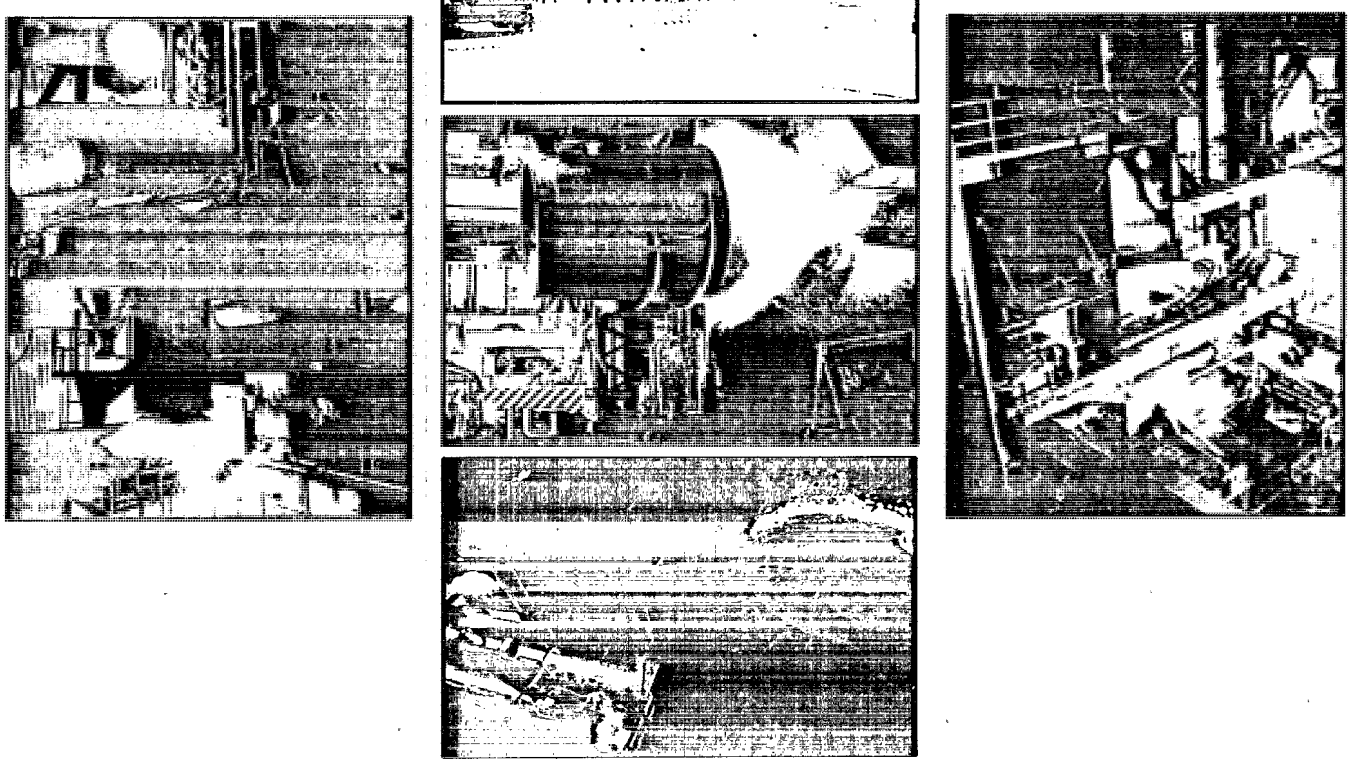
United States
Environmental Protection
Agency

Office of Water (4303)
Washington, DC 20460

EPA-821-B-00-011
December 2000

EPA

Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category



Printed on paper containing at least 30% postconsumer recovered fiber.

EPA-821-B-00-011

DEVELOPMENT DOCUMENT FOR PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY

December 2000

Office of Water
Office of Science and Technology
Engineering and Analysis Division
U.S. Environmental Protection Agency
Washington, DC 20460

ACKNOWLEDGMENT AND DISCLAIMER

This report has been reviewed and approved for publication by the Engineering and Analysis Division, Office of Science and Technology. The Agency would like to acknowledge the contributions of George Jett, Kevin Tingley, Yu-ting Liu, Elwood Forsht, William Anderson, Charles Tamulonis, Marla Smith, Jade Lee-Freeman, Jeanette Kranacs, Jan Matuszko, Ahmar Siddiqui, Maria Gomez-Taylor, Carol Ann Siciliano, and Beverly Randolph toward the development of this technical document.

