ND
	5	2	ND	ND	ND	ND
85. tetrachloroethylene	189	1	ND			ND
	5	1	ND	ND	ND	ND
86. toluene	189	1	ND			ND
	5	1	ND	ND	ND	ND
87. trichloroethylene	189	1	ND			ND
	5	1	ND	ND	ND	ND
88. vinyl chloride (chloroethylene)	189	1	ND			ND
	5	1	ND	ND	ND	ND
114. antimony	200	2	<0.01		<0.01	
	189	1	<0.003			0.19
	5	2	<0.003	0.004	<0.003	<0.003

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
115. arsenic	200	2	<0.01		<0.01	
	189	1	<0.003			0.025
	5	2	<0.005	0.004	<0.005	0.005
117. beryllium	200	2	<0.01		<0.01	
	189	1	<0.01			<0.01
	5	2	<0.0002	0.0006	<0.0002	<0.0002
118. cadmium	200	2	<0.05		<0.05	
	189	1	<0.01			0.61
	5	2	0.0002	0.001	0.020	0.003
119. chromium (total)	200	2	<0.05		<0.05	
	189	1	<0.01			1.1
	5	2	0.003	0.003	0.001	0.003
120. copper	200	2	<0.05		0.05	
	189	1	<0.01			11.0
	5	2	0.017	0.026	0.140	0.040
121. cyanide (total)	200	1	0.05		0.095	
	189	1	<0.02			<0.02
	5	1	0.052	0.008	0.090	0.150
122. lead	200	2	<0.10		<0.10	
	189	1	<0.10			3.0
	5	2	0.030	0.037	0.80	0.092

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
123. mercury	200	2	0.0002		0.015	
	189	1	0.002			<0.0002
	5	2	0.0002	0.0003	<0.0001	<0.0001
124. nickel	200	2	<0.2		<0.2	
	189	1	0.075			30.0
	5	2	0.020	0.017	0.016	0.014
125. selenium	200	2	<0.1A		<0.1A	
	189	1	<0.003			0.007
	5	2	<0.002	120.0	<0.002	<0.002
126. silver	200	2	<0.01		0.05	
	189	1	<0.0005			0.13
	5	2	<0.0002	0.001	0.003	0.004
127. thallium	200	2	<0.01		<0.01	
	189	1	<0.002			<0.002
	5	2	<0.001	<0.001	0.004	<0.30
128. zinc	200	2	0.10		0.150	
	189	1	2.5			
	5	2	<0.010	0.110	0.190	0.160

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	200	2	<1		<1	
	189	1	<1			<1
alkalinity	200	2	98		75	
	189	1	127			91
	5	2	16	31	0	33
aluminum	200	2	0.20		0.3	
	189	1	<0.050			8.3
ammonia nitrogen	200	2	0.04		0.24	
	189	1	<0.01			<0.01
barium	200	2	<0.050		<0.05	
	189	1	0.070			0.37
boron	200	1	<0.10		<0.10	
	189	1	<0.009			2.1
calcium	200	2	37.7		38.4	
	189	1	11			710
	5	2	13	9.9	14	9.7
chemical oxygen demand (COD)	200	2	<5		100	
	189	1				490

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
chloride	200	2	14		63	
	189	1	52			1,000
cobalt	200	2	<0.050		<0.05	
	189	1	<0.006			2.4
fluoride	200	2	0.28		0.21	
	189	1	1.1			1.8
iron	200	2	<0.050		0.2	
	189	1	0.31			104
	5	2	0.29	0.32	0.52	0.51
magnesium	200	1	8.50		8.6	
	189	1	2.4			15
	5	1	3.1	3.2	3.4	3.2
manganese	200	2	<0.050		<0.05	
	189	1	<0.01			1.2
molybdenum	200	2	<0.050		<0.05	
	189	1	<0.002			0.061
phenolics	5	1	0.15	0.25	0.061	0.005

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
phosphate	200	2	14		<0.9	
	189	1				<4
sodium	200	2	9		13.3	
	189	1	54			8,100
sulfate	200	2	57		27	
	189	1	13			920
tin	200	2	<0.050		<0.05	
	189	1	<0.12			<0.12
titanium	200	2	<0.005		<0.05	
	189	1	<0.005			<0.005
total organic carbon (TOC)	200	2	4.3		4	
	189	1	43			94
total solids (TS)	200	2	380		6,000	
	189	1	410			35,000
vanadium	200	2	<0.050		<0.05	
	189	1	<0.003			<0.003

Table V-14 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
FURNACE WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
yttrium	200	2	<0.50		<0.05	
	189	1	<0.002			0.004
Conventional Pollutants						
oil and grease	200	1	<1		2	
	189	1	<1			<1
	5	1	1.6	<1	<1	<1
total suspended solids (TSS)	200	2	60		5,600	
	189	1	8			1,100
	5	2	0	0	8	13
pH (standard units)	200	2	7.5		7.3	
	189	1	7.36			5.96
	5	2	6.8	6.6	3.4	7.1

†Sample Type Code: 1 - One-time grab
2 - Manual composite during intermittent process operation

(a) Reported together.

A - Detection limit raised due to interference.

Table V-15

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	6	1	ND	ND	ND	ND
2. acrolein	6	1	ND	ND	ND	ND
3. acrylonitrile	6	1	ND	ND	ND	ND
4. benzene	6	1	ND	ND	<0.01	ND
5. benzidine	6	1	ND	ND	ND	ND
6. carbon tetrachloride	6	1	ND	ND	ND	ND
7. chlorobenzene	6	1	ND	ND	ND	ND
8. 1,2,4-trichlorobenzene	6	1	ND	ND	ND	ND
9. hexachlorobenzene	6	1	ND	ND	ND	ND
10. 1,2-dichloroethane	6	1	ND	ND	ND	ND
11. 1,1,1-trichloroethane	6	1	ND	ND	ND	ND
12. hexachloroethane	6	1	ND	ND	ND	ND
13. 1,1-dichloroethane	6	1	ND	ND	ND	ND
14. 1,1,2-trichloroethane	6	1	ND	ND	ND	ND

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	6	1	ND	ND	ND	ND
16. chloroethane	6	1	ND	ND	ND	ND
17. bis(chloromethyl)ether	6	1	ND	ND	ND	ND
18. bis(2-chloroethyl)ether	6	1	ND	ND	ND	ND
19. 2-chloroethyl vinyl ether	6	1	ND	ND	ND	ND
20. 2-chloronaphthalene	6	1	ND	ND	ND	ND
21. 2,4,6-trichlorophenol	6	1	ND	ND	ND	ND
22. p-chloro-m-cresol	6	1	ND	ND	ND	ND
23. chloroform	6	1	ND	ND	ND	ND
24. 2-chlorophenol	6	1	ND	<0.01	ND	ND
25. 1,2-dichlorobenzene	6	1	ND	ND	ND	ND
26. 1,3-dichlorobenzene	6	1	ND	ND	ND	ND
27. 1,4-dichlorobenzene	6	1	ND	ND	ND	ND
28. 3,3'-dichlorobenzidine	6	1	ND	ND	ND	ND

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	6	1	ND	ND	ND	ND
30. 1,2-trans-dichloroethylene	6	1	ND	ND	ND	ND
31. 2,4-dichlorophenol	6	1	ND	ND	ND	ND
32. 1,2-dichloropropane	6	1	ND	ND	ND	ND
33. 1,3-dichloropropene	6	1	ND	ND	ND	ND
34. 2,4-dimethylphenol	6	1	ND	<0.01	ND	ND
35. 2,4-dinitrotoluene	6	1	ND	ND	ND	ND
36. 2,6-dinitrotoluene	6	1	ND	ND	ND	ND
37. 1,2-diphenylhydrazine	6	1	ND	ND	ND	ND
38. ethylbenzene	6	1	ND	ND	ND	ND
39. fluoranthene	6	1	ND	ND	ND	ND
40. 4-chlorophenyl phenyl ether	6	1	ND	ND	ND	ND
41. 4-bromophenyl phenyl ether	6	1	ND	ND	ND	ND
42. bis(2-chloroisopropyl)ether	6	1	ND	ND	ND	ND

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	6	1	ND	ND	ND	ND
44. methylene chloride	6	1	<0.01	<0.01	<0.01	<0.01
45. methyl chloride (chloromethane)	6	1	ND	ND	ND	ND
46. methyl bromide (bromomethane)	6	1	ND	ND	ND	ND
47. bromoform (tribromomethane)	6	1	ND	ND	ND	ND
48. dichlorobromomethane	6	1	ND	ND	ND	ND
49. trichlorofluoromethane	6	1	ND	ND	ND	ND
50. dichlorodifluoromethane	6	1	ND	ND	ND	ND
51. chlorodibromomethane	6	1	ND	ND	ND	ND
52. hexachlorobutadiene	6	1	ND	ND	ND	ND
53. hexachlorocyclopentadiene	6	1	ND	ND	ND	ND
54. isophorone	6	1	ND	ND	ND	ND
55. naphthalene	6	1	ND	ND	ND	ND
56. nitrobenzene	6	1	ND	ND	ND	ND

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	6	1	ND	ND	0.01	<0.01
58. 4-nitrophenol	6	1	ND	ND	ND	ND
59. 2,4-dinitrophenol	6	1	ND	ND	ND	ND
60. 4,6-dinitro-o-cresol	6	1	ND	ND	ND	ND
61. N-nitrosodimethylamine	6	1	ND	ND	ND	ND
62. N-nitrosodiphenylamine	6	1	ND	ND	ND	ND
63. N-nitrosodi-n-propylamine	6	1	ND	ND	ND	ND
64. pentachlorophenol	6	1	ND	ND	ND	ND
65. phenol	6	1	ND	0.17	0.45	0.65
66. bis(2-ethylhexyl) phthalate	6	1	0.02	0.06	0.10	0.02
67. butyl benzyl phthalate	6	1	ND	ND	ND	ND
68. di-n-butyl phthalate	6	1	<0.01	<0.01	<0.01	ND
69. di-n-octyl phthalate	6	1	ND	ND	ND	ND
70. diethyl phthalate	6	1	<0.01	<0.01	<0.01	<0.01

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	6	1	ND	ND	ND	ND
72. benzo(a)anthracene	6	1	ND	ND	ND	ND
73. benzo(a)pyrene	6	1	ND	ND	ND	ND
74. benzo(b)fluoranthene	6	1	ND	ND	ND	ND
75. benzo(k)fluoranthane	6	1	ND	ND	ND	ND
76. chrysene	6	1	ND	ND	ND	ND
77. acenaphthylene	6	1	ND	ND	ND	ND
78. anthracene (a)	6	1	ND	ND	ND	ND
79. benzo(ghi)perylene	6	1	ND	ND	ND	ND
80. fluorene	6	1	ND	ND	ND	ND
81. phenanthrene (a)	6	1	ND	ND	ND	ND
82. dibenzo(a,h)anthracene	6	1	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	6	1	ND	ND	ND	ND
84. pyrene	6	1	ND	ND	ND	ND

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	6	1	ND	ND	ND	ND
86. toluene	6	1	ND	<0.01	<0.01	<0.01
87. trichloroethylene	6	1	ND	ND	ND	ND
88. vinyl chloride (chloroethylene)	6	1	ND	ND	ND	ND
114. antimony	6	1	<0.003	3.5	1.0	5.2
	701	1	<0.003	<0.003		
115. arsenic	6	1	<0.005	0.25	2.2	1.0
	701	1	<0.002	<0.003		
117. beryllium	6	1	<0.0002	0.09	0.46	0.17
	701	1	0.002	0.005		
118. cadmium	6	1	0.0002	0.74	1.6	0.48
	701	1	0.014	0.12		
119. chromium (total)	6	1	0.003	20.0	22.0	14.0
	701	1	0.015	0.14		
chromium (hexavalent)	701	1		<0.02		

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
120. copper	6	1	0.017	12.0	340.0	130.0
	701	1	2.3	5.7		
121. cyanide (total)	6	1	0.052	170.0	11.0	25.0
	701	1	0.41	100		
cyanide (free)	701	1	0.26	29		
122. lead	6	1	0.03	3.4	9.7	2.1
	701	1	<0.08	<0.084		
123. mercury	6	1	0.0002	<0.0001	<0.0001	<0.0002
	701	1	0.0007	0.0004		
124. nickel	6	1	0.02	56.0	700.0	1.8
	701	1	0.25	1.1		
125. selenium	6	1	<0.002	<0.002	<0.002	<0.002
	701	1	<0.002	0.18		
126. silver	6	1	<0.0002	0.26	0.27	0.28
	701	1	<0.0005	<0.0005		
127. thallium	6	1	<0.001	1.2	0.91	0.90
	701	1	<0.002	<0.002		

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
128. zinc	6	1	<0.01	9,600	10,000	810
	701	1	0.055	<0.003		
Nonconventional Pollutants						
alkalinity	6	1	16	66,000	39,000	12,000
aluminum	701	1	0.86	2,100		
barium	701	1	0.056	0.012		
boron	701	1	<0.009	<0.009		
calcium	6	1	13	2.2	7.6	4.4
	701	1	4.2	2.1		
cobalt	701	1	0.044	2.1		
iron	6	1	0.29	4.7	6.0	0.53
	701	1	0.94	9.3		
magnesium	6	1	3.1	6.8	1.6	0.47
	701	1	1.3	0.99		
manganese	701	1	0.013	0.043		

Table V-15 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT PLATING SOLUTIONS
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
molybdenum	701	1	0.029	<0.002		
phenolics	6	1	0.15	0.02	0.07	0.37
sodium	701	1	13	1,500		
tin	701	1	<0.12	<0.12		
titanium	701	1	0.12	0.13		
vanadium	701	1	0.073	0.094		
yttrium	701	1	<0.002	<0.002		
Conventional Pollutants						
oil and grease	6	1	1.6	<1		<1
total suspended solids	6	1		600	1,200	520
pH (standard units)	6	1	6.8	12.0	12.3	12.4
	701	1	7	10		

†Sample Type Code: 1 - One-time grab

(a) Reported together.

Table V-16

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT CYANIDE STRIPPING SOLUTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	702	1	<0.003	<0.003		
115. arsenic	702	1	<0.002	0.11		
117. beryllium	702	1	0.002	2.4		
118. cadmium	702	1	0.014	7.6		
119. chromium (total)	702	1	0.015	0.12		
120. copper	702	1	2.3	5,000		
121. cyanide (total)	702	1	0.41	9,897		
cyanide (free)	702	1	0.26	40		
122. lead	702	1	<0.08	<0.08		
123. mercury	702	1	0.0007	0.0004		
124. nickel	702	1	0.25	890		
125. selenium	702	1	<0.002	0.18		
126. silver	702	1	<0.0005	<0.0005		
127. thallium	702	1	<0.002	<0.002		
128. zinc	702	1	0.055	56		

Table V-16 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT CYANIDE STRIPPING SOLUTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
aluminum	702	1	0.86	280		
barium	702	1	0.056	0.072		
boron	702	1	<0.009	<0.009		
calcium	702	1	4.2	0.42		
cobalt	702	1	0.044	73		
iron	702	1	0.94	23		
magnesium	702	1	1.3	0.19		
manganese	702	1	0.013	0.045		
molybdenum	702	1	0.029	12		
sodium	702	1	13	2,500		
tin	702	1	<0.12	<0.12		
titanium	702	1	0.12	0.59		
vanadium	702	1	0.073	0.51		
yttrium	702	1	<0.002	<0.002		

Table V-16 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT CYANIDE STRIPPING SOLUTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants						
pH (standard units)	702	1	7	10		

†Sample Type Code: 1 - One-time grab

Table V-17

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
2. acrolein	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
3. acrylonitrile	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
4. benzene	187	1	ND			ND
	4	1	ND	<0.01	ND	ND
	821	1		ND		
5. benzidine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
6. carbon tetrachloride	187	1	ND			0.210
	4	1	ND	ND	ND	ND
	821	1		ND		
7. chlorobenzene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
8. 1,2,4-trichlorobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
9. hexachlorobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
10. 1,2-dichloroethane	187	1	ND			ND
	4	1	ND	ND	ND	<0.01
	821	1		ND		
11. 1,1,1-trichloroethane	187	1	0.01			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
12. hexachloroethane	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
13. 1,1-dichloroethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
14. 1,1,2-trichloroethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
16. chloroethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
17. bis(chloromethyl)ether	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
18. bis(2-chloroethyl)ether	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
19. 2-chloroethyl vinyl ether	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
20. 2-chloronaphthalene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
21. 2,4,6-trichlorophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		<0.01		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
22. p-chloro-m-cresol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
23. chloroform	187	1	ND			ND
	4	1	0.05	0.02	0.02	0.02
	821	1		ND		
24. 2-chlorophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
25. 1,2-dichlorobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
26. 1,3-dichlorobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
27. 1,4-dichlorobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
28. 3,3'-dichlorobenzidine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
30. 1,2-trans-dichloroethylene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
31. 2,4-dichlorophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
32. 1,2-dichloropropane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
33. 1,3-dichloropropene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
34. 2,4-dimethylphenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
35. 2,4-dinitrotoluene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
36. 2,6-dinitrotoluene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
37. 1,2-diphenylhydrazine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
38. ethylbenzene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
39. fluoranthene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
40. 4-chlorophenyl phenyl ether	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
41. 4-bromophenyl phenyl ether	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
42. bis(2-chloroisopropyl)ether	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
44. methylene chloride	187	1	ND			ND
	4	1	<0.01	<0.01	<0.01	<0.01
	821	1		ND		
45. methyl chloride (chloromethane)	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
46. methyl bromide (bromomethane)	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
47. bromoform (tribromomethane)	187	1	ND			ND
	4	1	ND	<0.01	ND	ND
	821	1		ND		
48. dichlorobromomethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
49. trichlorofluoromethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
50. dichlorodifluoromethane	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
51. chlorodibromomethane	187	1	ND			ND
	4	1	<0.01	<0.01	ND	ND
	821	1		ND		
52. hexachlorobutadiene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
53. hexachlorocyclopentadiene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
54. isophorone	187	1	ND			ND
	4	2	ND	<0.01	ND	ND
	821	1		ND		
55. naphthalene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
56. nitrobenzene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	187	1	ND			ND
	4	2	ND	<0.01	<0.01	<0.01
	821	1		ND		
58. 4-nitrophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
59. 2,4-dinitrophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
60. 4,6-dinitro-o-cresol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
61. N-nitrosodimethylamine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
62. N-nitrosodiphenylamine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
63. N-nitrosodi-n-propylamine	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
65. phenol	187	1	ND			ND
	4	2	ND	<0.01	<0.01	ND
	821	1		ND		
66. bis(2-ethylhexyl) phthalate	187	1	0.026			0.033
	4	2	0.02	<0.01	<0.01	<0.01
	821	1		0.073		
67. butyl benzyl phthalate	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
68. di-n-butyl phthalate	187	1	ND			0.002
	4	2	<0.01	<0.01	<0.01	ND
	821	1		<0.01		
69. di-n-octyl phthalate	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
70. diethyl phthalate	187	1	ND			ND
	4	2	<0.01	<0.01	<0.01	<0.01
	821	1		<0.01		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
72. benzo(a)anthracene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
73. benzo(a)pyrene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
74. benzo(b)fluoranthene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
75. benzo(k)fluoranthane	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
76. chrysene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
77. acenaphthylene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
78. anthracene (a)	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
79. benzo(ghi)perylene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
80. fluorene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
81. phenanthrene (a)	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
82. dibenzo(a,h)anthracene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
83. indeno (1,2,3-c,d)pyrene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
84. pyrene	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
86. toluene	187	1	ND			ND
	4	1	ND	<0.01	<0.01	<0.01
	821	1		<0.01		
87. trichloroethylene	187	1	ND			ND
	4	1	ND	ND	ND	ND
	821	1		ND		
88. vinyl chloride (chloroethylene)	187	1	ND			ND
	4	2	ND	ND	ND	ND
	821	1		ND		
114. antimony	201	2	<0.01	1.8	3.2	
	187	1	<0.003			0.32
	4	2	<0.003	<0.003	<0.003	<0.003
	821	1		1.7		
115. arsenic	201	2	<0.01	2.4	0.6	
	187	1	<0.003			0.12
	4	2	<0.005	0.027	<0.005	<0.005
	821	1		0.061		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
117. beryllium	201	2	<0.01	<0.01	<0.01	
	187	1	<0.01			<0.01
	4	2	<0.0002	0.001	<0.0002	<0.0002
	821	1		<0.001		
118. cadmium	201	2	<0.05	<0.05	<0.05	
	187	1	<0.01			<0.01
	4	2	0.0002	0.001	0.001	0.001
	821	1		4.4		
119. chromium (total)	201	2	<0.05	0.75	0.70	
	187	1	<0.01			<0.01
	4	2	0.003	0.012	0.003	0.004
	821	1		0.012		
120. copper	201	2	<0.05	2.3	2.7	
	187	1	<0.01			0.15
	4	2	0.017	0.016	0.038	0.017
121. cyanide (total)	201	1	0.05	0.37	0.15	
	187	1	<0.02			<0.02
	4	1	0.052	0.930	0.840	0.98
	821	1		0.29		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
122. lead	201	2	<0.10	0.1	0.2	<0.10
	187	1	<0.10			0.250
	4	2	0.030	0.020	0.050	
	821	1		2.7		
123. mercury	201	2	0.0002	<0.0002	<0.0002	<0.0002
	187	1	0.002			<0.0001
	4	2	0.0002	<0.0001	<0.0001	
	821	1		<0.001		
124. nickel	201	2	<0.20	1.8	2.0	0.43
	187	1	0.075			0.018
	4	2	0.020	0.009	0.008	
	821	1		4.6		
125. selenium	201	2	<0.10A	B	<0.1A	0.019
	187	1	<0.003			<0.002
	4	2	<0.002	7.0	<0.002	
	821	1		7.4		
126. silver	201	2	<0.01	1.9	1.6	0.18
	187	1	<0.0005			0.001
	4	2	<0.0002	0.003	0.002	
	821	1		0.53		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
127. thallium	201	2	<0.01	B	B	
	187	1	<0.002			<0.002
	4	2	<0.001	<0.001	<0.004	<0.004
	821	1		0.82		
128. zinc	201	2	0.10	1.8	2.5	
	187	1	2.5			6.9
	4	2	<0.010	0.59	0.26	0.39
	821	1		2.3		
Nonconventional Pollutants						
acidity	201	2	<1	960	<1	
	187	1	<1			<1
alkalinity	201	2	98	<1	47	
	187	1	127			93,000
	4	2	16	280	360	330
aluminum	201	2	0.2	<10	<10	
	187	1	<0.05			<0.05
ammonia nitrogen	201	2	0.04	4	6.5	
	187	1	<0.01			<0.01
	821	1		12		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
barium	201	2	<0.05	<5	<5	0.042
	187	1	0.07			
boron	201	2	<0.10	<10	<10	<0.009
	187	1	<0.009			
calcium	201	2	37.7	40	40	49
	187	1	11			
	4	2	13	13	15	13
chemical oxygen demand (COD)	201	2	<5	1,800	16,000	1,100
	187	1				
chloride	201	2	14	69,000	80,000	1,200
	187	1	52			
cobalt	201	2	<0.05	<5	<5	<0.006
	187	1	<0.006			
fluoride	201	2	0.28	1.9	1.6	1.3
	187	1	1.1			
iron	201	2	<0.05	8	6.5	6.2
	187	1	0.31			
	4	2	0.29	0.39	0.26	0.30
	821	1		5.2		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
magnesium	201	2	8.50	<10	10	
	187	1	2.4			4.3
	4	2	3.1	3.1	4.4	3.1
manganese	201	2	<0.05	0.1	0.1	
	187	1	<0.01			0.06
molybdenum	201	2	<0.05	<5	<5	
	187	1	<0.002			<0.002
phenolics	4	1	0.15	0.089	0.067	<0.001
	821	1		0.05		
phosphate	201	2	14	5	<0.9	
	187	1				<4
sodium	201	2	9.0	53,000	65,000	
	187	1	54			72,000
sulfate	201	2	57	7,000	15,000	
	187	1	13			260
tin	201	2	<0.05	59.4	74.9	
	187	1	<0.12			<0.12

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
titanium	201	2	<0.005	<5	<5	
	187	1	<0.005			<0.005
total organic carbon (TOC)	201	2	4.3	20	29	
	187	1	43			80
total solids (TS)	201	2	380	140,000	180,000	
	187	1	410			27,000
vanadium	201	2	<0.05	<5	<5	
	187	1	<0.003			<0.003
yttrium	201	2	<0.05	<5	<5	
	187	1	<0.002			<0.002
Conventional Pollutants						
oil and grease	201	1	<1	3.5	14	
	187	1	<1			<1
	4	1	1.6	<1	<1	<1
	821	1		37		

Table V-17 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
REFINERY WET AIR POLLUTION CONTROL
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	201	2	60	5,500	390	
	187	1	8			690
	4	2	0	90	14	21
pH (standard units)	201	2	7.5	1.6	8.5	
	187	1	7.36			12.59
	4	2	6.8	10.9	11.9	10.9

†Sample Type Code: 1 - One-time grab
2 - Manual composite during intermittent process operation

(a) Reported together.

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-18

SECONDARY PRECIOUS METALS SAMPLING DATA
GOLD PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	233	1	<0.010		<0.50A	
115. arsenic	233	1	<0.010		<0.20	
117. beryllium	233	1	<0.010		0.150	
118. cadmium	233	1	<0.050		0.10	
119. chromium (total)	233	1	<0.050		3.40	
120. copper	233	1	<0.050		100.0	
121. cyanide (total)	233	1	0.05		<0.02	
122. lead	233	1	<0.10		6.5	
123. mercury	233	1	0.0002		<0.0002	
124. nickel	233	1	<0.20		46.0	
125. selenium	233	1	<0.10A		B	
126. silver	233	1	<0.010		26.0	
127. thallium	233	1	<0.010		<0.5A	
128. zinc	233	1	0.10		340.0	

Table V-18 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
GOLD PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	233	1	<1		<1	
alkalinity	233	1	98		850	
aluminum	233	1	0.20		109	
ammonia nitrogen	233	1	0.04		570	
barium	233	1	<0.050		<0.5	
boron	233	1	<0.10		<1.0	
calcium	233	1	37.7		44.0	
chemical oxygen demand (COD)	233	1	<5		37,000	
chloride	233	1	14		16,000	
cobalt	233	1	<0.050		1.0	
fluoride	233	1	0.28		0.65	
iron	233	1	<0.050		10.0	
magnesium	233	1	8.50		10.0	
manganese	233	1	<0.050		0.30	

Table V-18 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
GOLD PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
molybdenum	233	1	<0.050		2.0	
phosphate	233	1	14		130	
sodium	233	1	9		2,390	
sulfate	233	1	57		30,000	
tin	233	1	<0.050		<0.5	
titanium	233	1	<0.050		<0.5	
total organic carbon (TOC)	233	1	4.3		140	
total solids (TS)	233	1	380		240,000	
vanadium	233	1	<0.050		<0.5	
yttrium	233	1	<0.50		<0.5	
Conventional Pollutants						
oil and grease	233	1	<1		3	

Table V-18 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
GOLD PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	233	1	60		1,670	
pH (standard units)	233	1	7.5		9.3	

†Sample Type Code: 1 - One-time grab

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-19

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	230	1	<0.01	0.50		
	230	1	<0.01		<0.50A	
	230	1	<0.01		<0.20A	
115. arsenic	230	1	<0.01	<0.2A		
	230	1	<0.01		<0.01	
	230	1	<0.01		0.07	
117. beryllium	230	1	<0.01	<0.01		
	230	1	<0.01		0.02	
	230	1	<0.01		0.02	
118. cadmium	230	1	<0.05	0.05		
	230	1	<0.05		0.25	
	230	1	<0.05		0.4	
119. chromium (total)	230	1	<0.05	1.2		
	230	1	<0.05		1.8	
	230	1	<0.05		0.65	
120. copper	230	1	<0.05	300.0		
	230	1	<0.05		72.0	
	230	1	<0.05		72.0	
121. cyanide (total)	230	1	0.05	<0.02		
	230	1	0.05		<0.02	
	230	1	0.05		<0.02	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
122. lead	230	1	<0.10	1.8		
	230	1	<0.10		6.8	
	230	1	<0.10		6.2	
123. mercury	230	1	0.0002	<0.0002		
	230	1	0.0002		<0.0002	
	230	1	0.0002		<0.0002	
124. nickel	230	1	<0.2	30.0		
	230	1	<0.2		8.0	
	230	1	<0.2		8.8	
125. selenium	230	1	<0.1A	B		
	230	1	<0.1A		<0.1A	
	230	1	<0.1A		<0.1A	
126. silver	230	1	<0.01	9.4		
	230	1	<0.01		10.0	
	230	1	<0.01		1.8	
127. thallium	230	1	<0.01	<0.1A		
	230	1	<0.01		<0.01	
	230	1	<0.01		<0.04A	
128. zinc	230	1	0.10	170		
	230	1	0.10		180	
	230	1	0.10		270	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	230	1	<1	2,500		
	230	1	<1		9,000	
	230	1	<1		9,500	
alkalinity	230	1	98	<1		
	230	1	98		<1	
	230	1	98		<1	
aluminum	230	1	0.2	<1		
	230	1	0.2		23.3	
	230	1	0.2		9.8	
ammonia nitrogen	230	1	0.04	5,060		
	230	1	0.04		1.4	
	230	1	0.04		2,700	
barium	230	1	<0.05	<0.5		
	230	1	<0.05		<0.05	
	230	1	<0.05		<0.05	
boron	230	1	<0.1	<1		
	230	1	<0.1		1.4	
	230	1	<0.1		0.5	
calcium	230	1	37.7	10		
	230	1	37.7		33	
	230	1	37.7		18.3	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
chemical oxygen demand (COD)	230	1	<5	34,000		
	230	1	<5		24,000	
	230	1	<5		40,000	
chloride	230	1	14	10,000		
	230	1	14		12,000	
	230	1	14		41,000	
cobalt	230	1	<0.05	<0.5		
	230	1	<0.05		0.3	
	230	1	<0.05		0.4	
fluoride	230	1	0.28	0.28		
	230	1	0.28		0.8	
	230	1	0.28		0.37	
iron	230	1	<0.05	4.8		
	230	1	<0.05		21	
	230	1	<0.05		31	
magnesium	230	1	8.5	2		
	230	1	8.5		9	
	230	1	8.5		4	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
manganese	230	1	<0.05	0.1		
	230	1	<0.05		0.3	
	230	1	<0.05		0.3	
molybdenum	230	1	<0.050	<0.5		
	230	1	<0.050		0.7	
	230	1	<0.050		0.6	
phosphate	230	1	14	<4		
	230	1	14		<1	
	230	1	14		<1	
sodium	230	1	9.00	54		
	230	1	9.00		25.7	
	230	1	9.00		160	
sulfate	230	1	57	5,500		
	230	1	57		200,000	
	230	1	57		2,700	
tin	230	1	<0.050	3.4		
	230	1	<0.050		18.4	
	230	1	<0.050		5.6	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
titanium	230	1	<0.050	<0.5		
	230	1	<0.050		0.25	
	230	1	<0.050		0.4	
total organic carbon (TOC)	230	1	4.3	2,700		
	230	1	4.3		34	
	230	1	4.3		2,600	
total solids (TS)	230	1	380	170,000		
	230	1	380		250,000	
	230	1	380		55,000	
vanadium	230	1	<0.050	<0.5		
	230	1	<0.050		<0.05	
	230	1	<0.050		<0.05	
yttrium	230	1	<0.50	<0.5		
	230	1	<0.50		<0.05	
	230	1	<0.50		<0.05	

Table V-19 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
PALLADIUM PRECIPITATION AND FILTRATION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	230	1	<1	2		
	230	1	<1		<1	
	230	1	<1		5	
total suspended solids (TSS)	230	1	60	200		
	230	1	60		630	
	230	1	60		210	
pH (standard units)	230	1	7.5	1.6		
	230	1	7.5		0.1	
	230	1	7.5		0.2	

†Sample Type Code: 1 - One-time grab

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-20

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT SOLUTION FROM PGC SALT PRODUCTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	703	1	<0.003	<0.003		
115. arsenic	703	1	<0.002	<0.003		
117. beryllium	703	1	0.002	0.006		
118. cadmium	703	1	0.014	0.037		
119. chromium (total)	703	1	0.015	0.32		
120. copper	703	1	2.3	5.9		
121. cyanide (total)	703	1	0.41	5,000		
cyanide (free)	703	1	0.26	42		
122. lead	703	1	<0.08	0.33		
123. mercury	703	1	0.0007	<0.0002		
124. nickel	703	1	0.25	0.61		
125. selenium	703	1	<0.002	<0.003		
126. silver	703	1	<0.0005	<0.0005		
127. thallium	703	1	<0.002	<0.002		
128. zinc	703	1	0.055	0.98		

Table V-20 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT SOLUTION FROM PGC SALT PRODUCTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
aluminum	703	1	0.86	4.0		
barium	703	1	0.056	<0.001		
boron	703	1	<0.009	0.67		
calcium	703	1	4.2	2.6		
cobalt	703	1	0.044	0.11		
iron	703	1	0.94	27		
magnesium	703	1	1.3	0.77		
manganese	703	1	0.013	0.041		
molybdenum	703	1	0.029	0.1		
sodium	703	1	13	520		
tin	703	1	<0.12	<0.12		
titanium	703	1	0.12	0.84		
vanadium	703	1	0.073	0.18		
yttrium	703	1	<0.002	0.06		

Table V-20 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
SPENT SOLUTION FROM PGC SALT PRODUCTION
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants						
pH (standard units)	703	1	7	10		

†Sample Type Code: 1 - One-time grab

Table V-21

SECONDARY PRECIOUS METALS SAMPLING DATA
EQUIPMENT AND FLOOR WASH
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	228	1	<0.01	0.08	0.06	
115. arsenic	228	1	<0.01	<0.05A	<0.05A	
117. beryllium	228	1	<0.01	<0.01	<0.01	
118. cadmium	228	1	<0.05	0.6	0.1	
119. chromium (total)	228	1	<0.05	1.1	0.35	
120. copper	228	1	<0.05	280.0	21.0	
121. cyanide (total)	228	1	<0.05	0.13	0.11	
122. lead	228	1	<0.10	8.0	1.3	
123. mercury	228	1	0.0002	<0.0002	<0.0002	
124. nickel	228	1	<0.20	12.0	1.8	
125. selenium	228	1	<0.1A	<0.1A	<0.1A	
126. silver	228	1	<0.01	0.26	0.09	
127. thallium	228	1	<0.01	<0.05A	<0.01	
128. zinc	228	1	0.10	440.0	9.2	

Table V-21 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
EQUIPMENT AND FLOOR WASH
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	228	1		1,080	<1	
alkalinity	228	1	98	<1	360	
aluminum	228	1	0.20	5.5	4.9	
ammonia nitrogen	228	1	0.04	120	75	
barium	228	1	<0.050	<0.05	<0.05	
boron	228	1	<0.10	0.2	0.2	
calcium	228	1	37.7	43.7	34.2	
chemical oxygen demand (COD)	228	1	<5	37,000	6,200	
chloride	228	1	14	<1	490	
cobalt	228	1	<0.050	0.45	0.05	
fluoride	228	1	0.28	0.47	0.4	
iron	228	1	<0.050	39.8	12.0	
magnesium	228	1	8.50	9.3	7.9	
manganese	228	1	<0.050	0.3	0.15	

Table V-21 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
EQUIPMENT AND FLOOR WASH
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
molybdenum	228	1	<0.050	0.05	0.45	
phosphate	228	1	14	<4	<1	
sodium	228	1	9	44	478	
sulfate	228	1	57	2,900	3,000	
tin	228	1	<0.050	7.55	3.3	
titanium	228	1	<0.050	<0.05	<0.5	
total organic carbon (TOC)	228	1	4.3	15	15	
total solids (TS)	228	1	380	120	2,600	
vanadium	228	1	<0.050	<0.05	<0.05	
yttrium	228	1	<0.50	<0.05	<0.05	
Conventional Pollutants						
oil and grease	228	1	<1	2	6	

Table V-21 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
EQUIPMENT AND FLOOR WASH
RAW WASTEWATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	228	1	60	20	760	
pH (standard units)	228	1	7.5	1.8	10.9	

†Sample Type Code: 1 - One-time grab

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-22

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
2. acrolein	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
3. acrylonitrile	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
4. benzene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
5. benzidine	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
6. carbon tetrachloride	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
7. chlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
8. 1,2,4-trichlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
9. hexachlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
10. 1,2-dichloroethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
11. 1,1,1-trichloroethane	185	1	0.01		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
12. hexachloroethane	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
13. 1,1-dichloroethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
14. 1,1,2-trichloroethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
16. chloroethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
17. bis(chloromethyl)ether	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
18. bis(2-chloroethyl)ether	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
19. 2-chloroethyl vinyl ether	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
20. 2-chloronaphthalene	185	1	ND		ND	
	3	3	ND	<0.01	ND	ND
	822	1	ND	ND		
21. 2,4,6-trichlorophenol	185	1	ND		ND	
	3	3	ND	0.020	0.030	0.020
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
22. p-chloro-m-cresol	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
23. chloroform	185	1	ND		ND	
	3	1	0.050	<0.010	<0.01	<0.01
	822	1	ND	ND		
24. 2-chlorophenol	185	1	ND		ND	
	3	3	ND	<0.01	<0.01	<0.01
	822	1	ND	ND		
25. 1,2-dichlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
26. 1,3-dichlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
27. 1,4-dichlorobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
28. 3,3'-dichlorobenzidine	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
30. 1,2-trans-dichloroethylene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
31. 2,4-dichlorophenol	185	1	ND		ND	
	3	3	ND	0.030	0.030	0.020
	822	1	ND	ND		
32. 1,2-dichloropropane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
33. 1,3-dichloropropene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
34. 2,4-dimethylphenol	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
35. 2,4-dinitrotoluene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
36. 2,6-dinitrotoluene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
37. 1,2-diphenylhydrazine	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
38. ethylbenzene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
39. fluoranthene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
40. 4-chlorophenyl phenyl ether	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
41. 4-bromophenyl phenyl ether	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
42. bis(2-chloroisopropyl)ether	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-chloroethoxy)methane	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
44. methylene chloride	185	1	ND		ND	
	3	1	<0.01	ND	0.010	<0.01
	822	1	ND	0.040		
45. methyl chloride (chloromethane)	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
46. methyl bromide (bromomethane)	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
47. bromoform (tribromomethane)	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
48. dichlorobromomethane	185	1	ND		ND	
	3	1	<0.01	<0.01	<0.01	<0.01
	822	1	ND	ND		
49. trichlorofluoroemthane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
50. dichlorodifluoromethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
51. chlorodibromomethane	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
52. hexachlorobutadiene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
53. hexachlorocyclopentadiene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
54. isophorone	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
55. naphthalene	185	1	ND		ND	
	3	3	ND	<0.01	ND	ND
	822	1	ND	ND		
56. nitrobenzene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
58. 4-nitrophenol	185	1	ND		ND	
	3	3	ND	0.040	ND	ND
	822	1	ND	ND		
59. 2,4-dinitrophenol	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
60. 4,6-dinitro-o-cresol	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
61. N-nitrosodimethylamine	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
62. N-nitrosodiphenylamine	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
63. N-nitrosodi-n-propylamine	185	1	ND		ND	
	3	3	ND	<0.01	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	185	1	ND		ND	
	3	3	ND	<0.01	<0.01	<0.01
	822	1	ND	ND		
65. phenol	185	1	ND		0.041	
	3	3	ND	0.020	0.010	<0.01
	822	1	ND	ND		
66. bis(2-ethylhexyl) phthalate	185	1	0.026		0.007	
	3	3	0.020	0.040	0.030	0.040
	822	1	ND	<0.010		
67. butyl benzyl phthalate	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
68. di-n-butyl phthalate	185	1	ND		0.002	
	3	3	<0.01	<0.01	<0.01	ND
	822	1	ND	<0.010		
69. di-n-octyl phthalate	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
70. diethyl phthalate	185	1	ND		ND	
	3	3	<0.01	<0.01	<0.01	<0.01
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
72. benzo(a)anthracene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
73. benzo(a)pyrene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
74. benzo(b)fluoranthene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
75. benzo(k)fluoranthane	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
76. chrysene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
77. acenaphthylene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
78. anthracene (a)	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
79. benzo(ghi)perylene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
80. fluorene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
81. phenanthrene (a)	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
82. dibenzo(a,h)anthracene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		
84. pyrene	185	1	ND		ND	
	3	3	ND	ND	ND	ND
	822	1	ND	ND		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
86. toluene	185	1	ND		ND	
	3	1	ND	<0.01	<0.01	<0.01
	822	1	ND	0.046		
87. trichloroethylene	185	1	ND		ND	
	3	1	ND	<0.01	<0.01	<0.01
	822	1	ND	ND		
88. vinyl chloride (chloroethylene)	185	1	ND		ND	
	3	1	ND	ND	ND	ND
	822	1	ND	ND		
114. antimony	203	2	<0.01		1.70	0.340
	185	1	<0.003		0.26	
	3	3	<0.003	0.13	0.55	1.2
	822	1		0.21		
115. arsenic	203	2	<0.010		<0.20A	<0.20A
	185	1	<0.003		0.068	
	3	3	<0.005	0.095	0.190	0.140
	822	1		0.19		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
117. beryllium	203	2	<0.010		0.36	0.05
	185	1	<0.01		<0.01	
	3	3	<0.0002	1.4	1.32	1.9
	822	1		0.012		
118. cadmium	203	2	<0.050		28.0	16.0
	185	1	<0.01		3.4	
	3	3	0.0002	6	5.8	8.8
	822	1		0.21		
119. chromium (total)	203	2	<0.050		25.0	2.8
	185	1	<0.01		11.1	
	3	3	0.0003	31.0	15.0	19.0
	822	1		<0.001		
120. copper	203	2	<0.050		1,800	150.0
	185	1	<0.01		55.0	
	3	3	0.017	220	210	320
	822	1		14		
121. cyanide (total)	203	1	0.05		<0.02	<0.02
	185	1	<0.02		<0.02	
	3	1	0.052	<0.001	<0.0001	<0.001
	822	1		0.67		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
122. lead	203	2	<0.10		490.0	90.0
	185	1	<0.10		10	
	3	3	0.020	100	80	110
	822	1		5.0		
123. mercury	203	2	0.0002		<0.0002	<0.0002
	185	1	0.002		<0.0002	
	3	3	0.0002	0.013	<0.0001	<0.0001
	822	1		0.003		
124. nickel	203	2	<0.10A		470.0	22.0
	185	1	0.075		220	
	3	3	0.020	110	80	110
	822	1		0.95		
125. selenium	203	2	<0.10A		B	B
	185	1	<0.003		0.007	
	3	3	<0.002	64	<0.002	<0.002
	822	1		2.2		
126. silver	203	2	<0.010		4.90	14.0
	185	1	<0.0005		0.96	
	3	3	<0.0002	1.4	3.9	0.0013
	822	1		0.34		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
127. thallium	203	2	<0.010		B	B
	185	1	<0.002		<0.002	
	3	3	<0.001	0.310	0.400	0.730
	822	1		0.51		
128. zinc	203	2	0.100		34,000	22,000
	185	1	2.5		4,500	
	3	3	<0.010	3,400	2,800	3,400
	822	1		1.0		
Nonconventional Pollutants						
acidity	203	2			8,000	930
	185	1	<1		85	
alkalinity	203	2	98		<1	<1
	185	1	127		<1	
	3	3	16			
aluminum	203	2	0.20		1,070.0	50.0
	185	1	<0.050		44	
ammonia nitrogen	203	2	0.04		3,300	8.5
	185	1	<0.01		980	
	822	1		340		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
barium	203	2	<0.050		<5.0	<5.0
	185	1	0.070		1.9	
boron	203	2	<0.10		10.0	<10.0
	185	1	<0.009		35	
calcium	203	2	37.7		80.0	50.0
	185	1	11		150	
	3	3	15	16	19	20
chemical oxygen demand (COD)	203	2	<5		20,000	>50,000
	185	1				
chloride	203	2	14		78,000	11,000
	185	1	52		56,000	
cobalt	203	2	<0.050		15.0	<5
	185	1	<0.006		14.5	
fluoride	203	2	0.28		5.0	1.1
	185	1	1.1		3.1	
iron	203	2	<0.050		790.0	160.0
	185	1	0.31		825	
	3	3	0.29	2,100	1,900	2,600
	822	1		5,400		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
magnesium	203	2	8.50		100.0	20.0
	185	1	2.4		28	
	3	3	3.1	33	34	56
manganese	203	2	<0.050		6.60	1.40
	185	1	<0.01		6.2	
molybdenum	203	2	<0.050		10.0	<5.0
	185	1	<0.002		0.89	
phenolics	3	1	0.015	0.78	0.44	0.51
	822	1		0.092		
phosphate	203	2	14			210
	185	1				
sodium	203	2	9.00		2,090.0	940.0
	185	1	54		20,000	
sulfate	203	2	57		82,000	41,000
	185	1	13		195	
tin	203	2	<0.050		54.9	9.9
	185	1	<0.12		<0.12	

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
titanium	203	2	<0.050		125.0	<5.0
	185	1	<0.005		0.16	
total organic carbon (TOC)	203	2	4.3		450	590
	185	1	43		166	
total solids (TS)	203	2	380		17,000	120,000
	185	1	410		77,000	
vanadium	203	2	<0.050		<5.0	<5.0
	185	1	<0.003		0.090	
yttrium	203	2	<0.50		<5.0	<5.0
	185	1	<0.002		0.012	
Conventional Pollutants						
oil and grease	203	1	<1		4	3
	185	1	<1		<1	
	3	1	1.6	33	35	14
	822	1		30		

Table V-22 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CEMENTATION TANK EFFLUENT

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants (Continued)						
total suspended solids (TSS)	203	2	60		570	70
	185	1	8		895	
	3	3		48	100	61
pH (standard units)	203	2	7.5		0.40	1.00
	185	1	7.36		3.75	
	3	3	6.8	0.3	0.5	1.2

†Sample Type Code: 1 - One-time grab
2 - Manual composite during intermittent process operation
3 - 8-hour manual composite

(a) Reported together.