This report was prepared with the support of ERG, with subcontract support provided by Amendola Engineering, Inc., Hatch Engineering, GeoLogics Corporation, and DynCorp and statistical support provided by Science Applications International Corporation (SAIC) and Westat, under the direction and review of the Office of Science and Technology. Neither the United States Government nor any of its employees, contractors, subcontractors, or their employees make any warrant, expressed or implied, or assume any legal liability or responsibility for any third party's use of or the results of such use of any information, apparatus, product, or process discussed in this report, or represents that its use by such party would not infringe on privately owned rights.

The Agency wishes to thank the participating iron and steel mills for contributing to this study. Their help has been invaluable.

Cover photographs are courtesy of the Association of Iron and Steel Engineers and California Steel Industries, Inc.

The primary contact regarding questions or comments on this document is:

George Jett
U.S. EPA Engineering and Analysis Division (4303)
Ariel Rios Building
1200 Pennsylvania Avenue NW
Washington, DC 20460

(202) 260-7151 (telephone)
(202) 260-7185 (fax)
jett.george@epa.gov

TABLE OF CONTENTS

		Page
1	APPLICABILITY AND SUMMARY OF PROPOSED REGULATION	1-1
	1.1 Applicability	1-1
	1.2 Applicability Interface With Other Regulations	1-2
	1.2.1 Metal Products and Machinery	1-3
	1.2.2 Electroplating	1-4
	1.2.3 Metal Finishing	1-4
	1.2.4 Coil Coating	1-5
	1.2.5 Ferroalloy Manufacturing	1-5
	1.2.6 Metal Molding and Casting	1-5
	1.3 Summary of Proposed Regulation	1-5
	1.4 Protection of Confidential Business Information	1-8
	1.5 References	1-8
2	BACKGROUND	2-1
	2.1 Legal Authority	2-1
	2.1.1 Legislative Background	2-1
	2.1.2 Section 304(m) Requirements and Litigation	2-4
	2.2 History of Iron and Steel Category Rulemaking Activities	2-4
	2.2.1 Prior Regulations	2-4
	2.2.2 1982 Regulation	2-6
	2.2.3 Preliminary Study of the Iron and Steel Category	2-8
3	DATA COLLECTION	3-1
	3.1 Surveys	3-1
	3.2 Site Visits	3-6
	3.3 Sampling	3-7
	3.4 Other Data Sources	3-9
	3.5 Public Participation	3-10
	3.6 References	3-11
4	ANALYTICAL METHODS AND BASELINE VALUES	4-1
	4.1 Explanation and Importance of Baseline Values	4-1
	4.2 Reporting Conventions Associated with Analytical Results	4-2
	4.3 Nominal Quantitation Limits	4-3
	4.4 Comparisons to Baseline Values	4-4
	4.4.1 Comparison Type 1	4-4
	4.4.2 Comparison Type 2	4-4
	4.5 Analytical Methods	4-5
	4.5.1 Methods 1613B, 1625, 1664 (TCDF, Benzo(a)pyrene, Naphthalene, Phenol, HEM)	4-6

TABLE OF CONTENTS (Continued)

		Page
	4.5.2 Method 1620 and 200.7 (Chromium, Lead, Mercury, Nickel, Selenium, Zinc)	4-7
	4.5.3 Method 160.2, 209C, and 2540D (Total Suspended Solids)	4-8
	4.5.4 Method 218.4 (Hexavalent Chromium)	4-8
	4.5.5 Method 239.2 (Lead)	4-8
	4.5.6 Method 245.1 (Mercury)	4-9
	4.5.7 Method 3120B (Chromium and Hexavalent Chromium)	4-9
	4.5.8 Method 3130B (Lead, Zinc)	4-10
	4.5.9 Method 335.2 (Total Cyanide)	4-10
	4.5.10 Method 340.2 (Fluoride)	4-11
	4.5.11 Methods 350.2, 417/350.2, and 4500-NH_3 (Ammonia as Nitrogen)	4-11
	4.5.12 Methods 353.1, 353.2, and 353.3 (Nitrate/Nitrite)	4-12
	4.5.13 Methods 4500-CN M and D4374-98 (Thiocyanate)	4-12
	4.5.14 Method 625 (Naphthalene)	4-13
	4.5.15 Method 8270 (Benzo(a)pyrene)	4-13
	4.5.16 Methods 330.1, 330.2, 330.3, 330.4, 330.5 (Total Residual Chlorine)	4-14
	4.6 References	4-15
5	DESCRIPTION OF THE INDUSTRY	5-1
	5.1 Types of Sites	5-1
	5.2 Manufacturing Operations	5-4
	5.2.1 Cokemaking	5-4
	5.2.2 Sintering	5-6
	5.2.3 Briquetting	5-7
	5.2.4 Blast Furnace Ironmaking	5-7
	5.2.5 Direct Reduced Ironmaking	5-9
	5.2.6 Steelmaking: Basic Oxygen Furnaces (BOFs) and Electric Arc Furnaces (EAFs)	5-9
	5.2.7 Vacuum Degassing	5-11
	5.2.8 Ladle Metallurgy and Secondary Steelmaking	5-12
	5.2.9 Casting	5-13
	5.2.10 Hot Forming	5-14
	5.2.11 Finishing	5-17
	5.3 References	5-20
6	SUBCATEGORIZATION	6-1
	6.1 Subcategorization Process	6-1
	6.2 Subcategory A: Cokemaking	6-4