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-23

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	209	5	<0.01	<0.40A	0.40	0.120
	212	5	<0.01	<0.20A	<0.50A	<0.50A
	215	5	<0.01	<0.50A	0.18	<0.01
	218	5	<0.01	<0.20A	<0.01	<0.20A
	221	5	<0.01	<0.50A	<0.20A	<0.20A
	224	6	<0.01	<0.01	<0.20A	0.390
115. arsenic	209	5	<0.01	0.04	0.06	0.03
	212	5	<0.01	<0.05A	<0.05A	<0.05A
	215	5	<0.01	<0.05A	<0.10A	<0.05A
	218	5	<0.01	<0.10A	<0.10A	<0.10A
	221	5	<0.01	<0.20A	<0.20A	<0.20A
	224	6	<0.01	<0.40A	<0.05A	<0.05A
117. beryllium	209	5	<0.01	0.01	0.10	0.05
	212	5	<0.01	0.01	0.05	0.07
	215	5	<0.01	0.01	0.05	0.07
	218	5	<0.01	0.01	0.05	0.08
	221	5	<0.01	0.02	0.06	0.07
	224	6	<0.01	0.01	0.02	0.08
118. cadmium	209	5	<0.05	1.70	7.80	5.90
	212	5	<0.05	2.20	3.90	5.70
	215	5	<0.05	2.40	3.90	5.30
	218	5	<0.05	2.30	4.0	5.60
	221	5	<0.05	2.30	4.1	5.7
	224	6	<0.05	3.6	2.3	5.7

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
119. chromium (total)	209	5	<0.05	2.0	6.30	3.50
	212	5	<0.05	1.50	3.20	3.20
	215	5	<0.05	1.40	2.80	3.0
	218	5	<0.05	1.40	2.80	2.80
	221	5	<0.05	1.6	2.8	2.9
	224	6	<0.05	1.8	1.4	3.5
120. copper	209	5	<0.05	200.0	520.0	230.0
	212	5	<0.05	370.0	300.0	320.0
	215	5	<0.05	390.0	320.0	310.0
	218	5	<0.05	400.0	330.0	330.0
	221	5	<0.05	430	330	340
	224	6	<0.05	210	100	190
121. cyanide (total)	209	5	0.05	<0.02	<0.02	<0.02
	212	5	0.05	<0.02	<0.02	<0.02
	215	5	0.05	<0.02	<0.02	<0.02
	218	5	0.05	<0.02	<0.02	<0.02
	221	5	0.05	<0.02	<0.02	<0.02
	224	6	0.05	<0.02	<0.02	<0.02
122. lead	209	5	<0.10	24.0	110.0	72.0
	212	5	<0.10	25.0	39.0	44.0
	215	5	<0.10	26.0	33.0	36.0
	218	5	<0.10	24.0	33.0	34.0
	221	5	<0.10	25.0	32.0	35.0
	224	6	<0.10	23.0	19.0	33.0

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
123. mercury	209	5	0.0002	0.001	0.002	0.008
	212	5	0.0002	0.005	0.005	0.009
	215	5	0.0002	0.003	0.009	0.004
	218	5	0.0002	0.009	0.04	0.008
	221	5	0.0002	0.008	0.018	0.021
	224	6	0.0002	0.007	0.051	0.009
124. nickel	209	5	<0.20	24.0	130.0	57.0
	212	5	<0.20	34.0	58.0	68.0
	215	5	<0.20	34.0	62.0	66.0
	218	5	<0.20	34.0	64.0	68.0
	221	5	<0.20	36.0	64.0	68.0
	224	6	<0.20	48.0	36.0	90.0
125. selenium	209	5	<0.10A	<0.10A	<0.10A	<0.10A
	212	5	<0.10A	<0.10A	B	B
	215	5	<0.10A	<0.10A	B	B
	218	5	<0.10A	<0.10A	<0.10A	<0.10A
	221	5	<0.10A	<0.10A	B	B
	224	6	<0.10A	<0.10A	<0.10A	B
126. silver	209	5	<0.01	1.30	4.30	2.70
	212	5	<0.01	1.80	2.20	2.90
	215	5	<0.01	1.30	1.90	2.0
	218	5	<0.01	1.50	2.40	1.40
	221	5	<0.01	1.40	2.10	1.30
	224	6	<0.01	0.94	0.74	1.0

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
127. thallium	209	5	<0.01	B	<0.20A	B
	212	5	<0.01	<0.50A	<0.20A	<0.20A
	215	5	<0.01	<0.20A	B	<0.50A
	218	5	<0.01	<0.02A	<0.50A	B
	221	5	<0.01	<0.50A	<0.02A	<0.5A
	224	6	<0.01	<0.5A	B	B
128. zinc	209	5	0.10	1,800	8,400	6,200
	212	5	0.10	2,600	4,100	6,200
	215	5	0.10	2,600	4,400	6,000
	218	5	0.10	2,600	4,500	6,100
	221	5	0.10	2,800	4,500	6,300
	224	6	0.10	4,100	2,600	6,100
Nonconventional Pollutants						
acidity	209	5	<1	5,800	8,400	980
	212	5	<1	<1	170	180
	215	5	<1	<1	29	18
	218	5	<1	<1	28	29
	221	5	<1	<1	17	29
	224	6	<1	12	53	48
alkalinity	209	5	98	<1	<1	<1
	212	5	98	23	<1	<1
	215	5	98	23	<1	<1
	218	5	98	26	<1	<1
	221	5	98	41	<1	<1
	224	6	98	<1	<1	<1

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
aluminum	209	5	0.20	15.0	230.0	112.0
	212	5	0.20	15.0	96.0	121.0
	215	5	0.20	15.0	103.0	121.0
	218	5	0.20	17.0	107.0	126.0
	221	5	0.20	16.0	105.0	128.0
	224	6	0.20	28.0	34.0	138.0
ammonia nitrogen	209	5	0.04	470	110	1,100
	212	5	0.04	670	670	1,100
	215	5	0.04	580	700	1,100
	218	5	0.04	590	760	910
	221	5	0.04	1,080	760	1,150
	224	6	0.04	1,700	640	770
barium	209	5	<0.05	1.0	<0.5	<0.5
	212	5	<0.05	<0.5	<0.5	<0.5
	215	5	<0.05	<0.5	<0.5	<0.5
	218	5	<0.05	<0.5	<0.5	<0.5
	221	5	<0.05	<0.5	<0.5	<0.5
	224	6	<0.05	<0.5	<0.5	<0.5
boron	209	5	<0.10	<1.0	3.0	2.0
	212	5	<0.10	<1.0	1.0	2.0
	215	5	<0.10	<1.0	2.0	2.0
	218	5	<0.10	<1.0	2.0	2.0
	221	5	<0.10	<1.0	2.0	2.0
	224	6	<0.10	<1.0	<1.0	2.0

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
calcium	209	5	37.7	36.0	44.0	37.0
	212	5	37.7	36.0	38.0	38.0
	215	5	37.7	36.0	39.0	37.0
	218	5	37.7	37.0	39.0	37.0
	221	5	37.7	35.0	38.0	38.0
	224	6	37.7	36.0	37.0	40.0
chemical oxygen demand (COD)	209	5	<5	4,000	>50,000	3,100
	212	5	<5	6,100	2,400	2,400
	215	5	<5	3,900	3,700	3,400
	218	5	<5	5,000	4,900	3,600
	221	5	<5	3,200	5,500	5,200
	224	6	<5	3,600	6,200	5,100
chloride	209	5	14	12,000	13,000	17,000
	212	5	14	28,000	21,000	18,000
	215	5	14	15,000	14,000	18,000
	218	5	14	32,000	14,000	14,000
	221	5	14	15,000	15,000	18,000
	224	6	14	18,000	14,000	19,000
cobalt	209	5	<0.05	1.50	3.50	2.0
	212	5	<0.05	1.50	2.0	2.0
	215	5	<0.05	1.50	2.0	2.0
	218	5	<0.05	1.50	2.0	2.0
	221	5	<0.05	1.50	2.0	2.0
	224	6	<0.05	2.0	1.5	2.5

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
fluoride	209	5	0.28	2.4	0.13	0.73
	212	5	0.28	2.3	0.85	0.88
	215	5	0.28	0.48	0.88	0.87
	218	5	0.28	0.61	0.86	0.89
	221	5	0.28	0.32	0.87	0.92
	224	6	0.28	0.68	0.63	1.01
iron	209	5	<0.05	20.0	200.0	110.0
	212	5	<0.05	29.0	79.0	120.0
	215	5	<0.05	28.0	84.0	110.0
	218	5	<0.05	29.0	86.0	110.0
	221	5	<0.05	30.0	83.0	120.0
	224	6	<0.05	250.0	190.0	340.0
magnesium	209	5	8.5	9.0	28.0	19.0
	212	5	8.5	9.0	16.0	19.0
	215	5	8.5	9.0	17.0	19.0
	218	5	8.5	9.0	17.0	19.0
	221	5	8.5	8.0	17.0	19.0
	224	6	8.5	8.0	11.0	21.0
manganese	209	5	<0.05	0.15	0.85	0.90
	212	5	<0.05	0.30	0.75	1.20
	215	5	<0.05	0.30	0.85	1.10
	218	5	<0.05	0.25	0.85	1.20
	221	5	<0.05	0.25	0.85	1.10
	224	6	<0.05	1.30	1.20	2.60

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
molybdenum	209	5	<0.05	2.0	3.0	1.50
	212	5	<0.05	<0.50	1.0	<0.050
	215	5	<0.05	<0.50	<0.50	<0.50
	218	5	<0.05	<0.50	<0.50	<0.50
	221	5	<0.05	<0.50	<0.50	<0.50
	224	6	<0.05	<0.50	<0.50	<0.50
phosphate	209	5	14	13,000	600	310
	212	5	14	37,000	340	360
	215	5	14	3,000	360	360
	218	5	14	1,300	380	410
	221	5	14	680	380	600
	224	6	14	500	130	600
sodium	209	5	9.0	1,250	2,650	799.0
	212	5	9.0	9,540	8,150	6,910
	215	5	9.0	9,480	8,300	6,860
	218	5	9.0	10,500	8,920	7,290
	221	5	9.0	10,200	8,640	7,410
	224	6	9.0	11,600	8,780	9,390
sulfate	209	5	57	6,000	15,000	11,000
	212	5	57	9,000	11,000	15,000
	215	5	57	9,000	15,000	11,000
	218	5	57	10,000	10,000	13,000
	221	5	57	12,000	12,000	15,000
	224	6	57	9,000	11,000	18,000

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
tin	209	5	<0.05	56.9	22.4	7.90
	212	5	<0.05	5.70	31.4	9.10
	215	5	<0.05	<0.5	6.4	<0.5
	218	5	<0.05	<0.5	<0.5	<0.5
	221	5	<0.05	<0.5	<5.0	<0.5
	224	6	<0.05	<5.0	<5.0	<5.0
titanium	209	5	<0.05	<0.50	24.5	11.50
	212	5	<0.05	<0.50	<0.50	1.50
	215	5	<0.05	<0.50	<0.50	<0.50
	218	5	<0.05	<0.50	<0.50	<0.50
	221	5	<0.05	<0.50	<0.50	<0.50
	224	6	<0.05	<0.50	<0.50	<0.50
total organic carbon (TOC)	209	5	4.3	100	300	330
	212	5	4.3	150	240	280
	215	5	4.3	140	240	300
	218	5	4.3	130	240	300
	221	5	4.3	150	200	270
	224	6	4.3	150	230	240

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
total solids (TS)	209	5	380		40,000	30,000
	212	5	380		34,000	41,000
	215	5	380	37,000	39,000	42,000
	218	5	380	38,000	41,000	43,000
	221	5	380	42,000	41,000	44,000
	224	6	380	53,000	35,000	46,000
vanadium	209	5	<0.05	<0.50	<0.50	<0.50
	212	5	<0.05	<0.50	<0.50	<0.50
	215	5	<0.05	<0.50	<0.50	<0.50
	218	5	<0.05	<0.50	<0.50	<0.50
	221	5	<0.05	<0.50	<0.50	<0.50
	224	6	<0.05	<0.50	<0.50	<0.50
yttrium	209	5	<0.5	<0.50	<0.50	<0.50
	212	5	<0.5	<0.50	<0.50	<0.50
	215	5	<0.5	<0.50	<0.50	<0.50
	218	5	<0.5	<0.50	<0.50	<0.50
	221	5	<0.5	<0.50	<0.50	<0.50
	224	6	<0.5	<0.50	<0.50	<0.50

Table V-23 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT A

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	209	1	<1	3	6	5
	212	1	<1	2	6	<1
	215	1	<1	1.5	5	<1
	218	1	<1	2	2	<1
	221	1	<1	<1	<1	3
	224	1	<1	2	4	6
total suspended solids (TSS)	209	5	60	160	140	140
	212	5	60	140	290	140
	215	5	60	88	160	180
	218	5	60	160	5,700	120
	221	5	60	360	130	110
	224	6	60	580	120	190
pH (standard units)	209	5	7.5	1.0	1.1	1.2
	212	5	7.5	4.7	4.1	3.9
	215	5	7.5	4.8	4.2	4.3
	218	5	7.5	4.81	4.21	4.1
	221	5	7.5	4.91	4.4	4.1
	224	6	7.5	4.37	4.1	3.92

†Sample Type Code: 1 - One-time grab
5 - 24-hour manual composite
6 - 24-hour automatic composite

A - Detection limit raised due to interference.

B - Chemical interference.

Table V-24

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	184	1	ND	ND		
2. acrolein	184	1	ND	ND		
3. acrylonitrile	184	1	ND	ND		
4. benzene	184	1	ND	ND		
5. benzidine	184	1	ND	ND		
6. carbon tetrachloride	184	1	ND	ND		
7. chlorobenzene	184	1	ND	ND		
8. 1,2,4-trichlorobenzene	184	1	ND	ND		
9. hexachlorobenzene	184	1	ND	ND		
10. 1,2-dichloroethane	184	1	ND	ND		
11. 1,1,1-trichloroethane	184	1	0.01	0.01		
12. hexachloroethane	184	1	ND	ND		
13. 1,1-dichloroethane	184	1	ND	ND		
14. 1,1,2-trichloroethane	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
15. 1,1,2,2-tetrachloroethane	184	1	ND	ND		
16. chloroethane	184	1	ND	ND		
17. bis(chloromethyl)ether	184	1	ND	ND		
18. bis(2-chloroethyl)ether	184	1	ND	ND		
19. 2-chloroethyl vinyl ether	184	1	ND	ND		
20. 2-chloronaphthalene	184	1	ND	ND		
21. 2,4,6-trichlorophenol	184	1	ND	ND		
22. p-chloro-m-cresol	184	1	ND	ND		
23. chloroform	184	1	ND	ND		
24. 2-chlorophenol	184	1	ND	ND		
25. 1,2-dichlorobenzene	184	1	ND	ND		
26. 1,3-dichlorobenzene	184	1	ND	ND		
27. 1,4-dichlorobenzene	184	1	ND	ND		
28. 3,3'-dichlorobenzidine	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
29. 1,1-dichloroethylene	184	1	ND	ND		
30. 1,2-trans-dichloroethylene	184	1	ND	ND		
31. 2,4-dichlorophenol	184	1	ND	ND		
32. 1,2-dichloropropane	184	1	ND	ND		
33. 1,3-dichloropropene	184	1	ND	ND		
34. 2,4-dimethylphenol	184	1	ND	ND		
35. 2,4-dinitrotoluene	184	1	ND	ND		
36. 2,6-dinitrotoluene	184	1	ND	ND		
37. 1,2-diphenylhydrazine	184	1	ND	ND		
38. ethylbenzene	184	1	ND	ND		
39. fluoranthene	184	1	ND	ND		
40. 4-chlorophenyl phenyl ether	184	1	ND	ND		
41. 4-bromophenyl phenyl ether	184	1	ND	ND		
42. bis(2-chloroisopropyl)ether	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
43. bis(2-choroethoxy)methane	184	1	ND	ND		
44. methylene chloride	184	1	ND	ND		
45. methyl chloride (chloromethane)	184	1	ND	ND		
46. methyl bromide (bromomethane)	184	1	ND	ND		
47. bromoform (tribromomethane)	184	1	ND	ND		
48. dichlorobromomethane	184	1	ND	ND		
49. trichlorofluoromethane	184	1	ND	ND		
50. dichlorodifluoromethane	184	1	ND	ND		
51. chlorodibromomethane	184	1	ND	ND		
52. hexachlorobutadiene	184	1	ND	ND		
53. hexachlorocyclopentadiene	184	1	ND	ND		
54. isophorone	184	1	ND	ND		
55. naphthalene	184	1	ND	ND		
56. nitrobenzene	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
57. 2-nitrophenol	184	1	ND	ND		
58. 4-nitrophenol	184	1	ND	ND		
59. 2,4-dinitrophenol	184	1	ND	ND		
60. 4,6-dinitro-o-cresol	184	1	ND	ND		
61. N-nitrosodimethylamine	184	1	ND	ND		
62. N-nitrosodiphenylamine	184	1	ND	ND		
63. N-nitrosodi-n-propylamine	184	1	ND	ND		
64. pentachlorophenol	184	1	ND	ND		
65. phenol	184	1	ND	0.028		
66. bis(2-ethylhexyl) phthalate	184	1	0.026	0.030		
67. butyl benzyl phthalate	184	1	ND	ND		
68. di-n-butyl phthalate	184	1	ND	0.002		
69. di-n-octyl phthalate	184	1	ND	0.001		
70. diethyl phthalate	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
71. dimethyl phthalate	184	1	ND	0.02		
72. benzo(a)anthracene	184	1	ND	ND		
73. benzo(a)pyrene	184	1	ND	ND		
74. benzo(b)fluoranthene	184	1	ND	ND		
75. benzo(k)fluoranthane	184	1	ND	ND		
76. chrysene	184	1	ND	ND		
77. acenaphthylene	184	1	ND	ND		
78. anthracene (a)	184	1	ND	ND		
79. benzo(ghi)perylene	184	1	ND	ND		
80. fluorene	184	1	ND	ND		
81. phenanthrene (a)	184	1	ND	ND		
82. dibenzo(a,h)anthracene	184	1	ND	ND		
83. indeno (1,2,3-c,d)pyrene	184	1	ND	ND		
84. pyrene	184	1	ND	ND		

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
85. tetrachloroethylene	184	1	ND	ND		
86. toluene	184	1	ND	ND		
87. trichloroethylene	184	1	ND	ND		
88. vinyl chloride (chloroethylene)	184	1	ND	ND		
114. antimony	184	1	<0.003	2.6		
	011	1	<0.003	0.20	0.21	1.8
	012	1	<0.003	0.35	0.097	0.29
115. arsenic	184	1	<0.003	0.84		
	011	1	<0.003	0.12	0.073	0.43
	012	1	<0.003	0.061	0.023	0.043
117. beryllium	184	1	<0.01	<0.01		
	011	1	<0.01	<0.01	<0.01	<0.01
	012	1	<0.01	<0.01	<0.01	<0.01
118. cadmium	184	1	<0.01	<0.01		
	011	1	<0.01	1.0	0.53	0.81
	012	1	<0.01	<0.01	<0.01	<0.01
119. chromium (total)	184	1	<0.01	0.42		
	011	1	<0.01	0.22	0.04	0.21
	012	1	<0.01	0.11	<0.01	<0.01

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
120. copper	184	1	<0.01	0.40		
	011	1	<0.01	2.0	1.8	23
	012	1	<0.01	1.1	0.12	<0.01
121. cyanide (total)	184	1	<0.02	<0.02		
	011	1	<0.02	<0.02	<0.02	<0.02
	012	1	<0.02	<0.02	<0.02	<0.02
122. lead	184	1	<0.01	3.2		
	011	1	<0.01	0.59	1.5	2.0
	012	1	<0.01	0.28	<0.10	<0.10
123. mercury	184	1	0.002	0.38		
	011	1	0.002	0.14	0.005	0.175
	012	1	0.002	0.002	<0.0002	<0.0002
124. nickel	184	1	0.075	101		
	011	1	0.075	90	30	60
	012	1	0.075	0.60	0.61	1.7
125. selenium	184	1	<0.003	0.18		
	011	1	<0.003	0.010	0.013	0.082
	012	1	<0.003	0.014	0.010	0.012
126. silver	184	1	<0.0005	0.041		
	011	1	<0.0005	0.081	0.069	0.056
	012	1	<0.0005	0.035	0.049	0.077

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
127. thallium	184	1	<0.002	<0.002		
	011	1	<0.002	<0.002	<0.002	<0.002
	012	1	<0.002	<0.002	<0.002	<0.002
128. zinc	184	1	2.5	1,900		
	011	1	2.5	2,800	0.30	1,300
	012	1	2.5	56	6.9	41
Nonconventional Pollutants						
acidity	184	1	<1	<1		
	011	1	<1	<1	<1	<1
	012	1	<1	<1	<1	<1
alkalinity	184	1	127	>8,000		
	011	1	127	>8,000	1,090	8,400
	012	1	127	1,200	1,000	1,460
aluminum	184	1	<0.05	7.7		
	011	1	<0.05	49	24	11
	012	1	<0.05	2.8	1.8	<0.05
ammonia nitrogen	184	1	<0.01	2,300		
	011	1	<0.01	2,300	220	<0.01
	012	1	<0.01	670	1,070	<0.01

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Noncoventional Pollutants (Continued)						
barium	184	1	0.07	0.66		
	011	1	0.07	1.2	1.1	0.71
	012	1	0.07	0.24	0.85	0.05
boron	184	1	<0.009	3.8		
	011	1	<0.009	2.9	2.7	3.4
	012	1	<0.009	3.4	2.2	3.3
calcium	184	1	11	430		
	011	1	11	9,600	6,000	1,100
	012	1	11	730	5,200	19
chemical oxygen demand (COD)	011	1				990
	012	1				640
chloride	184	1	52	40,000		
	011	1	52	45,000	33,000	1,000
	012	1	52	21,000	200	1,200
cobalt	184	1	<0.006	4.6		
	011	1	<0.006	5.7	2.7	2.9
	012	1	<0.006	0.70	0.17	0.18
fluoride	184	1	1.1	11.0		
	011	1	1.1	0.81	1.9	1.5
	012	1	1.1	7.9	2.0	7.9

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Noncoventional Pollutants (Continued)						
iron	184	1	0.31	310		
	011	1	0.31	460	200	200
	012	1	0.31	1.1	0.15	0.21
magnesium	184	1	2.4	15.0		
	011	1	2.4	21.0	12.0	11.0
	012	1	2.4	1.0	1.3	2.2
manganese	184	1	<0.01	3.0		
	011	1	<0.01	5.0	2.4	2.2
	012	1	<0.01	<0.01	<0.01	<0.01
molybdenum	184	1	<0.002	0.23		
	011	1	<0.002	0.15	0.075	0.13
	012	1	<0.002	0.039	0.019	0.066
phosphate	011	1				<4
	012	1				<4
sodium	184	1	54	26,000		
	011	1	54	16,000	13,000	22,000
	012	1	54	14,000	11,000	23,000
sulfate	184	1	13	3,400		
	011	1	13	<0.6	930	2,500
	012	1	13	2,100	830	1,500

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
tin	184	1	<0.12	<0.12		
	011	1	<0.12	<0.12	1.3	<0.12
	012	1	<0.12	<0.12	6.9	<0.12
titanium	184	1	<0.005	0.26		
	011	1	<0.005	2.1	1.0	0.19
	012	1	<0.005	0.056	0.11	<0.005
total organic carbon (TOC)	184	1	43	38		
	011	1	43	97	110	260
	012	1	43	94	140	130
total solids (TS)	184	1	410	87,000		
	011	1	410	93,000	61,000	72,000
	012	1	410	42,000	52,000	43,000
vanadium	184	1	<0.003	0.072		
	011	1	<0.003	0.17	0.078	<0.003
	012	1	<0.003	0.063	0.09	<0.003
yttrium	184	1	<0.002	0.015		
	011	1	<0.002	0.014	0.064	0.006
	012	1	<0.002	0.014	0.046	<0.002

Table V-24 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT B

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	184	1	<1	<1		
	011	1	<1	6	<1	<1
	012	1	<1	<1	<1	<1
total suspended solids (TSS)	184	1	8	5,700		
	011	1	8	2,300	3,900	4,500
	012	1	8	2,500	5,700	53
pH (standard units)	184	1	7.36	8.61		
	011	1	7.36	10.09	10.00	8.76
	012	1	7.36	9.94	10.07	8.65

†Sample Type Code: 1 - One-time grab

(a) Reported together.