TABLE OF CONTENTS (Continued)

		Page
6.3	Subcategory B: Ironmaking	6-4
6.4	Subcategory C: Integrated Steelmaking	6-5
6.5	Subcategory D: Integrated and Stand-Alone Hot Forming	6-6
6.6	Subcategory E: Non-Integrated Steelmaking and Hot Forming	6-6
6.7	Subcategory F: Steel Finishing	6-7
6.8	Subcategory G: Other Operations	6-10
7	WASTEWATER CHARACTERIZATION	7-1
7.1	Identification of Pollutants of Concern	7-1
7.2	Calculation of Production-Normalized Flow Rates	7-3
7.3	Cokemaking Subcategory	7-5
7.4	Ironmaking Subcategory	7-8
7.4.1	Sintering	7-9
7.4.2	Blast Furnace Ironmaking Segment	7-10
7.5	Integrated Steelmaking Subcategory	7-12
7.5.1	Basic Oxygen Furnace (BOF) Steelmaking	7-12
7.5.2	Ladle Metallurgy	7-14
7.5.3	Vacuum Degassing	7-14
7.5.4	Continuous Casting	7-15
7.6	Integrated and Stand-Alone Hot Forming Subcategory	7-16
7.7	Non-Integrated Steelmaking and Hot Forming Subcategory	7-18
7.7.1	Electric Arc Furnace (EAF) Steelmaking	7-18
7.7.2	Ladle Metallurgy	7-18
7.7.3	Vacuum Degassing	7-18
7.7.4	Continuous Casting	7-19
7.7.5	Hot Forming	7-21
7.8	Steel Finishing Subcategory	7-22
7.8.1	Acid Pickling	7-23
7.8.2	Cold Forming	7-26
7.8.3	Alkaline Cleaning	7-28
7.8.4	Continuous Annealing	7-29
7.8.5	Hot Coating	7-30
7.8.6	Electroplating	7-31
7.9	Other Operations Subcategory	7-32
7.9.1	Directed Reduced Ironmaking (DRI) Segment	7-33
7.9.2	Forging Segment	7-33
7.9.3	Briquetting Segment	7-34
7.10	References	7-34

TABLE OF CONTENTS (Continued)

		Page
8	TECHNOLOGY OPTIONS	8-1
	8.1 Technology Overview	8-1
	8.1.1 In-Process Technologies	8-2
	8.1.2 End-of-Pipe Treatment Technologies	8-10
	8.2 Development of Technology Options	8-29
	8.2.1 Technology Options by Subcategory	8-29
	8.3 References	8-34
9	INCREMENTAL INVESTMENT AND OPERATING AND MAINTENANCE COSTS FOR PROPOSED REGULATION	9-1
	9.1 Methodology	9-1
	9.1.1 Investment Costs	9-3
	9.1.2 Operating and Maintenance Costs	9-6
	9.1.3 One-Time Costs	9-8
	9.2 Results	9-9
	9.2.1 Cokemaking Subcategory - By-Product Segment	9-9
	9.2.2 Ironmaking Subcategory	9-12
	9.2.3 Integrated Steelmaking Subcategory	9-15
	9.2.4 Integrated and Stand-Alone Hot Forming Subcategory	9-16
	9.2.5 Non-Integrated Steelmaking and Hot Forming Subcategory	9-18
	9.2.6 Steel Finishing Subcategory	9-19
	9.2.7 Other Operations Subcategory	9-23
	9.3 References	9-24
10	POLLUTANT LOADINGS	10-1
	10.1 Sources and Use of Available Data	10-2
	10.1.1 Analytical Data Sources	10-2
	10.1.2 Calculation of Averages from Analytical Data	10-2
	10.2 Methodology	10-3
	10.2.1 Baseline Pollutant Loading Calculation	10-5
	10.2.2 Treated Pollutant Loading Calculation	10-7
	10.3 Pollutant Loadings for the Cokemaking Subcategory	10-10
	10.3.1 Baseline Pollutant Loadings	10-10
	10.3.2 Treated Pollutant Loadings	10-11
	10.4 Pollutant Loadings for the Ironmaking Subcategory	10-14
	10.4.1 Baseline Pollutant Loadings	10-14
	10.4.2 Treated Pollutant Loadings	10-15
	10.5 Pollutant Loadings for the Integrated Steelmaking Subcategory	10-16
	10.5.1 Baseline Pollutant Loadings	10-16
	10.5.2 Treated Pollutant Loadings	10-17