Table V-25

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
1. acenaphthene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
2. acrolein	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
3. acrylonitrile	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
4. benzene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
5. benzidine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
6. carbon tetrachloride	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
7. chlorobenzene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
8. 1,2,4-trichlorobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
9. hexachlorobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
10. 1,2-dichloroethane	7	1	ND	ND	<0.01	ND
	2	1	ND	ND	ND	ND
11. 1,1,1-trichloroethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
12. hexachloroethane	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
13. 1,1-dichloroethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
14. 1,1,2-trichloroethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
15. 1,1,2,2-tetrachloroethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
16. chloroethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
17. bis(chloromethyl)ether	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
18. bis(2-chloroethyl)ether	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
19. 2-chloroethyl vinyl ether	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
20. 2-chloronaphthalene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
21. 2,4,6-trichlorophenol	7	3	ND	ND	<0.01	ND
	2	6	ND	ND	ND	ND
22. p-chloro-m-cresol	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
23. chloroform	7	1	0.05	0.06	0.02	0.02
	2	1	0.05	0.13	0.02	0.02
24. 2-chlorophenol	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
25. 1,2-dichlorobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
26. 1,3-dichlorobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
27. 1,4-dichlorobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
28. 3,3'-dichlorobenzidine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
29. 1,1-dichloroethylene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
30. 1,2-*trans*-dichloroethylene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
31. 2,4-dichlorophenol	7	3	ND	ND	<0.01	ND
	2	6	ND	ND	ND	ND
32. 1,2-dichloropropane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
33. 1,3-dichloropropene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
34. 2,4-dimethylphenol	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
35. 2,4-dinitrotoluene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
36. 2,6-dinitrotoluene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
37. 1,2-diphenylhydrazine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
38. ethylbenzene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
39. fluoranthene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
40. 4-chlorophenyl phenyl ether	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
41. 4-bromophenyl phenyl ether	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
42. bis(2-chloroisopropyl)ether	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
43. bis(2-choroethoxy)methane	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
44. methylene chloride	7	1	<0.01	<0.01	<0.01	<0.01
	2	1	<0.01	<0.01	<0.01	<0.01
45. methyl chloride (chloromethane)	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
46. methyl bromide (bromomethane)	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
47. bromoform (tribromomethane)	7	1	ND	ND	ND	ND
	2	1	ND	<0.01	ND	ND
48. dichlorobromomethane	7	1	<0.01	<0.01	<0.01	<0.01
	2	1	<0.01	<0.01	<0.01	<0.01
49. trichlorofluoromethane	7	1	ND	<0.01	ND	ND
	2	1	ND	ND	ND	ND
50. dichlorodifluoromethane	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
51. chlorodibromomethane	7	1	<0.01	<0.01	ND	ND
	2	1	<0.01	0.02	ND	ND
52. hexachlorobutadiene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
53. hexachlorocyclopentadiene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
54. isophorone	7	3	ND	ND	ND	ND
	2	6	ND	ND	<0.01	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
55. naphthalene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
56. nitrobenzene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
57. 2-nitrophenol	7	3	ND	<0.01	<0.01	ND
	2	6	ND	<0.01	<0.01	ND
58. 4-nitrophenol	7	3	ND	<0.01	0.019	ND
	2	6	ND	ND	<0.01	ND
59. 2,4-dinitrophenol	7	3	ND	ND	ND	ND
	2	6	ND	ND	0.110	ND
60. 4,6-dinitro-o-cresol	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
61. N-nitrosodimethylamine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
62. N-nitrosodiphenylamine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
63. N-nitrosodi-n-propylamine	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
64. pentachlorophenol	7	3	ND	ND	<0.01	ND
	2	6	ND	ND	ND	ND
65. phenol	7	3	ND	<0.01	0.018	<0.01
	2	6	ND	0.03	0.01	0.01
66. bis(2-ethylhexyl) phthalate	7	3	0.02	0.01	<0.01	0.01
	2	6	0.02	<0.01	<0.01	<0.01
67. butyl benzyl phthalate	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
68. di-n-butyl phthalate	7	3	<0.01	<0.01	<0.01	<0.01
	2	6	<0.01	<0.01	<0.01	<0.01
69. di-n-octyl phthalate	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
70. diethyl phthalate	7	3	<0.01	<0.01	<0.01	<0.01
	2	6	<0.01	<0.01	<0.01	<0.01
71. dimethyl phthalate	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
72. benzo(a)anthracene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
73. benzo(a)pyrene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
74. benzo(b)fluoranthene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
75. benzo(k)fluoranthane	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
76. chrysene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
77. acenaphthylene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
78. anthracene (a)	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
79. benzo(ghi)perylene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
80. fluorene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
81. phenanthrene (a)	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
82. dibenzo(a,h)anthracene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
83. indeno (1,2,3-c,d)pyrene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
84. pyrene	7	3	ND	ND	ND	ND
	2	6	ND	ND	ND	ND
85. tetrachloroethylene	7	1	ND	ND	ND	ND
	2	1	ND	ND	ND	ND
86. toluene	7	1	ND	ND	ND	ND
	2	1	ND	<0.01	<0.01	<0.01
87. trichloroethylene	7	1	ND	<0.01	ND	<0.01
	2	1	ND	ND	ND	ND
88. vinyl chloride (chloroethylene)	7	1	ND	ND	ND	<0.01
	2	1	ND	ND	ND	ND
114. antimony	7	3	<0.003	0.15	0.03	0.022
	2	6	<0.003	0.016	0.021	0.014
115. arsenic	7	3	<0.005	0.013	0.004	0.005
	2	6	<0.005	0.016	0.013	0.005

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
117. beryllium	7	3	<0.0002	0.006	0.013	0.003
	2	6	<0.0002	0.003	0.007	0.003
118. cadmium	7	3	0.0002	0.11	0.10	0.04
	2	6	0.0002	0.04	0.09	0.06
119. chromium (total)	7	3	0.003	0.76	0.45	0.16
	2	6	0.003	0.35	0.71	0.17
120. copper	7	3	0.017	2.10	0.57	0.73
	2	6	0.017	1.80	2.90	2.10
121. cyanide (total)	7	1	0.053	9.0	70.0	190.0
	2	1	0.053	8.0	16.0	140.0
122. lead	7	3	0.03	0.63	0.51	0.75
	2	6	0.03	0.19	0.41	0.31
123. mercury	7	3	0.0002	0.0002	<0.0001	<0.0001
	2	6	0.0002	0.0003	<0.0001	<0.0001
124. nickel	7	3	0.02	3.70	7.20	0.720
	2	6	0.02	0.39	4.20	2.80
125. selenium	7	3	<0.002	740.0	<0.002	<0.002
	2	6	<0.002	<0.002	<0.002	<0.002

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants (Continued)						
126. silver	7	3	<0.0002	0.05	0.06	0.03
	2	6	<0.0002	0.049	0.05	0.10
127. thallium	7	3	<0.001	<0.004	<0.004	0.012
	2	6	<0.001	<0.003	<0.004	0.30
128. zinc	7	3	<0.01	180.0	170.0	140.0
	2	6	<0.01	91.0	160.0	150.0
Nonconventional Pollutants						
alkalinity	7	3	16	1,900	0	870
	2	6	16	23	300	18
calcium	7	3	13	8.2	9.6	7.3
	2	6	13	10.0	9.0	9.5
iron	7	3	0.29	2.3	48	4.5
	2	6	0.29	3.4	14	3.6
magnesium	7	3	3.1	3.3	3.4	2.6
	2	6	3.1	3.5	3.7	2.9
phenolics	7	1	0.15	0.110	0.017	0.008
	2	1	0.15	0.088	0.063	0.054

Table V-25 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
TREATMENT PLANT SAMPLES - PLANT C

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	7	1	1.6	2.4	<1.7	<1.0
	2	1	1.6	<1	<1	<1
total suspended solids (TSS)	7	3	0	140	6	24
	2	6	0	0	59	3
pH (standard units)	7	3	6.8	1.9	2.0	8.9
	2	6	6.8	10.0	10.5	6.7

†Sample Type Code: 1 - One-time grab
3 - 8-hour manual composite
6 - 24-hour automatic composite

(a) Reported together.

Table V-26

SECONDARY PRECIOUS METALS SAMPLING DATA
CASTING CONTACT COOLING WATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l) Source	Day 1	Day 2	Day 3
Toxic Pollutants						
114. antimony	204	1	<0.01	<0.01		
115. arsenic	204	1	<0.01	<0.01		
117. beryllium	204	1	<0.01	<0.01		
118. cadmium	204	1	<0.05	<0.05		
119. chromium (total)	204	1	<0.05	<0.05		
120. copper	204	1	<0.05	0.05		
121. cyanide (total)	204	1	0.05	0.36		
122. lead	204	1	<0.10	<0.10		
123. mercury	204	1	0.0002	0.0004		
124. nickel	204	1	<0.2	0.20		
125. selenium	204	1	<0.1A	<0.1A		
126. silver	204	1	<0.01	<0.01		
127. thallium	204	1	<0.01	<0.01		
128. zinc	204	1	0.10	0.15		

Table V-26 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CASTING CONTACT COOLING WATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants						
acidity	204	1	<1	<1		
alkalinity	204	1	98	120		
aluminum	204	1	0.2	0.2		
ammonia nitrogen	204	1	0.04	0.06		
barium	204	1	<0.05	<0.05		
boron	204	1	<0.1	1.8		
calcium	204	1	37.7	37.3		
chemical oxygen demand (COD)	204	1	<5	33		
chloride	204	1	14	250		
cobalt	204	1	<0.05	<0.05		
fluoride	204	1	0.28	0.31		
iron	204	1	<0.05	1.5		
magnesium	204	1	8.5	8.3		

Table V-26 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CASTING CONTACT COOLING WATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Nonconventional Pollutants (Continued)						
manganese	204	1			<0.05	
molybdenum	204	1			<0.05	
phosphate	204	1			36	
sodium	204	1			22	
sulfate	204	1			79	
tin	204	1			<0.05	
titanium	204	1			<0.05	
total organic carbon (TOC)	204	1			24	
total solids (TS)	204	1			410	
vanadium	204	1			<0.05	
yttrium	204	1			<0.05	

Table V-26 (Continued)

SECONDARY PRECIOUS METALS SAMPLING DATA
CASTING CONTACT COOLING WATER

Pollutant	Stream Code	Sample Type†	Concentrations (mg/l)			
			Source	Day 1	Day 2	Day 3
Conventional Pollutants						
oil and grease	204	1	17		20	
total suspended solids (TSS)	204	1	60		44	
pH (standard units)	204	1	7.5		7.3	

†Sample Type Code: 1 - One-time grab

A - Detection limit raised due to interference.

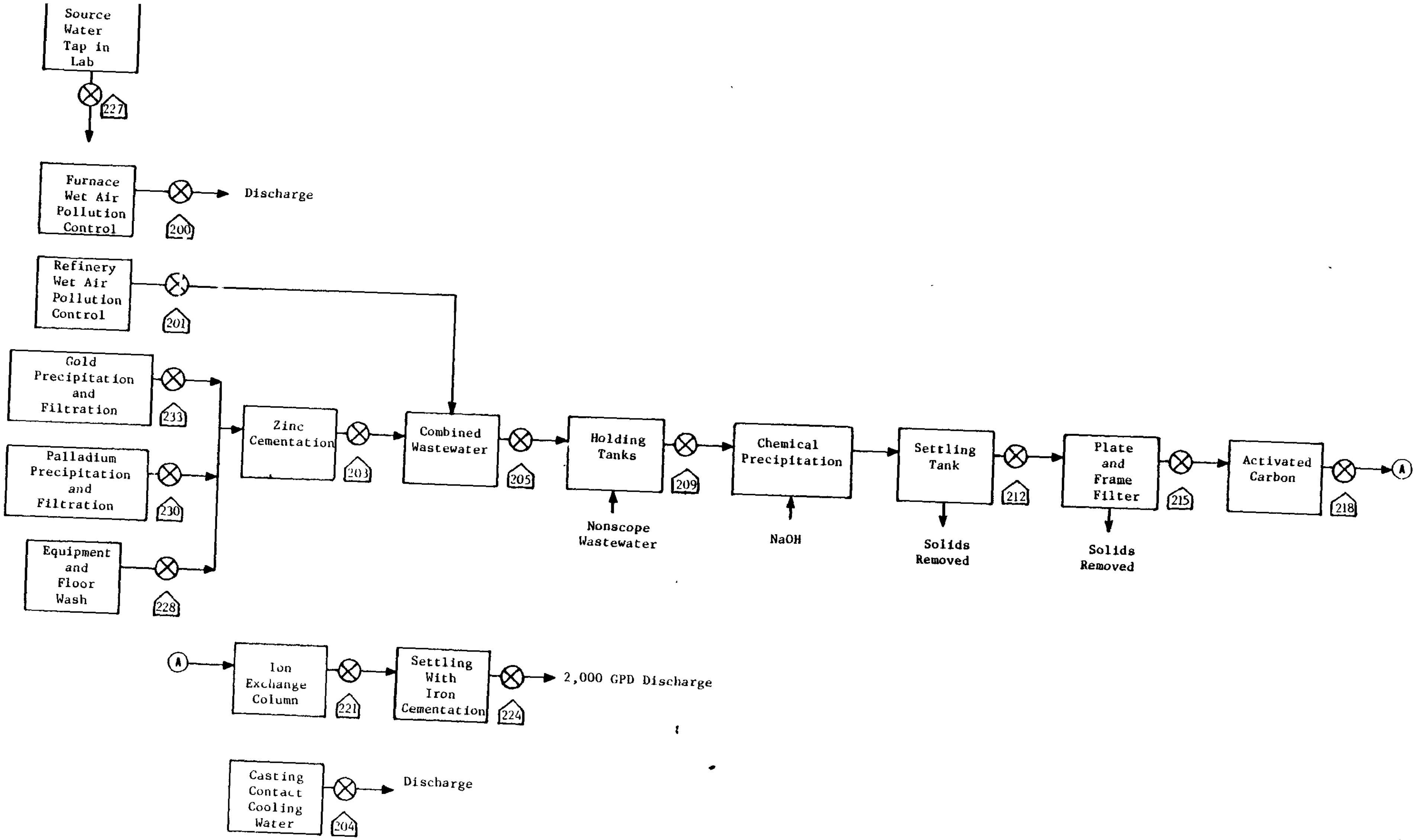

Figure V-1
SAMPLING SITES AT SECONDARY PRECIOUS METALS PLANT A

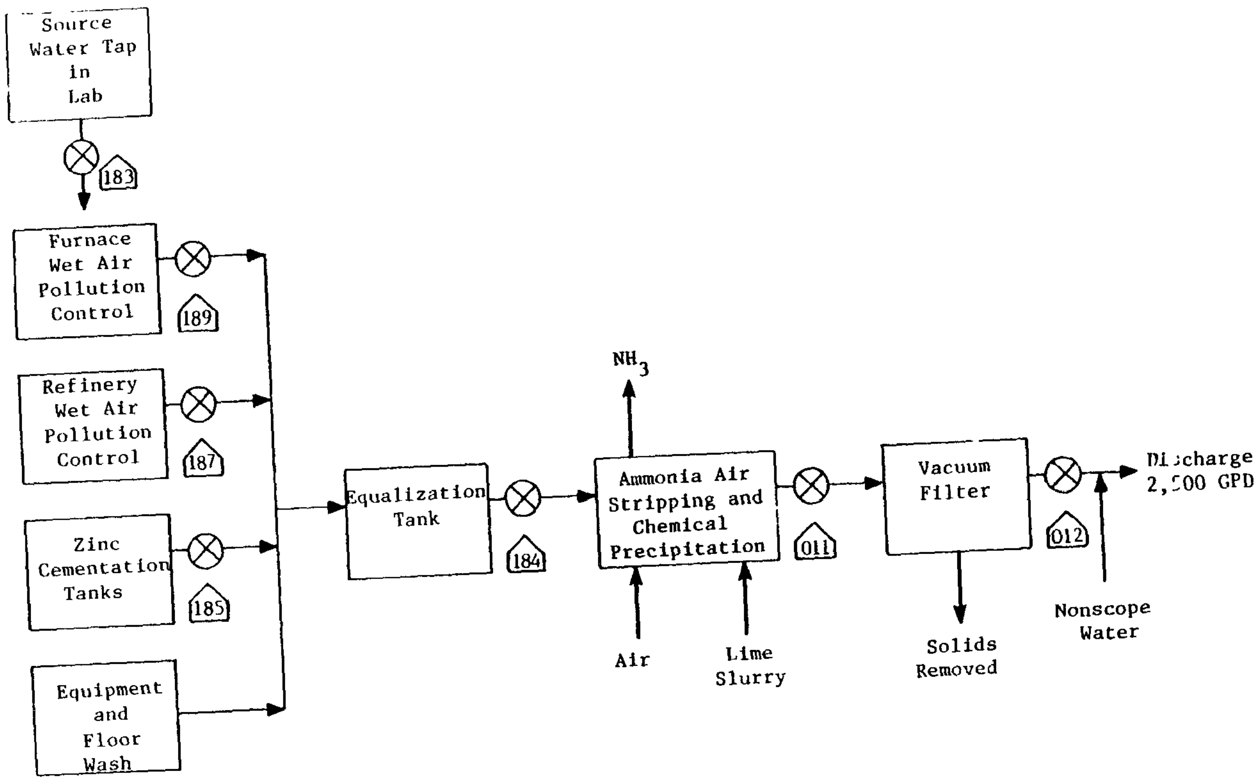

Figure V-2

SAMPLING SITES AT SECONDARY PRECIOUS METALS PLANT B

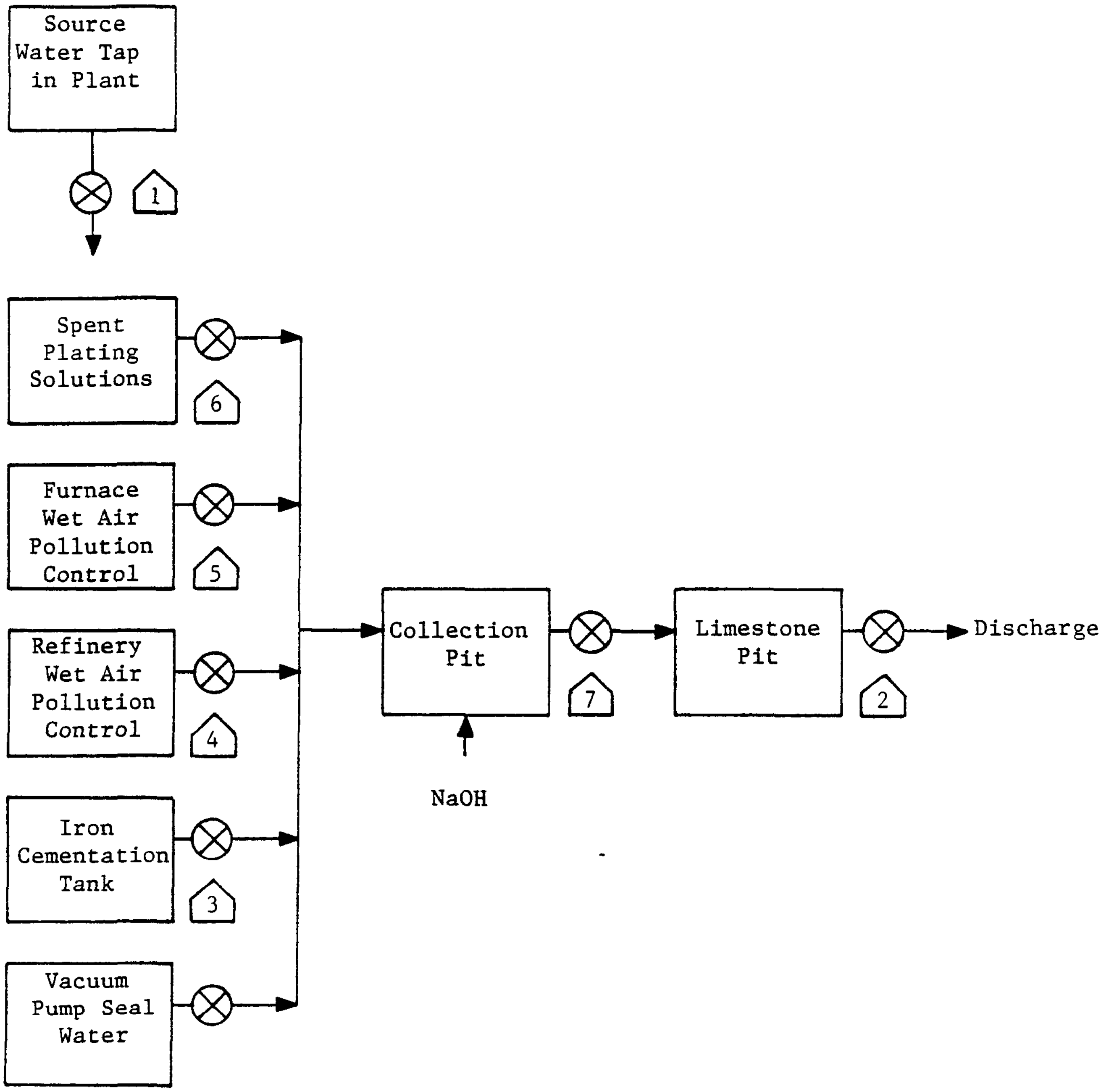

Figure V-3

SAMPLING SITES AT SECONDARY PRECIOUS METALS PLANT C

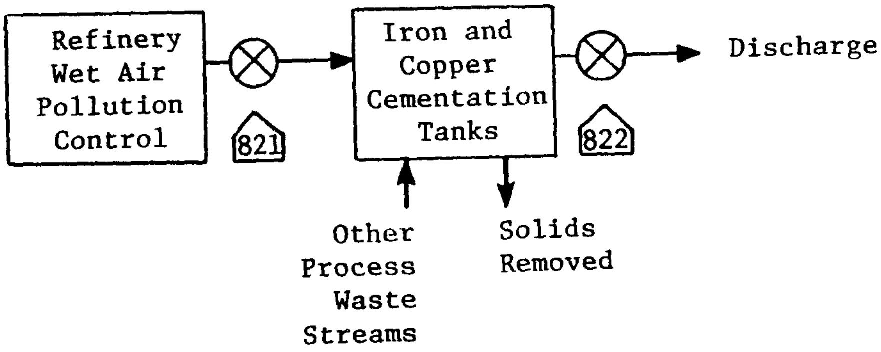

Figure V-4

SAMPLING SITES AT SECONDARY PRECIOUS METALS PLANT D

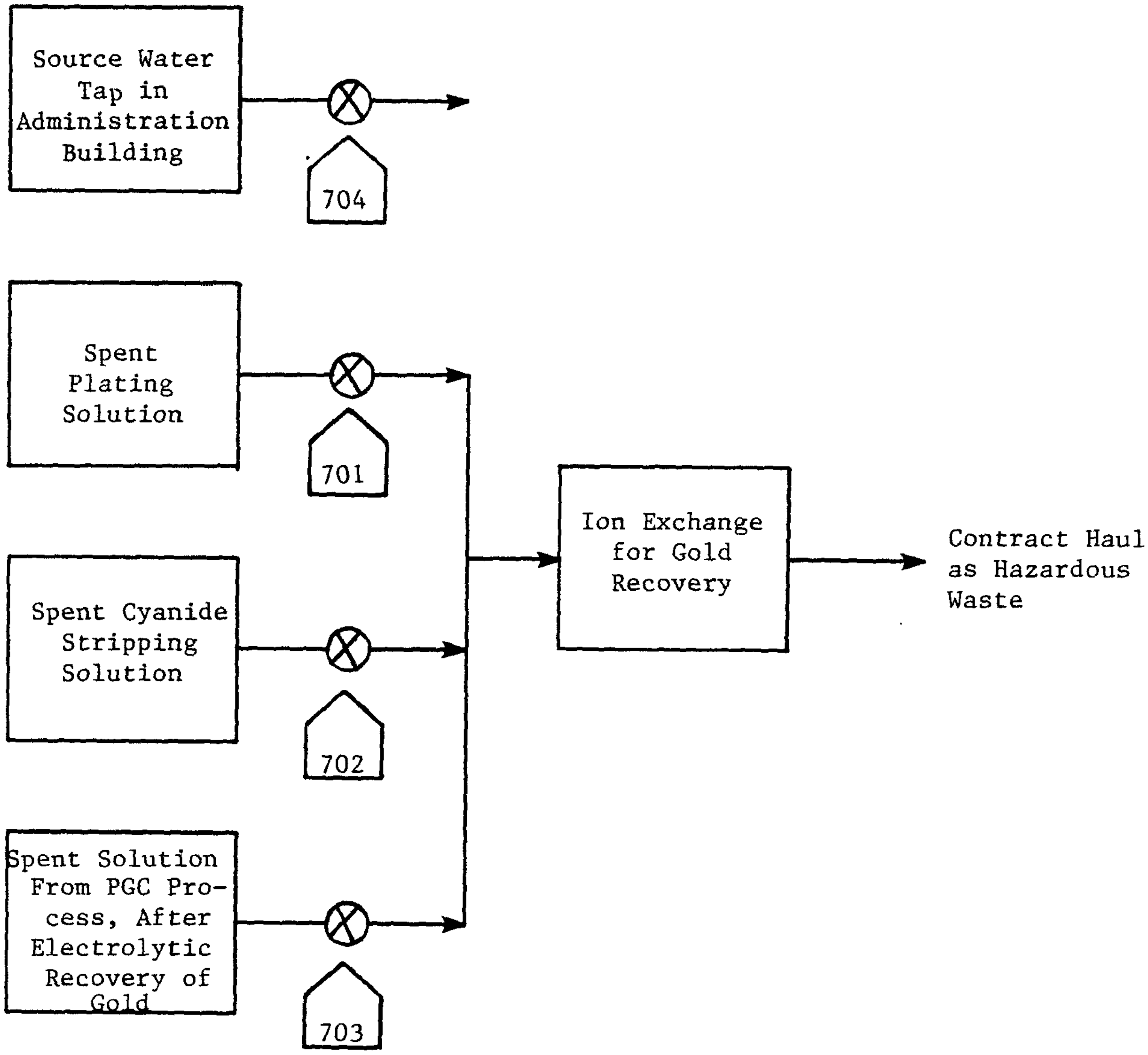

Figure V-5
SAMPLING SITES AT SECONDARY PRECIOUS METALS PLANT E

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION VI

SELECTION OF POLLUTANT PARAMETERS

Section V of this supplement presented data from secondary precious metals plant sampling visits and subsequent chemical analyses. This section examines that data and discusses the selection or exclusion of pollutants for potential limitation. The legal basis for the exclusion of toxic pollutants under Paragraph 8(a) of the Settlement Agreement is presented in Section VI of the General Development Document.

Each pollutant selected for potential limitation is discussed in Section VI of the General Development Document. That discussion provides information concerning where the pollutant originates (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 describes 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. Also described is the analysis performed to select or exclude conventional and nonconventional pollutants for limitation. 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 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 from the secondary precious metals subcategory for three conventional pollutant parameters (oil and grease, total suspended solids, and pH) and one nonconventional pollutant parameter (ammonia).

CONVENTIONAL AND NONCONVENTIONAL POLLUTANT PARAMETERS SELECTED

The conventional and nonconventional pollutants and pollutant parameters selected for limitation in this subcategory are:

ammonia
total suspended solids (TSS)
pH

Ammonia was found in 10 of 12 samples analyzed in concentrations ranging from 0.24 to 5,060 mg/l. Five of the values recorded are well above the treatable concentration of 32.2 mg/l, attainable by the available treatment technology. Therefore, ammonia is selected for limitation in this subcategory.

Oil and grease was analyzed for in 20 samples and was detected below quantifiable levels 11 times. In only two cases was oil and grease detected above its treatable concentration of 10 mg/l. The two treatable values are 14 mg/l and 37 mg/l and they are both for samples of refinery wet air pollution control. However, five other samples of this waste stream show oil and grease well below treatability. Because of the small number of sources in which oil and grease was detected above its treatable concentration, oil and grease is not selected for limitation in this subcategory.

Total suspended solids (TSS) concentrations ranging from 0 to 5,600 mg/l were observed in the 20 samples analyzed for this study. Nineteen of 20 samples exhibited concentrations above the concentration attainable by the identified treatment technology (2.6 mg/l). Furthermore, most of the specific methods for removing toxic metals do so by precipitation, and the resulting toxic metals precipitates should not be discharged. Meeting a limitation on TSS also aids in removal of precipitated toxic metals. For these reasons, total suspended solids are selected for limitation in this subcategory.

The pH values observed in 14 of 20 samples were outside the 7.5 to 10.0 range considered desirable for discharge to receiving waters. Six pH values ranged from 0.1 to 3.4. Six samples ranged from 5.9 to 9.3. The remaining eight samples ranged from 10.9 to 12.6. Effective removal of toxic metals by chemical precipitation requires careful control of pH. Therefore, 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. These data provide the basis for the categorization of specific pollutants, as discussed below. Table VI-1 is based on the raw wastewater data from streams 200, 189, 5, 201, 187, 4, 821, 233, 230, 228, 6, 701, 702, and 703 (see Section V). Treatment plant samples were not considered in the frequency count.

TOXIC POLLUTANTS NEVER DETECTED

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

1. acenaphthene
2. acrolein
3. acrylonitrile
5. benzidene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloromethyl) ether (Deleted)
18. bis (2-chloroethyl) ether
19. 2-chloroethyl vinyl ether
20. 2-chloronaphthalene
22. parachlorometa cresol
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)
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
45. methyl chloride (chloromethane)
46. methyl bromide (bromomethane)
49. trichlorofluoromethane (Deleted)
50. dichlorodifluoromethane (Deleted)
52. hexachlorobutadiene
53. hexachlorocyclopentadiene
55. naphthalene

56. nitrobenzene
58. 4-nitrophenol
59. 2,4-dinitrophenol
60. 4,6-dinitro-o-cresol
61. N-nitrosodimethylamine
63. N-nitrosodi-n-propylamine
64. pentachlorophenol
67. butyl benzyl phthalate
72. benzo (a)anthracene (1,2-benzanthracene)
73. benzo (a)pyrene (3,4-benzopyrene)
74. 3,4-benzofluoranthene
75. benzo(k)fluoranthene (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
87. trichloroethylene
88. vinyl chloride (chloroethylene)
89. aldrin*
90. dieldrin*
91. chlordane*
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-BHC-Alpha*
103. b-BHC-Beta*
104. r-BHC (lindane)-Gamma*
105. g-BHC-Delta*
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
129. 2,3,7,8-tetrachlorodibenzo-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 LIMIT

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

4. benzene
7. chlorobenzene
10. 1,2-dichloroethane
21. 2,4,6-trichlorophenol
24. 2-chlorophenol
34. 2,4-dimethylphenol
44. methylene chloride (dichloromethane)
47. bromoform (tribromomethane)
48. dichlorobromomethane
51. chlorodibromomethane
54. isophorone
62. N-nitrosodiphenylamine
68. di-n-butyl phthalate
69. di-n-octyl phthalate
70. diethyl phthalate
71. dimethyl phthalate
86. toluene

TOXIC POLLUTANTS PRESENT BELOW CONCENTRATIONS ACHIEVABLE BY TREATMENT

The pollutants listed below are not selected for consideration in establishing limitations because they were not found in any wastewater samples from this subcategory above concentrations considered achievable by existing or available treatment technologies. These pollutants are discussed individually following the list.

57. 2-nitrophenol
123. mercury

2-Nitrophenol was found in only one sample at its quantification limit. The reported concentration was 0.01 mg/l, which is also the treatable concentration. Since the pollutant was not detected above the concentration attainable by identified treatment technology, 2-nitrophenol is not considered for limitation.

Mercury was detected below its quantification limit in 20 out of 24 samples analyzed. The four values reported above the quantification limit ranged from 0.0003 mg/l to 0.015 mg/l, which are all below the concentration attainable by identified treatment technology, which is 0.036 mg/l. Therefore, mercury is not considered for limitation.

TOXIC POLLUTANTS DETECTED IN A SMALL NUMBER OF SOURCES

The following pollutants were not selected for limitation on the basis that they are detectable in the effluent from only a small number of sources within the subcategory and they are uniquely related to only those sources.

6. carbon tetrachloride
11. 1,1,1-trichloroethane
23. chloroform
65. phenol
66. bis(2-ethylhexyl) phthalate
117. beryllium

Although these pollutants were not selected for consideration in establishing nationwide limitations, it may be appropriate, on a case-by-case basis, for the local permitter to specify effluent limitations.

Carbon tetrachloride was detected in only one of 12 samples analyzed, at a concentration of 0.21 mg/l. The treatability concentration is 0.01 mg/l for this pollutant. Since it was not detected in 11 other samples, the measurement may be regarded as specific to the site and not characteristic of the subcategory as a whole. Also, carbon tetrachloride cannot be attributed to specific materials and processes used in the secondary precious metals subcategory. Therefore, carbon tetrachloride is not considered for limitation.

1,1,1-Trichloroethane was detected in only one of 12 samples analyzed, at a concentration of 0.015 mg/l. The treatability concentration is 0.01 mg/l for this pollutant. Since it was not detected in 11 other samples, the measurement may be regarded as specific to the site and not characteristic of the subcategory as a whole. Also, 1,1,1-trichloroethane cannot be attributed to specific materials and processes used in the secondary precious metals subcategory. Therefore, 1,1,1-trichloroethane is not considered for limitation.

Chloroform was detected in four of 12 samples above its treatable concentration of 0.01 mg/l. The four concentrations are all 0.02 mg/l. All four samples have a lower concentration of chloroform than the source water at the plant (0.05 mg/l). Chloroform cannot be attributed to specific materials or processes used in the subcategory, and very little removal of this pollutant can be expected with treatment. Therefore, chloroform is not considered for limitation.

Phenol was detected in only four of 12 samples above its treatable concentration of 0.01 mg/l. The four concentrations are 0.013 mg/l, 0.17 mg/l, 0.45 mg/l, and 0.65 mg/l. The three samples with concentrations above 0.10 mg/l were all taken at one plant which was shut down indefinitely subsequent to being sampled. Since phenol was not detected above its treatable concentration in eight other samples, the measurements may be regarded as specific to the site and not characteristic of the subcategory as a whole. Phenol cannot be attributed to specific materials and processes used in the secondary precious metals subcategory. Also, because of the relatively low concentrations of phenol in the raw waste compared with its treatable concentration, very little removal of phenol can be expected with treatment. Therefore, phenol is not considered for limitation.

Bis(2-ethylhexyl) phthalate was found above its treatable concentration of 0.01 mg/l in six of 12 samples. The concentrations ranged from 0.02 mg/l to 0.1 mg/l. This pollutant is not associated with specific processes used in the secondary precious metals subcategory, but is commonly used as a plasticizer in laboratory and field sampling equipment. Since the presence of this pollutant may be attributed to sample contamination, bis(2-ethylhexyl) phthalate is not considered for limitation.

Beryllium was found in only one out of 24 samples analyzed above its treatable concentration of 0.20 mg/l. The sample had a concentration of 0.46 mg/l. Since it was not found above its treatable concentration in 23 other samples, the measurement may be regarded as site-specific and not characteristic of the subcategory as a whole. Although beryllium may be part of a raw material, such as jewelry scrap, used in the secondary precious metals industry, all the wastewater samples analyzed from plants which process these raw materials showed beryllium present below treatable concentrations. Therefore, beryllium is not considered 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.

114. antimony
115. arsenic
118. cadmium
119. chromium
120. copper
121. cyanide
122. lead
124. nickel
125. selenium
126. silver
127. thallium
128. zinc

Antimony was detected above its treatable concentration (0.47 mg/l) in seven of 24 samples. The quantifiable concentrations ranged from 0.19 mg/l to 5.2 mg/l. Since antimony was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Arsenic was detected above its treatable concentration (0.34 mg/l) in four of 24 samples. The quantifiable concentrations ranged from 0.025 mg/l to 2.4 mg/l. Since arsenic was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Cadmium was detected above its treatable concentration (0.049 mg/l) in 12 of 24 samples. The quantifiable concentrations ranged from 0.0029 mg/l to 7.6 mg/l. Since cadmium was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Chromium was detected above its treatable concentration (0.07 mg/l) in 15 of 24 samples. The quantifiable concentrations ranged from 0.012 mg/l to 22 mg/l. Since chromium was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Copper was detected above its treatable concentration (0.39 mg/l) in 15 of 23 samples. The quantifiable concentrations ranged from 0.016 mg/l to 5,000 mg/l. Since copper was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Cyanide (total) was detected above its treatable concentration (0.047 mg/l) in 17 of 24 samples. The quantifiable concentrations ranged from 0.09 mg/l to 9,897 mg/l. Since cyanide is used as a raw material, and was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Lead was detected above its treatable concentration (0.08 mg/l) in 17 of 24 samples. The quantifiable concentrations ranged from 0.02 mg/l to 0.7 mg/l. Since lead was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Nickel was detected above its treatable concentration (0.22 mg/l) in 17 of 24 samples. The quantifiable concentrations ranged from 0.008 mg/l to 890 mg/l. Since nickel was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Selenium was detected above its treatable concentration (0.20 mg/l) in three of 24 samples. The quantifiable concentrations ranged from 0.019 mg/l to 120 mg/l. Since selenium was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Silver was detected above its treatable concentration (0.07 mg/l) in 14 of 24 samples. The quantifiable concentrations ranged from 0.05 mg/l to 26 mg/l. Since silver was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Thallium was detected above its treatable concentration (0.34 mg/l) in four of 22 samples. The quantifiable concentrations ranged from 0.82 mg/l to 1.2 mg/l. Since thallium was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Zinc was detected above its treatable concentration (0.23 mg/l) in 18 of 23 samples. The quantifiable concentrations ranged from 0.11 mg/l to 10,000 mg/l. Since zinc is used in the cementation process, and was present in concentrations exceeding the concentrations achievable by identified treatment technology, it is selected for consideration for limitation.

Table VI-1

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
SECONDARY PRECIOUS METALS 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
1. acenaphthene	0.010	0.01	6	12	12			
2. acrolein	0.010	0.01	6	12	12			
3. acrylonitrile	0.010	0.01	6	12	12			
4. benzene	0.010	0.01	6	12	10	2		
5. benzidine	0.010	0.01	6	12	12			
6. carbon tetrachloride	0.010	0.01	6	12	11			1
7. chlorobenzene	0.010	0.01	6	12	11	1		
8. 1,2,4-trichlorobenzene	0.010	0.01	6	12	12			
9. hexachlorobenzene	0.010	0.01	6	12	12			
10. 1,2-dichloroethane	0.010	0.01	6	12	11	1		
11. 1,1,1-trichloroethane	0.010	0.01	6	12	11			1
12. hexachloroethane	0.010	0.01	6	12	12			
13. 1,1-dichloroethane	0.010	0.01	6	12	12			
14. 1,1,2-trichloroethane	0.010	0.01	6	12	12			
15. 1,1,2,2-tetrachloroethane	0.010	0.01	6	12	12			
16. chloroethane	0.010	0.01	6	12	12			
17. bis(chloromethyl) ether	0.010	0.01	6	12	12			
18. bis(2-chloroethyl) ether	0.010	0.01	6	12	12			
19. 2-chloroethyl vinyl ether	0.010	0.01	6	12	12			
20. 2-chloronaphthalene	0.010	0.01	6	12	12			
21. 2,4,6-trichlorophenol	0.010	0.01	6	12	11	1		
22. parachlorometa cresol	0.010	0.01	6	12	12			
23. chloroform	0.010	0.01	6	12	6	1	1	4
24. 2-chlorophenol	0.010	0.01	6	12	11	1		
25. 1,2-dichlorobenzene	0.010	0.01	6	12	12			
26. 1,3-dichlorobenzene	0.010	0.01	6	12	12			
27. 1,4-dichlorobenzene	0.010	0.01	6	12	12			
28. 3,3'-dichlorobenzidine	0.010	0.01	6	12	12			
29. 1,1-dichloroethylene	0.010	0.01	6	12	12			
30. 1,2-trans-dichloroethylene	0.010	0.01	6	12	12			
31. 2,4-dichlorophenol	0.010	0.01	6	12	12			
32. 1,2-dichloropropane	0.010	0.01	6	12	12			
33. 1,3-dichloropropylene	0.010	0.01	6	12	12			
34. 2,4-dimethylphenol	0.010	0.01	6	12	11	1		
35. 2,4-dinitrotoluene	0.010	0.01	6	12	12			

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
SECONDARY PRECIOUS METALS 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
36. 2,6-dinitrotoluene	0.010	0.01	6	12	12			
37. 1,2-diphenylhydrazine	0.010	0.01	6	12	12			
38. ethylbenzene	0.010	0.01	6	12	12			
39. fluoranthene	0.010	0.01	6	12	12			
40. 4-chlorophenyl phenyl ether	0.010	0.01	6	12	12			
41. 4-bromophenyl phenyl ether	0.010	0.01	6	12	12			
42. bis(2-chloroisopropyl) ether	0.010	0.01	6	12	12			
43. bis(2-chloroethoxy) methane	0.010	0.01	6	12	12			
44. methylene chloride	0.010	0.01	6	12	3	9		
45. methyl chloride	0.010	0.01	6	12	12			
46. methyl bromide	0.010	0.01	6	12	12			
47. bromoform	0.010	0.01	6	12	11	1		
48. dichlorobromomethane	0.010	0.01	6	12	10	2		
49. trichlorofluoromethane	0.010	0.01	6	12	12			
50. dichlorodifluoromethane	0.010	0.01	6	12	12			
51. chlorodibromomethane	0.010	0.01	6	12	11	1		
52. hexachlorobutadiene	0.010	0.01	6	12	12			
53. hexachlorocyclopentadiene	0.010	0.01	6	12	12			
54. isophorone	0.010	0.01	6	12	11	1		
55. naphthalene	0.010	0.01	6	12	12			
56. nitrobenzene	0.010	0.01	6	12	12			
57. 2-nitrophenol	0.010	0.01	6	12	7	4	1	
58. 4-nitrophenol	0.010	0.01	6	12	12			
59. 2,4-dinitrophenol	0.010	0.01	6	12	12			
60. 4,6-dinitro-o-cresol	0.010	0.01	6	12	12			
61. N-nitrosodimethylamine	0.010	0.01	6	12	12			
62. N-nitrosodiphenylamine	0.010	0.01	6	12	11	1		
63. N-nitrosodi-n-propylamine	0.010	0.01	6	12	12			
64. pentachlorophenol	0.010	0.01	6	12	12			
65. phenol	0.010	0.01	6	12	4	4		4
66. bis(2-ethylhexyl) phthalate	0.010	0.01	6	12	0	6		6
67. butyl benzyl phthalate	0.010	0.01	6	12	12			
68. di-n-butyl phthalate	0.010	0.01	6	12	2	10		
69. di-n-octyl phthalate	0.010	0.01	6	12	11	1		
70. diethyl phthalate	0.010	0.01	6	12	2	10		

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
SECONDARY PRECIOUS METALS 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
71. dimethyl phthalate	0.010	0.01	6	12	11	1		
72. benzo(a)anthracene	0.010	0.01	6	12	12			
73. benzo(a)pyrene	0.010	0.01	6	12	12			
74. 3,4-benzofluoranthene	0.010	0.01	6	12	12			
75. benzo(k)fluoranthene	0.010	0.01	6	12	12			
76. chrysene	0.010	0.01	6	12	12			
77. acenaphthylene	0.010	0.01	6	12	12			
78. anthracene (c)	0.010	0.01	6	12	12			
79. benzo(ghi)perylene	0.010	0.01	6	12	12			
80. fluorene	0.010	0.01	6	12	12			
81. phenanthrene (c)	0.010	0.01	6	12	12			
82. dibenzo(a,h)anthracene	0.010	0.01	6	12	12			
83. indeno(1,2,3-cd)pyrene	0.010	0.01	6	12	12			
84. pyrene	0.010	0.01	6	12	12			
85. tetrachloroethylene	0.010	0.01	6	12	12			
86. toluene	0.010	0.01	6	12	5	7		
87. trichloroethylene	0.010	0.01	6	12	12			
88. vinyl chloride	0.010	0.01	6	12	12			
114. antimony	0.100	0.47	14	24	0	15	2	7
115. arsenic	0.010	0.34	14	24	0	13	7	4
116. asbestos	10 MFL	10 MFL	0					
117. beryllium	0.010	0.20	14	24	0	17	6	1
118. cadmium	0.002	0.049	14	24	0	8	4	12
119. chromium	0.005	0.07	14	24	0	7	2	15
120. copper	0.009	0.39	13	23	0	0	8	15
121. cyanide (d)	0.02	0.047	14	24	0	7	0	17
122. lead	0.020	0.08	14	24	0	4	3	17
123. mercury	0.0001	0.036	14	24	0	20	4	0
124. nickel	0.005	0.22	14	24	0	1	6	17
125. selenium	0.01	0.20	13	21	0	15	3	3
126. silver	0.02	0.07	14	24	0	9	1	14
127. thallium	0.100	0.34	13	22	0	18	0	4
128. zinc	0.050	0.23	13	23	0	1	4	18
129. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)			0					

Table VI-1 (Continued)

FREQUENCY OF OCCURRENCE OF TOXIC POLLUTANTS
SECONDARY PRECIOUS METALS 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
oil and grease	5.0	10.0	11	20	0	16	2	2
total suspended solids (TSS)	1.0	2.6	10	20	0	1	0	19
ammonia		32	8	12	0		7	5

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

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

(c) Reported together.

(d) Analytical quantification concentration for EPA Method 335.2, Total Cyanide Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, March 1979.

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGIES

The preceding sections of this supplement discussed the sources, flows, and characteristics of the wastewaters from secondary precious metals plants. This section summarizes the description of these wastewaters and indicates the level of treatment which is currently practiced by plants in the secondary precious metals subcategory for each waste stream.

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 precious metals subcategory is characterized by the presence of the toxic metal pollutants, free and complexed cyanide, ammonia, and suspended solids. The raw (untreated) wastewater data for specific sources as well as combined waste streams are presented in Section V. Generally, 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 economies of scale and, in some instances, to combine streams of differing alkalinity to reduce treatment chemical requirements. Twenty-four plants in this subcategory currently have combined wastewater treatment systems, 20 have chemical precipitation and sedimentation, and one of these has chemical precipitation, sedimentation and pressure filtration. One plant currently strips ammonia with air, and eight plants currently treat for cyanide. Seven of the eight use alkaline oxidation, and one plant precipitates cyanide with ferrous sulfate. Three options have been selected for consideration for BPT, BAT, NSPS, and pretreatment in this subcategory, based on combined treatment of these compatible waste streams.

FURNACE WET AIR POLLUTION CONTROL

Air emission sources in secondary precious metals furnace operations include incinerator and smelting furnaces. Sixteen secondary precious metals producers control air emissions, using various methods. These are:

1. Dry baghouse - 11 plants, and
2. Wet scrubber - five plants.

Toxic organics, metals, cyanide, and suspended solids are present at treatable concentrations in the wastewater produced by furnace wet air pollution control. Two plants producing this wastewater practice complete recycle. One practices partial recycle ($\geq$90 percent). Two practice no recycle. Treatment methods used are:

1. No treatment - one plant, and
2. Chemical precipitation and sedimentation - two plants.

RAW MATERIAL GRANULATION

Two of three plants reporting this waste stream discharge it. The two plants do not practice recycle or treatment of this waste stream. The non-discharging plant completely recycles this water.

SPENT PLATING SOLUTIONS

Spent or contaminated cyanide solutions from electroplating shops may have the precious metal values recovered by a precipitation or electrolytic process. The waste stream is characterized by treatable concentrations of toxic organics and metals, free and complexed cyanide, and TSS. Treatment methods for this wastewater consist of:

1. Total cyanide precipitation using ferrous sulfate - one plant,
2. Free cyanide destruction using alkaline oxidation - six plants,
3. Chemical precipitation and sedimentation - one plant, and
4. Contractor disposal - four plants.

Four plants that have cyanide pretreatment also have chemical precipitation and sedimentation end-of-pipe treatment. The plant which uses ferrous sulfate also uses alkaline oxidation for cyanide treatment.

SPENT CYANIDE STRIPPING SOLUTIONS

Six plants use potassium or sodium cyanide solution to strip gold away from scrap. Four plants employ contractor disposal methods to achieve zero discharge of spent stripping solution. This wastewater contains toxic metals, free and complexed cyanide, and TSS above treatable concentrations. One of the two discharging plants destroys the free cyanide with chlorine gas (alkaline oxidation). The other plant destroys the free and complexed cyanide with ferrous sulfate, and then practices chemical precipitation and sedimentation.

REFINERY WET AIR POLLUTION CONTROL

Scrubbers are used at 28 plants to control fumes from precipitation and filtration processes. This wastewater contains treatable concentrations of toxic metals, chloride, sulfate, and suspended solids. Twenty plants discharge this wastewater, five of which practice no recycle, and 15 of which practice recycle of 75 percent or more. Eight plants do not discharge this wastewater. Three of these plants practice 100 percent recycle, and five of them have this wastewater disposed of by a contractor.

At the 20 discharging plants, scrubber water is commonly combined with other process wastewater and treated in a central treatment facility. Treatment methods used are:

1. Chemical precipitation and sedimentation - seven plants;
2. Chemical precipitation, sedimentation, and filtration - one plant; and
3. No treatment - 12 plants.

GOLD SOLVENT EXTRACTION RAFFINATE AND WASH WATER

One plant recovers gold by a solvent extraction process, and generates a raffinate waste stream and a wash water waste stream. Toxic metals and TSS are expected to be found at treatable levels in the raffinate and wash water. This waste stream is not recycled. Treatment before discharge consists of neutralization with caustic, but no solids are removed.

GOLD SPENT ELECTROLYTE

Wastewater discharges from electrolytic refining consist of spent electrolyte solution. Of the three plants practicing electrolytic refining, one discharges wastewater. This wastewater is expected to contain treatable concentrations of toxic metals, ammonia, and TSS. This waste stream is not recycled. The one discharging plant practices chemical precipitation and sedimentation of the spent electrolyte prior to discharge. The other two plants are zero discharge by means of contractor disposal.

GOLD PRECIPITATION AND FILTRATION

Nineteen of 28 plants who produce gold by dissolving gold-containing raw material in acid and then selectively precipitating it from solution discharge this waste stream. This wastewater contains toxic metals, ammonia and TSS above treatable concentrations. No plants reported recycling this waste stream although two plants reported reuse of the waste stream. Treatment methods for this wastewater consist of:

1. Chemical precipitation and sedimentation - 10 plants;
2. Chemical precipitation, sedimentation, and filtration - one plant;
3. Contractor disposal - seven plants;
4. One hundred percent reuse - two plants; and
5. No treatment - eight plants.

PLATINUM PRECIPITATION AND FILTRATION

Fourteen of 18 plants who produce platinum by a dissolution and selective precipitation process discharge this waste stream. This wastewater is expected to contain toxic metals, ammonia, and TSS above treatable concentrations. No plants reported recycling this waste stream. Treatment methods for this wastewater consist of:

1. Chemical precipitation and sedimentation - 10 plants (one with ammonia air stripping);
2. Chemical precipitation, sedimentation, and filtration - one plant;
3. No treatment - three plants; and
4. Contractor disposal - four plants.

PALLADIUM PRECIPITATION AND FILTRATION

Fourteen of 19 plants who produce palladium by a dissolution and selective precipitation process discharge this waste stream. This wastewater should contain toxic metals, ammonia, and TSS above treatable concentrations. No plants reported recycling this waste stream. Treatment methods for this wastewater consist of:

1. Chemical precipitation and sedimentation - nine plants (one with ammonia air stripping);
2. Chemical precipitation, sedimentation, and filtration - one plant;
3. No treatment - four plants;
4. One hundred percent reuse - one plant; and
5. Contractor disposal - four plants.

OTHER PLATINUM GROUP METALS PRECIPITATION AND FILTRATION

Two of three plants using a wet chemistry technique to produce platinum group metals such as rhodium and iridium discharge this waste stream. This waste stream is expected to contain toxic metals, ammonia and TSS. Treatment methods for this wastewater consist of:

1. Chemical precipitation and sedimentation - one plant,
2. No treatment - one plant, and
3. Contractor disposal - one plant.

SPENT SOLUTION FROM PGC SALT PRODUCTION

Two of three plants producing PGC salt from pure gold and potassium cyanide solution discharge excess cyanide solution. The two dischargers chlorinate the wastewater to destroy free cyanide, and one practices chemical precipitation and sedimentation. The non-discharging plant achieves this status by contractor disposal. The untreated wastewater contains toxic metals, free and complexed cyanide, and TSS above treatable concentrations.

EQUIPMENT AND FLOOR WASH

Three plants reported an equipment and floor wash waste stream and two of these plants discharge it. This wastewater contains toxic metals, ammonia, and TSS above treatable concentrations. No plants reported recycling this waste stream. Both discharging plants practice chemical precipitation and sedimentation. One of the two plants air strips ammonia. The nondischarging plant uses contractor disposal to achieve this status.

CONTROL AND TREATMENT OPTIONS CONSIDERED

Based on an examination of the wastewater sampling data, three control and treatment technologies that effectively control the pollutants found in secondary precious metals wastewaters were selected for evaluation. These technology options are discussed below.

OPTION A

Option A for the secondary precious metals subcategory requires treatment technologies to reduce pollutant mass. The Option A treatment scheme consists of ammonia steam stripping preliminary treatment applied to the combined stream of gold precipitation and filtration, platinum precipitation and filtration, palladium precipitation and filtration, other platinum group metal precipitation and filtration, and equipment and floor wash water; and cyanide precipitation preliminary treatment applied to the combined stream of spent plating solution, spent cyanide stripping solution, and spent solutions from PGC salt production. Preliminary treatment is followed by chemical precipitation and sedimentation (lime and settle) treatment applied to the combined stream of steam stripper effluent, cyanide precipitation effluent, and the combined stream of all other wastewater. Chemical precipitation is used to remove metals by the addition of lime or caustic followed by gravity sedimentation. Suspended solids are also removed by the process.

OPTION B

Option B for the secondary precious metals subcategory consists of ammonia steam stripping, cyanide precipitation, chemical precipitation, and sedimentation technology considered in Option A plus control technologies to reduce the discharge of wastewater volume. Water recycle of furnace and refinery scrubber water are the principal control mechanisms for flow reduction.

OPTION C

Option C for the secondary precious metals subcategory consists of the ammonia steam stripping, cyanide precipitation, in-process flow reduction, and chemical precipitation and sedimentation technology considered in Option B plus multimedia filtration technology added at the end of the Option B 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 in which there are rapid increases in flows or loadings of pollutants to the treatment system.

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION VIII

COSTS, ENERGY, AND NONWATER QUALITY ASPECTS

This section presents a summary of compliance costs for the secondary precious metals subcategory and a description of the treatment options and subcategory-specific assumptions used to develop these estimates. Together with the estimated pollutant reduction performance presented in Sections IX, X, XI, and XII 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 precious metals subcategory.

TREATMENT OPTIONS FOR EXISTING SOURCES

As discussed in Section VII, three treatment options have been developed for existing secondary precious metals sources. The treatment schemes for each option are summarized below and schematically presented in Figures X-1 through X-3.

OPTION A

Option A consists of ammonia steam stripping and cyanide precipitation preliminary treatment (where required), and chemical precipitation and sedimentation end-of-pipe technology.

OPTION B

Option B consists of in-process flow reduction measures, ammonia steam stripping and cyanide precipitation preliminary treatment (where required), and chemical precipitation and sedimentation end-of-pipe technology. The in-process flow reduction measures consists of the recycle of furnace scrubber water and refinery scrubber water through holding tanks.

OPTION C

Option C requires the in-process flow reduction measures of Option B, ammonia steam stripping and cyanide precipitation preliminary treatment, and end-of-pipe treatment technology consisting of chemical precipitation, sedimentation, and multimedia filtration.

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 Tables VIII-1 and VIII-2 for the direct and indirect dischargers, respectively.

Each of the general assumptions used to develop compliance costs is presented in Section VIII of the General Development Document. Each subcategory contains a unique set of waste streams requiring certain subcategory-specific assumptions to develop compliance costs. The major assumptions specific to the secondary precious metals subcategory are discussed briefly below.

(1) For overlap plants (i.e., secondary precious metals - secondary silver or secondary precious metals - secondary tungsten plants), costs and removal estimates are apportioned on a flow-weighted basis. The total flow used for flow-weighting costs includes recycled floor wash water, whereas the total flow used for flow-weighting removals does not include floor wash water.

(2) A flow allowance for floor washing is assumed for each plant on the basis of 1.0 liter per troy ounce of precious metals, including silver, produced in the refinery. The flow allowance is based on the rates reported by the three plants supplying information about this stream. Table V-13 shows water use rates of 14.2, 1.0, and 0.97 liters per troy ounce. The highest rate was omitted because it is more than 10 times the next highest rate. The flow allowance was based on the average of the two lower rates.

(3) Floor wash water is obtained by recycling wastewater treated by chemical precipitation and sedimentation for all options. The recycle ratio is equal to the flow of floor wash water divided by the total flow to treatment.

(4) If a plant has a precipitation and filtration operation for platinum, palladium, other platinum group metals (PGM), or silver (from photographic raw materials), we assume floor wash water requires ammonia stripping to meet the proposed ammonia limitations.

(5) All sludge produced from chemical precipitation is nonhazardous. All sludge produced from cyanide precipitation is hazardous, per RCRA regulations.

(6) All precipitation and filtration wastewater (gold, platinum, palladium, or other PGM) are assumed to undergo cementation prior to entering waste treatment. Zinc cementation is assumed unless iron cementation is specifically noted as in-place. Costs for installing and operating a cementation system are not included in the cost estimates because cementation is not considered a wastewater treatment operation. Only the zinc or iron raw waste values are changed by operating a cementation process. The revised raw waste values impact a plant's waste treatment cost.

(7) Ammonia stripping costs for plants having less than 50 liters per hour of water requiring stripping are based on air stripping via agitation-aeration in the batch chemical precipitation tank instead of steam stripping. These costs include a blower, sparger and hood.

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 precious metals 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 the three options considered are estimated at 5.11×10^6 kWh/yr, 5.12×10^6 kWh/yr, and 5.19×10^6 kWh/yr for Options A, B, and C, respectively. Option B energy requirements are similar to those for Option A. Because less water is being treated, energy costs for lime and settle treatment are less; however, recycle equipment such as holding tanks and pumps require additional energy, offsetting the energy savings. Option C, which includes filtration, is estimated to increase energy consumption over Option B by approximately 1 percent. Option C represents roughly 8 percent of a typical plant's electrical energy usage. It is therefore concluded that the energy requirements of the treatment options considered will not have a significant impact on total plant energy consumption.

SOLID WASTE

Sludge generated in the secondary precious metals subcategory is due to the precipitation of metal hydroxides and cyanide using lime and other chemicals. Sludges associated with the secondary precious metals 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. The one exception to this is solid wastes generated by cyanide precipitation. These sludges are expected to be hazardous and this judgment was included in this study. None of the non-cyanide wastes are listed specifically as hazardous. Nor are they likely to exhibit a characteristic of hazardous waste. This judgment is made based on the recommended technology of lime precipitation, sedimentation, 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 identified should be 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 waste 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). 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.

The Agency estimates that the proposed BPT regulation for secondary precious metals manufacturing facilities will generate 306 metric tons of solid wastes (wet basis) in 1982 as a result of wastewater treatment. Proposed BAT will not significantly increase sludge generation, however proposed PSES will add 1,450 metric tons of solid waste per year.

AIR POLLUTION

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

At seven secondary precious metals plants, streams with treatable concentrations of ammonia having flows less than 50 l/hr were treated with air stripping for design and cost determination. None of the waste streams were air pollution control streams. The air stripping is accomplished by aeration and agitation in the chemical precipitation batch tank, which includes a ventilation hood. Air stripping is not a model treatment technology because it simply transfers the ammonia from one medium to another, whereas steam stripping allows for ammonia recovery, and if desired, reuse. Air stripping was used in costing instead of steam stripping because at such low flow, continuous operation of steam strippers is not possible. Therefore, the treatable concentration for ammonia would be difficult to attain. The Agency does not believe that under these circumstances (low flow, non-air pollution control streams) that air stripping will create an air quality problem.

Table VIII-1

COST OF COMPLIANCE FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY DIRECT DISCHARGERS

The costs for this subcategory cannot be presented here because the data on which they are based have been claimed to be confidential.

Table VIII-2

COST OF COMPLIANCE FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY INDIRECT DISCHARGERS

(March, 1982 Dollars)

Option	Total Required Capital Cost	Total Annual Cost
A	1,392,000	950,000
B	1,325,000	928,000
C	1,419,000	984,000

SECONDARY PRECIOUS METALS 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 precious metals 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 employed, 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 within the subcategory.

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 the category 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 precious metals subcategory has been subdivided into 13 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 13 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 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. Cyanide precipitation is applied to streams with treatable concentrations of free and complexed cyanide.

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 troy ounce of production - mg/T.O.) were calculated by multiplying the BPT regulatory flow (l/T.O.) by 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 precious metals 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/T.O.) 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 Weyerhaeuser 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. Tables X-2 and XII-1 show the estimated pollutant removals for each treatment option for direct and indirect dischargers. Compliance costs are presented in Tables X-3 and XII-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, ammonia steam stripping to remove ammonia, and cyanide precipitation to remove free and complexed cyanide. Chemical precipitation and sedimentation technology is already in-place at 20 of the plants in the subcategory including all three direct dischargers. One plant has cyanide precipitation in-place. The technology bases for steam stripping and cyanide precipitation are discussed below. The pollutants specifically proposed for regulation at BPT are copper, cyanide, zinc, ammonia, TSS, and pH.

Implementation of the proposed BPT limitations will remove annually an estimated 34,570 kg of toxic pollutants (which include 6.3 kg of cyanide), 490 kg of ammonia, and 11,200 kg of TSS.

The compliance costs for this subcategory are not presented here because the data on which they are based have been claimed to be confidential. The Agency has determined that the benefits justify the costs for this subcategory.

More stringent technology options were not selected for BPT since they require in-process changes or end-of-pipe technologies less widely practiced in the subcategory, and, therefore, are more appropriately considered under BAT.

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.

Cyanide precipitation is demonstated in the secondary precious metals subcategory at one plant. Cyanide precipitation technology is required for the secondary precious metals subcategory because existing treatment within the subcategory does not effectively remove cyanide. Most secondary precious metals plant use alkaline oxidation to destroy free cyanide, but do not effectively remove complexed cyanide. Cyanide precipitation is directed at control of free and complexed cyanides in waste streams within the secondary precious metals subcategory. This subcategory collectively discharges approximately 557 kg/yr of cyanide. The achievable performance is transferred from three well-operated coil coating plants in the coil coating category, and are contained within the public record supporting this document. The Agency believes this technology, and the achievable concentration limits, are transferable to the secondary precious metals subcategory because raw wastewater cyanide concentrations (prior to dilution with waste streams without cyanide) are of the same order of magnitude in both categories. Further, no pollutants were identified in secondary precious metals wastewater that would interfere with the operation or performance of this technology.

Several discharging plants within the secondary precious metals subcategory use chlorine gas or hypochlorite solution to oxidize cyanide in their wastewater. EPA considered chemical oxidation using chlorine. Although the chlorine oxidation process can be used effectively for wastewater containing predominantly free cyanides and easily oxidizable cyanide complexes, the Agency determined that precipitation with ferrous sulfate is more cost-effective than chlorine oxidation for the removal of iron-cyanide complexes which may be found in the secondary precious metals wastewater.

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 the dcp. 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 13 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 supplement further describes the discharge flow rates and presents the water use and discharge flow rates for each plant by subdivision.

FURNACE WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for furnace wet air pollution control is 71.8 liters per troy ounce of precious metals, including silver, incinerated or smelted, based on zero percent recycle. This rate is allocated only for plants practicing wet air pollution control for the furnace. Five plants reported this wastewater, two of whom practice 100 percent recycle (plants 1094 and 1084). The BPT rate is based on the average water use rate of two of the three remaining plants. Plant 1105 was omitted because its water use rate was not reported, and its recycle rate was not quantified precisely enough to back-calculate a water use rate. The BPT rate is the average of 116 and 27.6 liters per troy ounce. The distribution of wastewater rates for this waste stream is presented in Section V (Table V-1).

RAW MATERIAL GRANULATION

The BPT wastewater discharge rate for raw material granulation is 0 liters per troy ounce of precious metals in the granulated raw material. Of the 30 plants which use a dissolution and selective precipitation process to recover precious metals, only three plants reported using water to granulate the raw material. Of the three, one plant practices 100 percent recycle. EPA proposes zero discharge of pollutants from this waste stream, and solicits comments. The two reasons for proposing zero discharge are that 27 plants are able to use a dissolution and selective precipitation process and do not need to granulate their raw material with water, and that one of the three plants that does use water does not discharge it by means of 100 percent recycle. The discharge rates for this waste stream are shown in Table V-2.

SPENT PLATING SOLUTIONS

The BPT wastewater discharge rate for spent plating solutions is 1.0 liter per liter of spent plating solution raw material. This rate is applicable to those plants which recover gold and other precious metals from spent or contaminated electroplaters solutions which they receive as a raw material. The discharge rate is given in terms of volume of raw material because EPA believes plants cannot control the concentration of precious metals in this raw material, and should be allowed to discharge the entire volume of solution coming into the plant, after recovering the precious metals. Only the volume of raw material solution should be allowed to be discharged, and this is why a discharge rate of 1.0 liter per liter was chosen. The 12 plants with this subdivision are shown in Table V-3.

SPENT CYANIDE STRIPPING SOLUTIONS

The BPT wastewater discharge rate for spent cyanide stripping solutions is 1.1 liters per troy ounce of gold recovered by cyanide stripping. This rate applies to plants which recover gold by stripping it away from a raw material, like electronic scrap, with a cyanide-based solution, and then recovering the gold from this solution. This rate is based on the rate reported by the lower of the two discharging plants (1.1 liters per troy ounce and 78.3 liters per troy ounce). The 78.3 liters per troy ounce rate was not used in the calculation of the BPT flow rate because the other four plants with this waste stream (but who do not discharge it), all report wastewater generation rates less than one-tenth of 78.3 liters per troy ounce. This can be seen in Table V-4. The Agency believes 1.1 liters per troy ounce is an achievable discharge rate, and solicits comments on this selection.

EPA is also considering a BPT wastewater discharge rate of 3.7 liters per troy ounce for this waste stream. This rate is based on the average of the lower five of the six rates reported for this stream. Plant 1100 was omitted because of its excessive water use. At promulgation, EPA will select a discharge rate (1.1 or 3.7 liters per troy ounce) based on a variety of factors, including public comments.

REFINERY WET AIR POLLUTION CONTROL

The BPT wastewater discharge rate for refinery wet air pollution control is 21.0 liters per troy ounce of precious metals, including silver, produced in the refinery, based on zero percent recycle. This rate is allocated only for plants practicing wet air pollution control for acid or cyanide fumes in the refinery. Twenty-eight plants reported this waste stream, five of which practice zero percent recycle and discharge the wastewater (107, 42, 32.8, 6.8, and 2.4 liters per troy ounce). The BPT rate is based on the average of the lower four of these five dischargers. The highest flow rate (107 liters per troy ounce) was omitted from the BPT rate calculation because there is no reason to believe this much water is needed for this operation in light of rates from the other plants. Table V-5 shows the distribution of water use and discharge rates for refinery wet air pollution control.

EPA is also considering a BPT wastewater discharge rate for refinery wet air pollution control of 19.8 liters per troy ounce of precious metals, including silver, produced in the refinery, based on zero percent recycle. This rate is based on an average water use calculation. Again excluding the highest water use rate (107 liters per troy ounce) and the plants who did not precisely quantify their recycle rates, the average water use rate is 19.8 liters per troy ounce (average of 46.4, 42, 39.4, 32.8, 13.2, 7.2, 7.0, 6.8, 2.4, and 0.6 liters per troy ounce). At promulgation, EPA will select a discharge rate (21.0 or 19.8 liters per troy ounce) based on a variety of factors, including public comments.

GOLD SOLVENT EXTRACTION RAFFINATE AND WASH WATER

The BPT wastewater discharge rate for gold solvent extraction raffinate and wash water is 0.63 liters per troy ounce of gold recovered by solvent extraction. This discharge rate is allocated only to plants which refine gold by a solvent extraction process. The discharge rate is based on the rate reported by the only plant with this process (0.63 liters per troy ounce), as shown in Table V-6.

GOLD SPENT ELECTROLYTE

The BPT wastewater discharge rate for gold spent electrolyte is 0.0087 liters per troy ounce of gold recovered by electrolysis. This rate only applies to plants which refine gold by electrolysis. The discharge rate is based on the lower of the two rates reported for this waste stream (0.0087 liters per troy ounce), as shown in Table V-7. The other flow rate (0.294 liters per troy ounce) is more than 10 times higher than the selected BPT rate.

GOLD PRECIPITATION AND FILTRATION

The BPT wastewater discharge rate for gold precipitation and filtration is 4.4 liters per troy ounce of gold precipitated. This rate only applies to plants which refine gold by dissolving gold-containing raw material in acid, and then recovering gold by precipitation. Of the 28 plants using this process, nine plants supplied insufficient information to calculate discharge rates, two plants report 100 percent reuse of this water, and six plants do not discharge this waste stream by means of contract hauling (these plants have water use rates of 560.5, 69.1, 3.34, 0.815, 0.63, and 0.05 liters per troy ounce). The BPT discharge rate is based on the average water use rate of 10 of the 11 discharging plants (24.3, 7.98, 4.1, 2.65, 2.5, 1.86, 0.341, 0.312, 0.27, and

0.144 liters per troy ounce). The plant reporting 404 liters per troy ounces rate was not considered in the average because this water use rate is almost 10 times that of the next highest plant. Eight of the discharging plants meet the BPT rate. Water use and discharge rates are presented in Table V-8.

EPA is also considering a BPT wastewater discharge rate for gold precipitation and filtration of 3.5 liters per troy ounce of gold precipitated. This rate is based on the average of the water use rates reported, excluding the three plants with excessive flows (plants 1034, 1100, and 1091). At promulgation, EPA will select a discharge rate (4.4 or 3.5 liters per troy ounce) based on a variety of factors, including public comments.

PLATINUM PRECIPITATION AND FILTRATION

The BPT wastewater discharge rate for platinum precipitation and filtration is 5.2 liters per troy ounce of platinum precipitated. This rate only applies to plants which refine platinum by dissolving it in acid or base, and recover it by precipitation. Of the 18 plants using this process, 13 supplied insufficient information to calculate discharge rates. Five plants reported sufficient data (354, 30.2, 10.4, 4.5, and 0.58 liters per troy ounce). Table V-9 presents the water use and discharge rates for this waste stream. The BPT discharge rate is based on the average of the three lowest water use rates. The 354 and 30.2 liters per troy ounce water use rates were omitted from the average because there is no reason to believe this much water is needed for this operation in light of the rates from the other plants.

PALLADIUM PRECIPITATION AND FILTRATION

The BPT wastewater discharge rate for palladium precipitation and filtration is 3.5 liters per troy ounce of palladium precipitated. This rate only applies to plants which refine palladium by dissolving it in acid or base, and then recovering it by precipitation. Of the 19 plants using this process, 14 reported insufficient data to calculate a water use rate. The BPT discharge rate is based on the average of four of the five plants reporting sufficient water use data. The highest flow (15.8 liters per troy ounce) was omitted because there is no reason to believe this much water is needed for this operation. The water use rates averaged are 4.58, 4.4, 3.4, and 1.53 liters per troy ounce. These discharge rates are presented in Table V-10.

OTHER PLATINUM GROUP METALS PRECIPITATION AND FILTRATION

The BPT wastewater discharge rate for other platinum group metals (rhodium, iridium, osmium, and ruthenium) precipitation and filtration is 5.2 liters per troy ounce of platinum group metals precipitated. This rate only applies to plants which refine these metals by dissolving them in either acid or base, and then precipitating them. Three plants use this process and none reported sufficient information to calculate water use or discharge rates. This is shown in Table V-11. The BPT discharge rate is therefore based on the platinum precipitation and filtration BPT discharge rate derived from Table V-9. These two subdivisions are expected to have similar flows because all five metals (platinum, rhodium, iridium, osmium, and ruthenium) are part of the platinum group, and should all be refined in a similar manner.

SPENT SOLUTION FROM PGC SALT PRODUCTION

The BPT wastewater discharge rate for spent solution from the PGC salt production process is 0.9 liters per troy ounce of gold contained in PGC product. This rate applies only to plants which manufacture a potassium gold cyanide salt product by reacting pure gold with potassium cyanide solution. There are three plants reporting this process, as shown in Table V-12. The reported water use rates are 260 liters per troy ounce and 0.9 liters per troy ounce. The third plant provided insufficient data to calculate a water use rate. The plant reporting 260 liters per troy ounce explained that part of that water is used in a scrubber above the reaction vessel, and the two flow rates (discharging excess solution and scrubber liquor) could not be separated. It is likely that most of that plant's water discharge is due to the scrubber. The plant reporting 0.9 liters per troy ounce confirmed that its water discharge was due entirely to the excess reaction solution. Because the data from the plant reporting 260 liters per troy ounce could not be apportioned between scrubber liquor and spent solution, the BPT wastewater discharge is based upon 0.9 liters per troy ounce.

EQUIPMENT AND FLOOR WASH

The BPT wastewater discharge rate for equipment and floor wash is 0 liters per troy ounce of precious metals, including silver, produced in the refinery. The BPT discharge rate is based on recycle of treated effluent for use as raw water for equipment and floor wash. In precious metals refineries, EPA realizes there is a possibility of accidental leaks and spills which may contain precious metals and silver, and need to be recovered by washing the equipment and the floor. We believe that wastewater treatment plant effluent can be recycled for this purpose, increasing the capacity of treatment but not the actual amount of water discharged.

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. Six pollutants are selected for limitation under BPT and are listed below:

- 120. copper
- 121. cyanide
- 128. zinc
- ammonia (as N)
- total suspended solids (TSS)
- pH

EFFLUENT LIMITATIONS

The concentrations achievable by application of the proposed BPT treatment are explained in Section VII of the General Development Document and summarized there in Table VII-19. The achievable treatment 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 troy ounce 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 PRECIOUS METALS SUBCATEGORY

Wastewater Stream	liters per troy ounce	Production Normalizing Parameter
Furnace wet air pollution control	71.8	Troy ounces of precious metals, including silver, incinerated or smelted
Raw material granulation	0	Troy ounces of precious metals in the granulated raw material
Spent plating solutions	1.0 liter/ liter	Liters of spent plating solutions used as a raw material
Spent cyanide stripping solutions	1.1	Troy ounces of gold stripped
Refinery wet air pollution control	21.0	Troy ounces of precious metals produced in refinery, including silver
Gold solvent extraction raffinate and wash water	0.63	Troy ounces of gold produced by solvent extraction
Gold spent electrolyte	0.0087	Troy ounces of gold produced by electrolysis
Gold precipitation and filtration	4.4	Troy ounces of gold precipitated
Platinum precipitation and filtration	5.2	Troy ounces of platinum precipitated
Palladium precipitation and filtration	3.5	Troy ounces of palladium precipitated

Table IX-1 (Continued)

BPT WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	liters per troy ounce	Production Normalizing Parameter
Other platinum group metals precipitation and filtration	5.2	Troy ounces of other platinum group metals precipitated
Spent solution from PGC salt production	0.9	Troy ounces of gold contained in PGC product
Equipment and floor wash	0	Troy ounces of precious metals, including silver, produced in refinery

Table IX-2

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	136.400	71.800
Cyanide (total)	20.820	8.616
Zinc	104.800	43.800
Ammonia (as N)	9,571.000	4,207.000
Total suspended solids	2,944.000	1,400.000
pH	Within the range of 7.5 to 10.0 at all times	

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metal in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.900	1.000
Cyanide (total)	0.290	0.120
Zinc	1.460	0.610
Ammonia (as N)	133.300	58.600
Total suspended solids	41.000	19.500
pH	Within the range of 7.5 to 10.0 at all times	

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	2.090	1.100
Cyanide (total)	0.319	0.132
Zinc	1.606	0.671
Ammonia (as N)	146.600	64.460
Total suspended solids	45.100	21.450
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	39.900	21.000
Cyanide (total)	6.090	2.520
Zinc	30.660	12.810
Ammonia (as N)	2,799.000	1,231.000
Total suspended solids	861.000	409.500
pH	Within the range of 7.5 to 10.0 at all times	

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	1.197	0.630
Cyanide (total)	0.183	0.076
Zinc	0.920	0.384
Ammonia (as N)	83.980	36.920
Total suspended solids	25.830	12.290
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.017	0.009
Cyanide (total)	0.003	0.001
Zinc	0.013	0.005
Ammonia (as N)	1.160	0.510
Total suspended solids	0.357	0.170
pH	Within the range of 7.5 to 10.0 at all times	

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	8.360	4.400
Cyanide (total)	1.276	0.528
Zinc	6.424	2.684
Ammonia (as N)	586.500	257.800
Total suspended solids	180.400	85.800
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	9.880	5.200
Cyanide (total)	1.508	0.624
Zinc	7.592	3.172
Ammonia (as N)	693.200	304.700
Total suspended solids	213.200	101.400
pH	Within the range of 7.5 to 10.0 at all times	

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	6.650	3.500
Cyanide (total)	1.015	0.420
Zinc	5.110	2.135
Ammonia (as N)	466.600	205.100
Total suspended solids	143.500	68.250
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	9.880	5.200
Cyanide (total)	1.508	0.624
Zinc	7.592	3.172
Ammonia (as N)	693.200	304.700
Total suspended solids	213.200	101.400
pH	Within the range of 7.5 to 10.0 at all times	

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.710	0.900
Cyanide (total)	0.261	0.108
Zinc	1.314	0.549
Ammonia (as N)	120.000	52.740
Total suspended solids	36.900	17.550
pH	Within the range of 7.5 to 10.0 at all times	

Table IX-2 (Continued)

BPT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

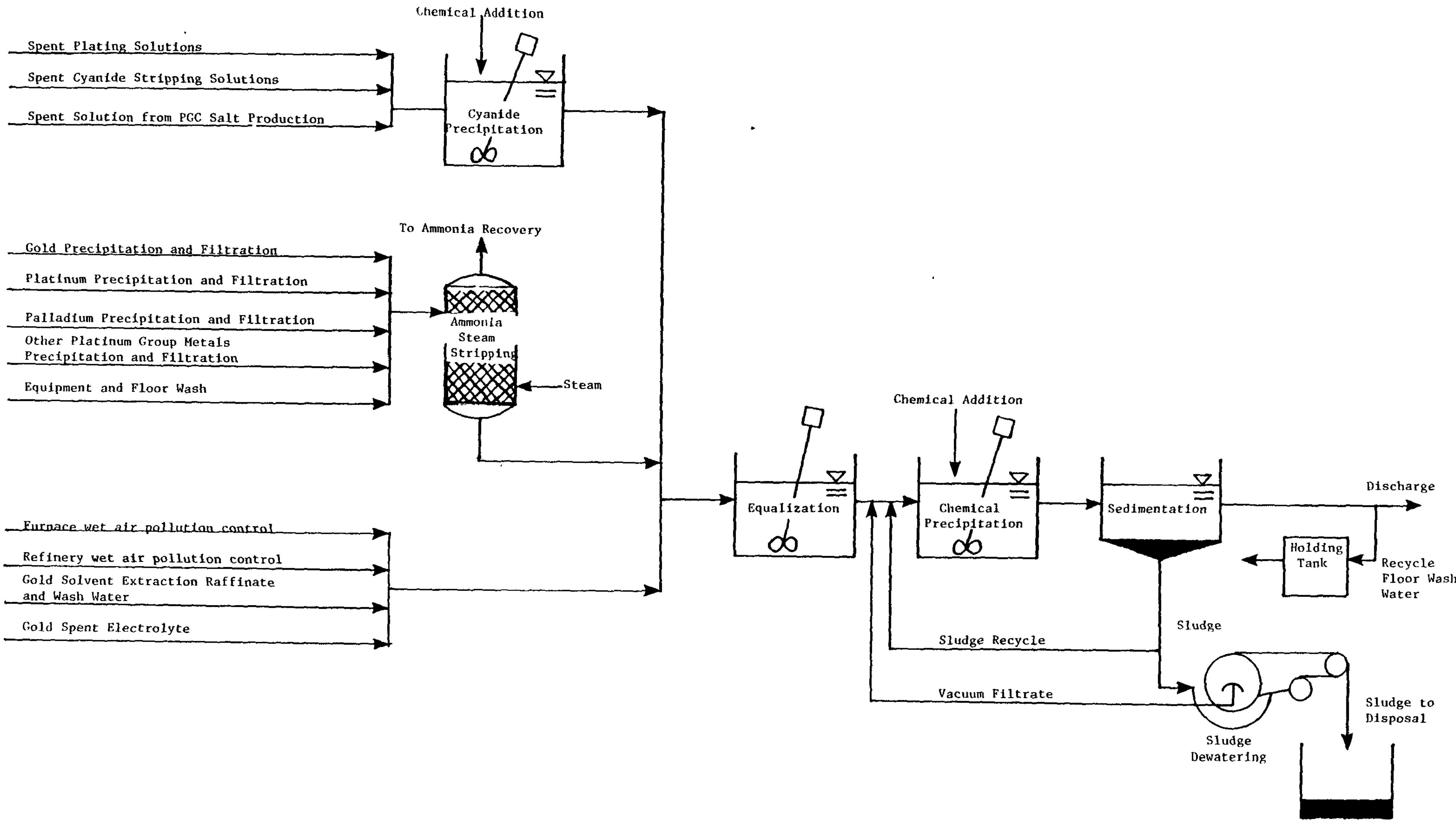

Figure IX-1

BPT TREATMENT SCHEME FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

SECONDARY PRECIOUS METALS 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 category 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 practice.

The statutory 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 three technology options which could be applied to the secondary precious metals 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 and reductions in the effluent flows allocated to various waste streams.

In summary, the treatment technologies considered for the secondary precious metals subcategory are:

Option A (Figure X-1):

- Cyanide precipitation preliminary treatment for streams containing cyanide at treatable concentrations
- Ammonia steam stripping preliminary treatment for streams containing ammonia at treatable concentrations
- Chemical precipitation and sedimentation

Option B (Figure X-2) is based on

- In-process flow reduction of wet air pollution control water
- Cyanide precipitation preliminary treatment for streams containing cyanide at treatable concentrations
- Ammonia steam stripping preliminary treatment for streams containing ammonia at treatable concentrations
- Chemical precipitation and sedimentation

Option C (Figure X-3) is based on

- In-process flow reduction of wet air pollution control water
- Cyanide precipitation preliminary treatment for streams containing cyanide at treatable concentrations
- Ammonia steam stripping preliminary treatment for streams containing ammonia at treatable concentrations
- Chemical precipitation and sedimentation
- Multimedia filtration

The three options examined for BAT are discussed in greater detail below. The first option considered is the same as the BPT treatment technology which was presented in the previous section.

OPTION A

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

OPTION B

Option B for the secondary precious metals subcategory achieves lower pollutant discharge by building upon the Option A (ammonia steam stripping, cyanide precipitation, chemical precipitation, and sedimentation) treatment technology. Flow reduction measures are added to the Option A treatment scheme (see Figure X-2). These flow reduction measures, including in-process changes, result in the concentration of pollutants in some wastewater streams. As explained in Section VII of the General Development Document, treatment of a more concentrated effluent allows achievement of a greater net pollutant removal and introduces the possible economic benefits associated with treating a lower volume of wastewater.

Option B flow reduction measures are reflected in the BAT wastewater discharge rates. Flow reduction has been included in determining the BAT discharge rates for furnace wet air pollution control, and refinery wet air pollution control. Based on available data, the Agency did not feel that further flow reduction over BPT would be feasible for the remaining 11 waste streams in the secondary precious metals subcategory. These waste streams are:

1. Raw material granulation,
2. Spent plating solutions,
3. Spent cyanide stripping solutions,
4. Gold solvent extraction raffinate and wash water,
5. Gold spent electrolyte,
6. Gold precipitation and filtration,
7. Platinum precipitation and filtration,
8. Palladium precipitation and filtration
9. Other platinum group metals precipitation and filtration,
10. Spent solution from PGC salt production, and
11. Equipment and floor wash.

Flow reduction measures used in Option B to reduce process wastewater generation or discharge rates include the following:

<u>Recycle of Water Used in Wet Air Pollution Control</u>

There are two wastewater sources associated with wet air pollution control which are regulated under these effluent limitations:

1. Furnace scrubber, and
2. Refinery scrubber.

Table X-1 presents the number of plants reporting wastewater from the wet air pollution control sources listed above, the number of plants practicing recycle, and the range of recycle values being listed. Recycle of both furnace scrubber water and refinery scrubber water are required for BAT. The recycle rate used for both sources is based on the average of all discharging plants which currently practice recycle of these waste streams (currently practicing greater than 90 percent recycle), as will be shown later.

OPTION C

Option C for the secondary precious metals subcategory consists of all control and treatment requirements of Option B (in-process flow reduction, ammonia steam stripping, cyanide precipitation, and chemical precipitation and sedimentation) plus multimedia filtration technology added at the end of the Option B treatment scheme (see Figure X-3). Multimedia filtration is used to remove suspended solids, including precipitates of toxic metals, beyond the concentration attainable by gravity sedimentation. The filter suggested is of the gravity, mixed media type, although other filters, such as rapid sand filters or pressure filters, would perform satisfactorily.

INDUSTRY COST AND ENVIRONMENTAL BENEFITS

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 was 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 precious metals 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.

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 within the subcategory and the mass of pollutant discharged after application of the treatment option. The pollutant removal estimates for direct dischargers in the secondary precious metals subcategory are presented in Table X-2.

COMPLIANCE COSTS

In estimating subcategory-wide compliance costs, the first step was to develop a cost model, relating the total costs associated with installation and operation of wastewater treatment technologies to plant process wastewater discharge. EPA applied the model on a per plant basis, a plant's costs (both capital, and operating and maintenance) being determined by what treatment it has in place and by its individual process wastewater discharge (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, yielding the cost of compliance for the subcategory. These costs were used in assessing economic achievability. Table X-3 shows the compliance costs of the various options for direct dischargers in the secondary precious metals subcategory. Compliance costs for indirect dischargers are presented in Table XII-2.

BAT OPTION SELECTION

EPA has selected Option C as the basis for BAT effluent limitations for the secondary precious metals subcategory. Our proposed BAT limitations for this subcategory are based on preliminary treatment consisting of cyanide precipitation and ammonia steam stripping and end-of-pipe treatment consisting of chemical precipitation and sedimentation (BPT technology) with the addition of in-process wastewater flow reduction, and filtration. Flow reductions are based on recycle of scrubber effluent. Twenty-one of the 29 existing plants currently have scrubber liquor recycle rates of 90 percent or greater. Filters also are presently utilized by one plant in the subcategory.

The pollutants specifically limited under BAT are copper, cyanide, zinc, and ammonia. The toxic pollutants antimony, arsenic, cadmium, chromium, lead, nickel, selenium, silver, and thallium were also considered for regulation because they were found at treatable concentrations in the raw wastewaters from this subcategory. These pollutants were not selected for specific regulation because they will be effectively controlled when the regulated toxic metals are treated to the levels achievable by the model BAT technology.

Implementation of the proposed BAT limitations would remove annually an estimated 34,580 kg of toxic pollutants, which is 10 kg of toxic pollutants greater than the estimated BPT removal. No additional ammonia or cyanide is removed at BAT.

An intermediate option considered for BAT is flow reduction plus preliminary treatment consisting of cyanide precipitation, ammonia steam stripping and end-of-pipe treatment consisting of chemical precipitation and sedimentation. This option would remove an estimated 6.3 kg of toxic metals more than the estimated BPT removal.

The compliance costs for this subcategory are not presented here because the data on which they are based have been claimed to be confidential.

BAT treatment for the secondary precious metals subcategory is shown schematically in Figure X-3.

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 concentration 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 13 wastewater sources were determined and are summarized in Table X-4. 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 (PNP) are also listed in Table X-4.

As discussed previously, the BAT wastewater discharge rate equals the BPT wastewater discharge rate for 11 of the 13 waste streams in the secondary precious metals subcategory. Based on the available data, the Agency determined that further flow reduction would not be feasible for these wastewater sources. Wastewater streams for which BAT discharge rates differ from BPT are discussed below.

FURNACE WET AIR POLLUTION CONTROL

The BAT wastewater discharge rate for furnace wet air pollution control is 4.5 liters per troy ounce of precious metal, including silver, incinerated or smelted. This rate is based on the value reported by the only discharging plant practicing recycle, and it is supported by the fact that two plants achieve zero discharge through 100 percent recycle.

REFINERY WET AIR POLLUTION CONTROL

The BAT wastewater discharge rate for refinery wet air pollution control is 1.0 liter per troy ounce of precious metals, including silver, produced in the refinery. This rate is based on the average of all discharging plants which practice at least 90 percent recycle. These plants are shown in Table V-5 (1.75 liters per troy ounce, 0.19 liters per troy ounce, 0.234 liters per troy ounce, 14.2 liters per troy ounce, 0.072 liters per troy ounce, 0.67 liters per troy ounce, 0.7 liters per troy ounce, 2.3 liters per troy ounce, 0.03 liters per troy ounce, 0.172 liters per troy ounce, 0.036 liters per troy ounce, 1.665 liters per troy ounce, 1.41 liters per troy ounce, 1.1 liters per troy ounce, 0.06 liters per troy ounce, 4.64 liters per troy ounce, and 0.21 liters per troy ounce). Omitting the plant discharging 14.2 liters per troy ounce as being out of line with the water use at the majority of other dischargers, the average discharge rate equals 1.0 liter per troy ounce. This rate is supported by the average water use calculation presented in Section IX. That calculation shows average water use of 19.8 liters per troy ounce. Assuming 95 percent recycle is achievable (18 of 21 plants reported greater than 90 percent recycle for this stream), the BAT wastewater discharge rate of 1.0 liter per troy ounce is confirmed.

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 consideration for limitation. This examination and evaluation was presented in Section VI. The Agency, however, had chosen not to regulate all 12 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 wastewaters 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 analysis. The pollutants selected for specific limitation are listed below:

120. copper
121. cyanide
128. zinc
ammonia (as N)

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 caustic 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 caustic 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 precious metals subcategory to control the discharges of toxic metal pollutants are copper and zinc. Cyanide and ammonia are also selected for limitation since the methods used to control copper and zinc are not effective in the control of cyanide or ammonia.

The following toxic pollutants are excluded from limitation on the basis that they are effectively controlled by the limitations developed for copper and zinc:

114. antimony
115. arsenic
118. cadmium
119. chromium
122. lead
124. nickel
125. selenium
126. silver
127. thallium

EFFLUENT LIMITATIONS

The treatable concentrations, achievable by application of the BAT technology (Option C), are summarized in Table VII-19 of the General Development Document. These treatable concentrations (both one-day maximum and monthly average) are multiplied by the BAT normalized discharge flows summarized in Table X-4 to calculate the mass of pollutants allowed to be discharged per mass of product. The results of these calculations in milligrams of pollutant per troy ounce of product represent the BAT effluent limitations for the secondary precious metals subcategory. BAT effluent limitations based on Option C (ammonia steam stripping, cyanide precipitation, chemical precipitation, sedimentation, in-process flow reduction, and multimedia filtration) are presented in Table X-5.

Table X-1

CURRENT RECYCLE PRACTICES WITHIN THE SECONDARY PRECIOUS METALS SUBCATEGORY

	Number of Plants With Wastewater	Number of Plants Practicing Recycle	Range of Recycle Values (%)
Furnace Scrubber	5	3	≥90 - 100
Refinery Scrubber	28	21	75 - 100

Table X-2

POLLUTANT REMOVAL ESTIMATES FOR DIRECT DISCHARGERS

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option B Discharge (kg/yr)	Option B Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	1.23	0.90	0.33	0.90	0.33	0.90	0.33
Arsenic	0.40	0.30	0.10	0.30	0.11	0.30	0.11
Cadmium	3.22	0.34	2.88	0.28	2.94	0.18	3.05
Chromium (Total)	3.88	0.29	3.59	0.29	3.59	0.24	3.63
Copper	267.51	3.78	263.72	2.07	265.43	1.39	266.11
Cyanide (Total)	17.76	11.48	6.29	11.46	6.31	11.46	6.31
Lead	15.59	0.78	14.81	0.43	15.16	0.29	15.30
Mercury	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Nickel	54.40	4.80	49.60	2.65	51.76	0.79	53.62
Selenium	224.90	1.86	223.04	0.97	223.93	0.65	224.25
Silver	11.23	0.49	10.74	0.36	10.87	0.25	10.98
Thallium	0.38	0.28	0.10	0.28	0.10	0.28	0.10
Zinc	33,996.82	2.15	33,994.67	1.18	33,995.64	0.82	33,996.00
TOTAL TOXICS	34,597.32	27.46	34,569.87	22.17	34,576.16	17.55	34,579.79
Ammonia	615.38	120.98	494.39	120.80	494.57	120.80	494.57
Cobalt	0.93	0.33	0.61	0.18	0.75	0.12	0.81
Fluoride	3.01	2.28	0.73	2.26	0.74	2.26	0.74
TOTAL NONCONVENTIONALS	619.32	123.59	495.73	123.25	496.07	123.19	496.13
TSS	11,294.34	78.28	11,216.05	42.91	11,251.43	9.30	11,285.04
Oil and Grease	8.87	6.70	2.17	6.66	2.21	6.66	2.21
TOTAL CONVENTIONALS	11,303.21	84.98	11,218.23	49.57	11,253.64	15.95	11,287.26
TOTAL POLLUTANTS	46,519.85	236.03	46,283.83	193.98	46,325.88	156.69	46,363.17

Option A - Chemical precipitation, sedimentation, ammonia steam stripping, and cyanide precipitation.

Option B - Chemical precipitation, sedimentation, ammonia steam stripping, cyanide precipitation, and flow reduction.

Option C - Chemical precipitation, sedimentation, ammonia steam stripping, cyanide precipitation, flow reduction, and filtration

Table X-3

COST OF COMPLIANCE FOR DIRECT DISCHARGERS IN THE SECONDARY PRECIOUS METALS SUBCATEGORY

The costs for this subcategory cannot be presented here because the data on which they are based have been claimed to be confidential.

Table X-4

BAT WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Furnace wet air pollution control	4.5	Troy ounces of precious metals, including silver, incinerated or smelted
Raw material granulation	0	Troy ounces of precious metals in the granulated raw material
Spent plating solutions	1.0 liter/ liter	Liters of spent plating solution used as a raw material
Spent cyanide stripping solutions	1.1	Troy ounces of gold stripped
Refinery wet air pollution control	1.0	Troy ounces of precious metals produced in refinery, including silver
Gold solvent extraction raffinate and wash water	0.63	Troy ounces of gold produced by solvent extraction
Gold spent electrolyte	0.0087	Troy ounces of gold produced by electrolysis
Gold precipitation and filtration	4.4	Troy ounces of gold precipitated
Platinum precipitation and filtration	5.2	Troy ounces of platinum precipitated

Table X-4 (Continued)

BAT WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	BAT Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Palladium precipitation and filtration	3.5	Troy ounces of palladium precipitated
Other platinum group metals precipitation and filtration	5.2	Troy ounces of other platinum group metals precipitated
Spent solution from PGC salt production	0.9	Troy ounces of gold contained in PGC product
Equipment and floor wash	0	Troy ounces of precious metals, including silver, produced in refinery

Table X-5

BAT MASS LIMITATIONS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	5.760	2.745
Cyanide (total)	0.900	0.360
Zinc	4.590	1.890
Ammonia (as N)	599.900	263.700

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

Table X-5 (Continued)

BAT MASS LIMITATIONS FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

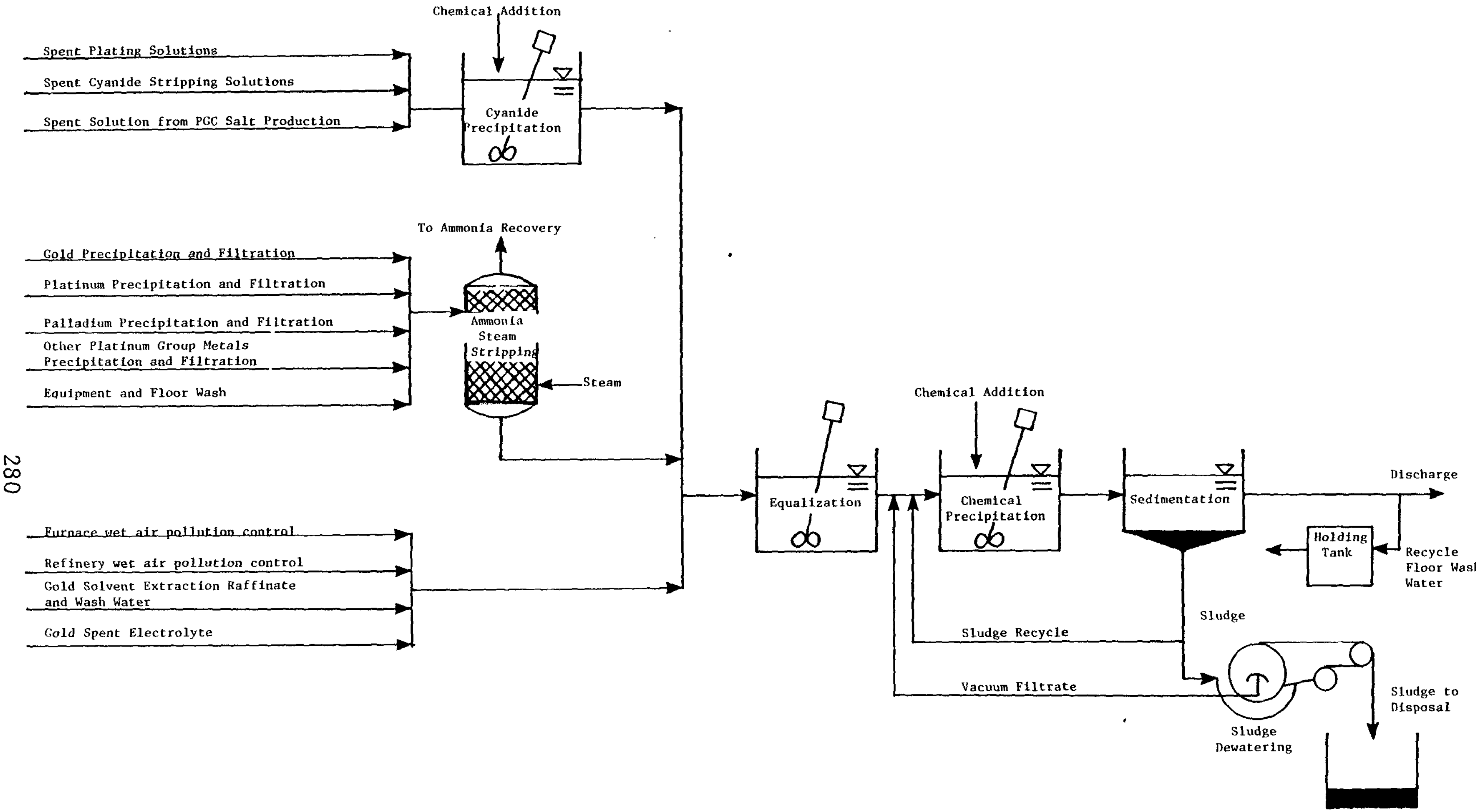

Figure X-1

BAT TREATMENT SCHEME FOR OPTION A

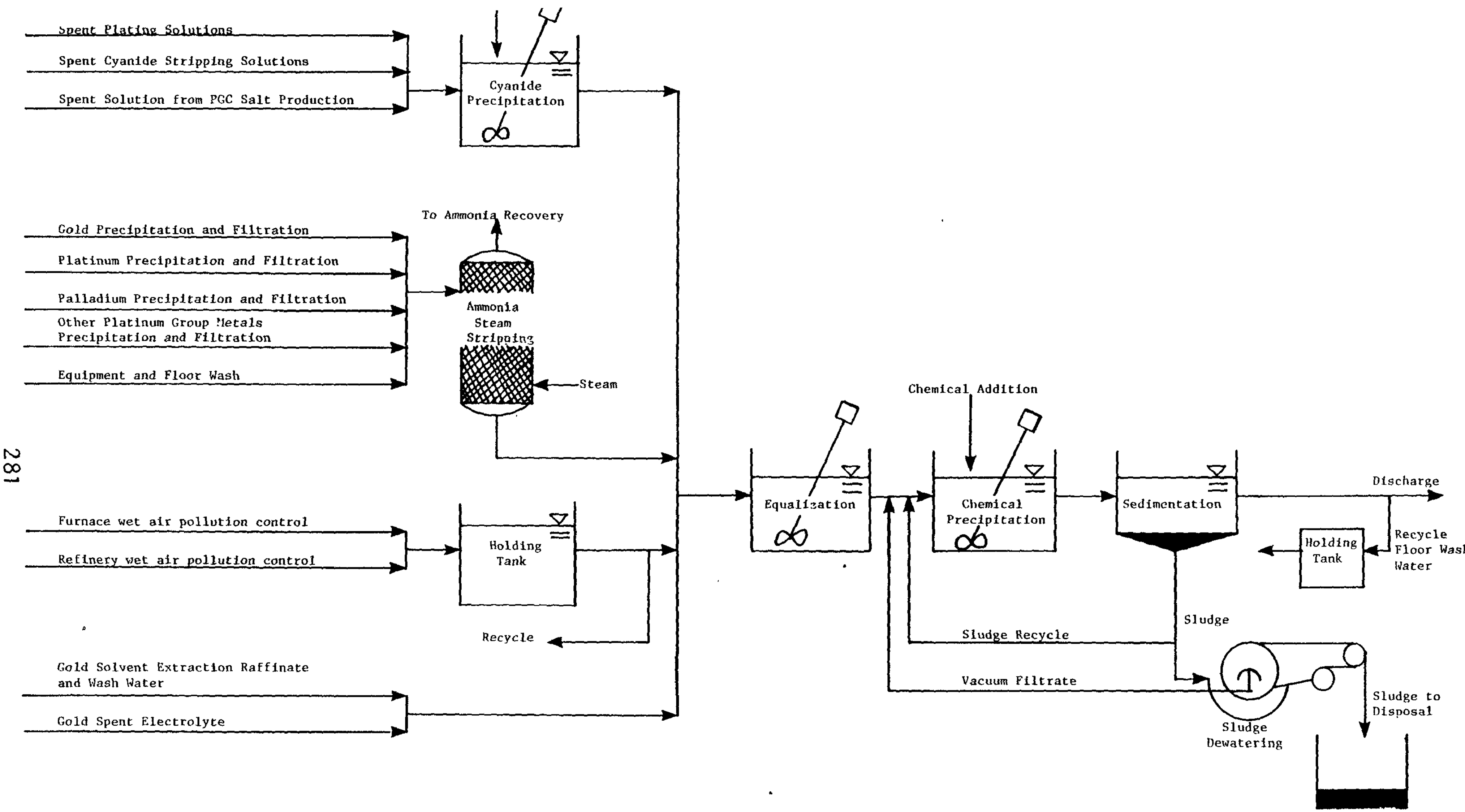

Figure X-2

BAT TREATMENT SCHEME FOR OPTION B

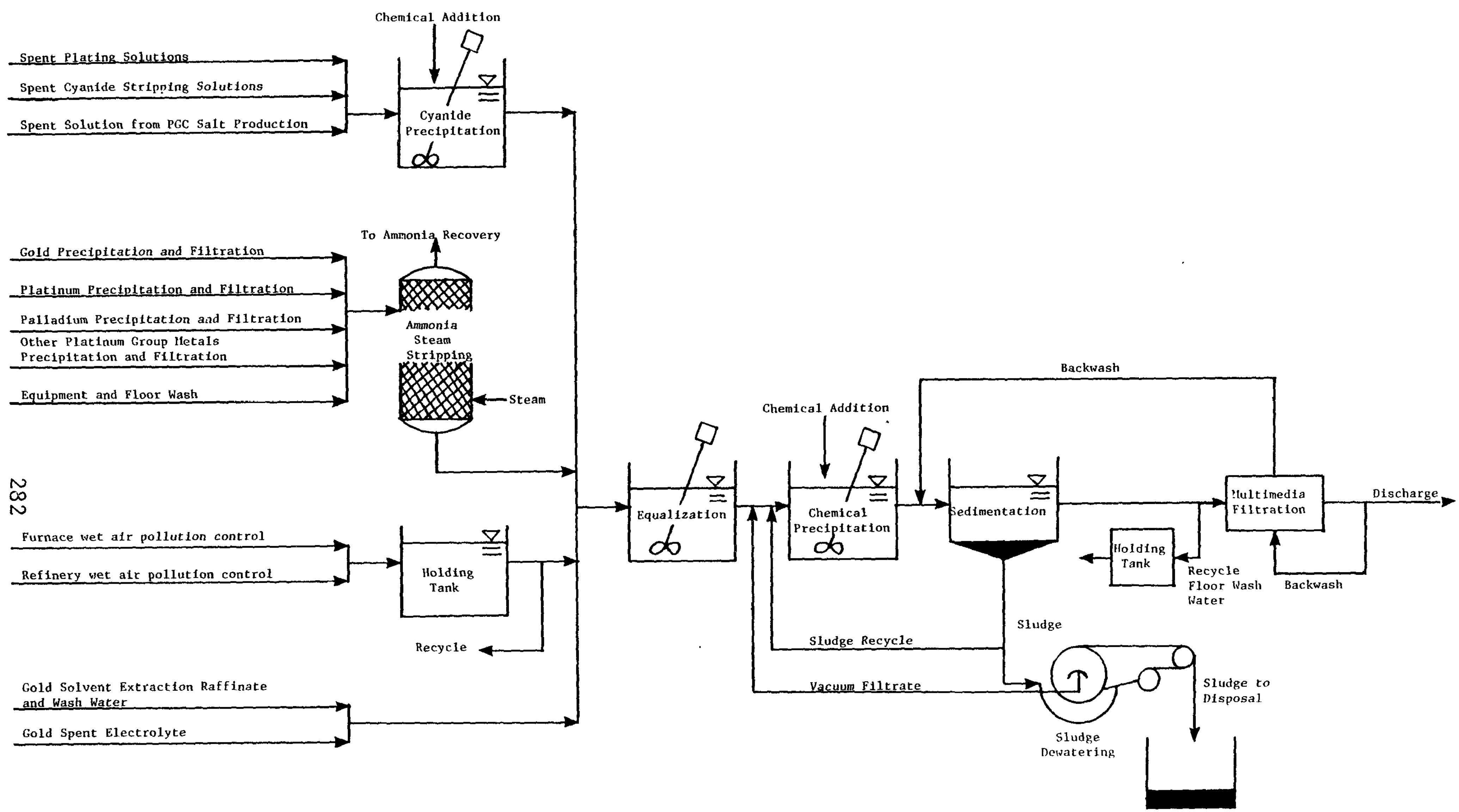

Figure X-3

BAT TREATMENT SCHEME FOR OPTION C

SECONDARY PRECIOUS METALS 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 precious metals 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 precious metals 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 precious metals 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 except for furnace wet air pollution control, since the processes used by new sources are not expected to differ from those used at existing sources. Furnace wet air pollution control is expected to be different at new plants. As shown in Table V-1, 12 of 17 plants use dry air pollution control techniques to control emissions from incinerator or smelting furnaces, and a new plant is expected to be able to economically install dry air pollution control. Except for furnace wet air pollution control, 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 XI-1.

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

OPTION B

- Preliminary treatment with cyanide precipitation (where required)
- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- Dry air pollution control for furnace emissions
- In-process flow reduction of refinery scrubber liquor

OPTION C

- Preliminary treatment with cyanide precipitation (where required)
- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- Dry air pollution control for furnace emissions
- In-process flow reduction of refinery scrubber liquor
- Multimedia filtration

NSPS OPTION SELECTION

We are proposing that NSPS for the secondary precious metals subcategory be equal to BAT, except for furnace air pollution control, which we are proposing as zero discharge. Except for furnace air pollution control, our review of the industry indicates that no new demonstrated technologies exist that improve on BAT technology. Zero discharge for furnace air pollution control is based on dry scrubbing, which is demonstrated at 11 out of 16 plants with furnace air pollution control. Cost for dry scrubbing air pollution control in a new facility is no greater than the cost for wet scrubbing which was the basis for BAT cost estimates. We believe that the proposed NSPS are econmically achievable, and that they are not a barrier to entry of new plants into this subcategory.

The wastewater flow rates for NSPS are the same as the BAT flow rates, except for furnace air pollution control. Further flow reduction measures for NSPS are feasible for furnace air pollution control, because dry scrubbing is demonstrated for controlling emissions from incineration and smelting furnaces; however not from refinery emissions sources. The nature of refinery emissions (acid fumes) technically precludes the use of dry scrubbers. Therefore, EPA is including an allowance from this source at NSPS equivalent to that proposed for BAT. EPA also does not believe that new plants could achieve any additional flow reduction beyond the scrubber effluent recycle rate proposed for BAT.

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, except for furnace wet air pollution control, and are shown in Table XI-1. The mass of pollutant allowed to be discharged per mass of product is calculated by multiplying the appropriate treatable concentration (mg/l) by the production normalized wastewater discharge flows (l/troy ounce). 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 PRECIOUS METALS SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Furnace wet air pollution control	0	Troy ounces of precious metals, including silver, incinerated or smelted
Raw material granulation	0	Troy ounces of precious metals in the granulated raw material
Spent plating solutions	1.0 liter/ liter	Liters of spent plating solutions used as a raw material
Spent cyanide stripping solutions	1.1	Troy ounces of gold stripped
Refinery wet air pollution control	1.0	Troy ounces of precious metals produced in refinery, including silver
Gold solvent extraction raffinate and wash water	0.63	Troy ounces of gold produced by solvent extraction
Gold spent electrolyte	0.0087	Troy ounces of gold produced by electrolysis
Gold precipitation and filtration	4.4	Troy ounces of gold precipitated
Platinum precipitation and filtration	5.2	Troy ounces of platinum precipitated

Table XI-1 (Continued)

NSPS WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	NSPS Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Palladium precipitation and filtration	3.5	Troy ounces of palladium precipitated
Other platinum group metals precipitation and filtration	5.2	Troy ounces of other platinum group metals precipitated
Spent solution from PGC salt production	0.9	Troy ounces of gold contained in PGC product
Equipment and floor wash	0	Troy ounces of precious metals, including silver, produced in refinery

Table XI-2

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000
Total suspended solids	0.000	0.000
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600
Total suspended solids	15.000	12.000
pH	Within the range of 7.5 to 10.0 at all times	

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460
Total suspended solids	16.500	13.200
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600
Total suspended solids	15.000	12.000
pH	Within the range of 7.5 to 10.0 at all times	

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920
Total suspended solids	9.450	7.560
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510
Total suspended solids	0.131	0.104
pH	Within the range of 7.5 to 10.0 at all times	

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800
Total suspended solids	66.000	52.800
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700
Total suspended solids	78.000	62.400
pH	Within the range of 7.5 to 10.0 at all times	

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100
Total suspended solids	52.500	42.000
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700
Total suspended solids	78.000	62.400
pH	Within the range of 7.5 to 10.0 at all times	

(l) Spent Solutions from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740
Total suspended solids	13.500	10.800
pH	Within the range of 7.5 to 10.0 at all times	

Table XI-2 (Continued)

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

NSPS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	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 PRECIOUS METALS 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.

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

TECHNICAL APPROACH TO PRETREATMENT

Before proposing 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.

INDUSTRY COST AND POLLUTANT REMOVAL ESTIMATES

The industry cost and pollutant removal estimates of each treatment option were used to determine the most cost-effective option. The methodology applied in calculating pollutant removal estimates and plant compliance costs is discussed in Section X. Table XII-1 shows the estimated pollutant removal benefits for indirect dischargers. Compliance costs for indirect dischargers are presented in Table XII-2.

PRETREATMENT STANDARDS FOR EXISTING AND NEW SOURCES

Options for pretreatment of wastewaters from both existing and 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 PSES and PSNS, therefore, are the same as the BAT and NSPS options discussed in Sections X and XI, respectively.

A description of each option is presented in Sections X and XI, 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 PSES and PSNS options are:

OPTION A

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

OPTION B

- Preliminary treatment with cyanide precipitation (where required)
- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of furnace and refinery scrubber liquor (for PSNS, dry furnace air pollution control)

OPTION C

- Preliminary treatment with cyanide precipitation (where required)
- Preliminary treatment with ammonia steam stripping (where required)
- Chemical precipitation and sedimentation
- In-process flow reduction of furnace and refinery scrubber liquor (for PSNS, dry furnace air pollution control)
- Multimedia filtration

PSES OPTION SELECTION

We are proposing PSES equal to BAT (Option C) for this subcategory. It is necessary to propose this PSES to prevent pass-through of copper, cyanide, zinc, and ammonia. These toxic pollutants are removed by a well-operated POTW achieving secondary treatment at an average of 32 percent, while BAT level technology removes approximately 99 percent.

The technology basis for PSES thus is chemical precipitation and sedimentation, ammonia steam stripping, cyanide precipitation, wastewater flow reduction, and filtration. The achievable concentration for ammonia steam stripping is based on iron and steel manufacturing category data, as explained in the discussion of BPT and BAT for this subcategory. Flow reduction is based on the same recycle of scrubber effluent that is the flow basis of BAT. Recycle is practiced by 21 of the 29 existing plants in the subcategory.

Implementation of the proposed PSES limitations would remove annually an estimated 98,550 kg of toxic pollutants including 840 kg of cyanide, and an estimated 9,240 kg of ammonia. Capital cost for achieving proposed PSES is $1,419,000 and annualized cost of $984,000. The proposed PSES will not result in adverse economic impacts.

An intermediate option considered for PSES is BAT equivalent technology without filters (Option B). This option removes an estimated 98,530 kg of toxic pollutants and 9,240 kg of ammonia. We estimate the capital cost of this technology is $1,325,000, and annual cost $928,000.

PSNS OPTION SELECTION

We are proposing PSNS equivalent to NSPS (Option C). The technology basis for proposed PSNS is identical to NSPS. This is equivalent to PSES and BAT, with additional flow reduction based on dry air pollution control on furnace emissions. The same pollutants pass through at PSNS as at PSES, for the same reasons. We know of no economically feasible, demonstrated technology that is better than NSPS technology. The NSPS flow allowances are based on minimization of process wastewater wherever possible through the use of holding tanks to recycle wet scrubbing wastewater and the use of dry scrubbing to control furnace emissions. The discharges are based on recycle of these waste streams (see Section X - Recycle of Water Used in Wet Air Pollution Control).

There are no additional costs associated with the installation of dry scrubbers instead of wet scrubbers which were used for estimating cost of BAT. We believe that the proposed PSNS are achievable, and that they are not a barrier to entry of new plants into this subcategory.

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 PSES and PSNS to prevent the pass-through of copper, cyanide, zinc, and ammonia, which are the limited pollutants.

PRETREATMENT STANDARDS

Pretreatment standards are based on the treatable concentrations from the selected treatment technology, (Option C), and the discharge rates determined in Sections X and XI for BAT and NSPS, respectively. A mass of pollutant per mass of product (mg/troy ounce) 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/troy ounce). The achievable treatment concentrations for BAT are identical to those for PSES and PSNS. These concentrations are listed in Tables VII-19 of the General Development Document. PSES and PSNS are presented in Tables XII-4 and XII-6.

Table XII-1

POLLUTANT REMOVAL ESTIMATES FOR INDIRECT DISCHARGERS

Pollutant	Raw Waste (kg/yr)	Option A Discharge (kg/yr)	Option A Removed (kg/yr)	Option B Discharge (kg/yr)	Option B Removed (kg/yr)	Option C Discharge (kg/yr)	Option C Removed (kg/yr)
Antimony	32.42	8.30	24.13	6.91	25.51	5.19	27.24
Arsenic	11.28	5.02	6.26	4.12	7.16	2.94	8.34
Cadmium	15.18	1.96	13.22	0.96	14.22	0.59	14.58
Chromium (Total)	177.34	1.68	175.66	1.02	176.32	0.85	176.49
Copper	2,387.71	14.39	2,373.32	7.03	2,380.68	4.73	2,382.98
Cyanide (Total)	857.13	24.83	832.29	21.97	835.15	17.70	839.42
Lead	93.54	2.98	90.56	1.46	92.09	0.97	92.57
Mercury	0.04	0.04	0.00	0.03	0.01	0.03	0.01
Nickel	2,387.45	18.36	2,369.09	8.98	2,378.47	2.67	2,384.78
Selenium	1,253.97	7.34	1,246.64	3.53	1,250.44	2.35	1,251.62
Silver	38.69	2.48	36.21	1.21	37.48	0.85	37.84
Thallium	10.90	4.85	6.05	3.97	6.93	2.86	8.04
Zinc	91,328.75	8.18	91,320.56	4.00	91,324.75	2.79	91,325.96
TOTAL TOXICS	98,594.40	100.40	98,494.00	65.20	98,529.21	44.53	98,549.87
Ammonia	9,499.14	282.68	9,216.46	258.88	9,240.26	258.88	9,240.26
Cobalt	3.17	0.72	2.46	0.41	2.77	0.30	2.87
Fluoride	9.01	7.32	1.69	6.62	2.39	6.62	2.39
TOTAL NONCONVENTIONALS	9,511.33	290.71	9,220.62	265.90	9,245.43	265.80	9,245.53
TSS	41,346.57	297.75	41,048.82	145.55	41,201.02	31.54	41,315.03
Oil and Grease	28.94	23.75	5.18	21.59	7.35	21.59	7.35
TOTAL CONVENTIONALS	41,375.51	321.50	41,054.01	167.14	41,208.37	53.12	41,322.38
TOTAL POLLUTANTS	149,481.24	712.61	148,768.62	498.24	148,983.00	363.45	149,117.78

Option A - Chemical precipitation, sedimentation, ammonia steam stripping, and cyanide precipitation.

Option B - Chemical precipitation, sedimentation, ammonia steam stripping, cyanide precipitation, and flow reduction.

Option C - Chemical precipitation, sedimentation, ammonia steam stripping, cyanide precipitation, flow reduction, and filtration

Table XII-2

COST OF COMPLIANCE FOR THE
SECONDARY PRECIOUS METALS SUBCATEGORY

INDIRECT DISCHARGERS

Option	Total Required Capital Cost (1982 Dollars)	Total Annual Cost (1982 Dollars)
A	1,392,000	950,000
B	1,325,000	928,000
C	1,419,000	984,000

Table XII-3

PSES WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	PSES Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Furnace wet air pollution control	4.5	Troy ounces of precious metals, including silver, incinerated or smelted
Raw material granulation	0	Troy ounces of precious metals in the granulated raw material
Spent plating solutions	1.0 liter/ liter	Liters of spent plating solutions used as a raw material
Spent cyanide stripping solutions	1.1	Troy ounces of gold stripped
Refinery wet air pollution control	1.0	Troy ounces of precious metals produced in refinery, including silver
Gold solvent extraction raffinate and wash water	0.63	Troy ounces of gold produced by solvent extraction
Gold spent electrolyte	0.0087	Troy ounces of gold produced by electrolysis
Gold precipitation and filtration	4.4	Troy ounces of gold precipitated
Platinum precipitation and filtration	5.2	Troy ounces of platinum precipitated

Table XII-3 (Continued)

PSES WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	PSES Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Palladium precipitation and filtration	3.5	Troy ounces of palladium precipitated
Other platinum group metals precipitation and filtration	5.2	Troy ounces of other platinum group metals precipitated
Spent solution from PGC salt production	0.9	Troy ounces of gold contained in PGC product
Equipment and floor wash	0	Troy ounces of precious metals, including silver, produced in refinery

Table XII-4

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	5.760	2.745
Cyanide (total)	0.900	0.360
Zinc	4.590	1.890
Ammonia (as N)	599.900	263.700

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

Table XII-4 (Continued)

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

Table XII-4 (Continued)

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

Table XII-4 (Continued)

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

Table XII-4 (Continued)

PSES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

Table XII-5

PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Furnace wet air pollution control	0	Troy ounces of precious metals, including silver, incinerated or smelted
Raw material granulation	0	Troy ounces of precious metals in the granulated raw material
Spent plating solutions	1.0 liter/liter	Liters of spent plating solutions used as a raw material
Spent cyanide stripping solutions	1.1	Troy ounces of gold stripped
Refinery wet air pollution control	1.0	Troy ounces of precious metals produced in refinery, including silver
Gold solvent extraction raffinate and wash water	0.63	Troy ounces of gold produced by solvent extraction
Gold spent electrolyte	0.0087	Troy ounces of gold produced by electrolysis
Gold precipitation and filtration	4.4	Troy ounces of gold precipitated
Platinum precipitation and filtration	5.2	Troy ounces of platinum precipitated

Table XII-5 (Continued)

PSNS WASTEWATER DISCHARGE RATES FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

Wastewater Stream	PSNS Normalized Discharge Rate liters per troy ounce	Production Normalizing Parameter
Palladium precipitation and filtration	3.5	Troy ounces of palladium precipitated
Other platinum group metals precipitation and filtration	5.2	Troy ounces of other platinum group metals precipitated
Spent solution from PGC salt production	0.9	Troy ounces of gold contained in PGC product
Equipment and floor wash	0	Troy ounces of precious metals, including silver, produced in refinery

Table XII-6

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(a) Furnace Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, incinerated or smelted		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

(b) Raw Material Granulation

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals in the granulated raw material		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

(c) Spent Plating Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/liter of spent plating solution used as a raw material		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

Table XII-6 (Continued)

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(d) Spent Cyanide Stripping Solutions

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by cyanide stripping		
Copper	1.408	0.671
Cyanide (total)	0.220	0.088
Zinc	1.122	0.462
Ammonia (as N)	146.600	64.460

(e) Refinery Wet Air Pollution Control

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	1.280	0.610
Cyanide (total)	0.200	0.080
Zinc	1.020	0.420
Ammonia (as N)	133.300	58.600

(f) Gold Solvent Extraction Raffinate and Wash Water

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by solvent extraction		
Copper	0.806	0.384
Cyanide (total)	0.126	0.050
Zinc	0.643	0.265
Ammonia (as N)	83.980	36.920

Table XII-6 (Continued)

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(g) Gold Spent Electrolyte

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold produced by electrolysis		
Copper	0.0111	0.0053
Cyanide (total)	0.0017	0.0007
Zinc	0.0089	0.0037
Ammonia (as N)	1.160	0.510

(h) Gold Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold precipitated		
Copper	5.632	2.684
Cyanide (total)	0.880	0.352
Zinc	4.488	1.848
Ammonia (as N)	586.500	257.800

(i) Platinum Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of platinum precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

Table XII-6 (Continued)

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(j) Palladium Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of palladium precipitated		
Copper	4.480	2.135
Cyanide (total)	0.700	0.280
Zinc	3.570	1.470
Ammonia (as N)	466.600	205.100

(k) Other Platinum Group Metals Precipitation and Filtration

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of other platinum group metals precipitated		
Copper	6.656	3.172
Cyanide (total)	1.040	0.416
Zinc	5.304	2.184
Ammonia (as N)	693.200	304.700

(l) Spent Solution from PGC Salt Production

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of gold contained in PGC product		
Copper	1.152	0.549
Cyanide (total)	0.180	0.072
Zinc	0.918	0.378
Ammonia (as N)	120.000	52.740

Table XII-6 (Continued)

PSNS FOR THE SECONDARY PRECIOUS METALS SUBCATEGORY

(m) Equipment and Floor Wash

Pollutant or Pollutant Property	Maximum for Any One Day	Maximum for Monthly Average
mg/troy ounce of precious metals, including silver, produced in refinery		
Copper	0.000	0.000
Cyanide (total)	0.000	0.000
Zinc	0.000	0.000
Ammonia (as N)	0.000	0.000

SECONDARY PRECIOUS METALS SUBCATEGORY

SECTION XIII

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

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