TABLE OF CONTENTS (Continued)

		Page
10.6	Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory	10-18
	10.6.1 Baseline Pollutant Loadings	10-18
	10.6.2 Treated Pollutant Loadings	10-19
10.7	Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory	10-20
	10.7.1 Baseline Pollutant Loadings	10-21
	10.7.2 Treated Pollutant Loadings	10-21
10.8	Pollutant Loadings for the Steel Finishing Subcategory	10-23
	10.8.1 Baseline Pollutant Loadings	10-23
	10.8.2 Treated Pollutant Loadings	10-23
10.9	Pollutant Loadings for the Other Operations Subcategory	10-26
	10.9.1 Baseline Pollutant Loadings	10-26
	10.9.2 Treated Pollutant Loadings	10-26
10.10	References	10-28
11	REGULATED POLLUTANTS	11-1
11.1	Regulated Pollutant Selection Methodology for Direct Dischargers	11-1
11.2	Cokemaking Subcategory	11-3
11.3	Ironmaking Subcategory	11-4
11.4	Integrated Steelmaking Subcategory	11-5
11.5	Integrated and Stand-Alone Hot Forming Subcategory	11-5
	11.5.1 Carbon and Alloy Steel Segment	11-5
	11.5.2 Stainless Steel Segment	11-6
11.6	Non-Integrated Steelmaking and Hot Forming Subcategory	11-6
	11.6.1 Carbon and Alloy Steel Segment	11-7
	11.6.2 Stainless Steel Segment	11-7
11.7	Steel Finishing Subcategory	11-7
	11.7.1 Carbon and Alloy Steel Segment	11-8
	11.7.2 Stainless Steel Segment	11-8
11.8	Other Operations Subcategory	11-10
	11.8.1 Direct Reduced Ironmaking Segment	11-10
	11.8.2 Forging Segment	11-10
11.9	Regulated Pollutant Selection Methodology for Indirect Dischargers	11-10
	11.9.1 POTW Pass-Through Methodology	11-12
11.10	Cokemaking Subcategory	11-18
11.11	Ironmaking Subcategory	11-19
11.12	Integrated Steelmaking Subcategory	11-19
11.13	Integrated and Stand-Alone Hot Forming Subcategory	11-20

TABLE OF CONTENTS (Continued)

Page

11.13.1 Carbon and Alloy Steel Segment 11-20
11.13.2 Stainless Steel Segment 11-20
11.14 Non-Integrated Steelmaking and Hot Forming Subcategory 11-21
11.14.1 Carbon and Alloy Steel Segment 11-21
11.14.2 Stainless Steel Segment 11-21
11.15 Steel Finishing Subcategory 11-22
11.15.1 Carbon and Alloy Steel Segment 11-22
11.15.2 Stainless Steel Segment 11-22
11.16 Other Operations Subcategory 11-23
11.16.1 Direct Reduced Ironmaking Segment 11-23
11.16.2 Forging Segment 11-23
11.17 References 11-23

12 LIMITATIONS AND STANDARDS: DATA SELECTION AND CALCULATION 12-1
12.1 Overview of Data Selection 12-1
12.2 Episode Selection for Each Subcategory and Option 12-4
12.2.1 Subpart A: Cokemaking Subcategory 12-4
12.2.2 Subpart B: Ironmaking Subcategory 12-12
12.2.3 Subpart C: Integrated Steelmaking Subcategory 12-15
12.2.4 Subpart D: Integrated and Stand-Alone Hot Forming Subcategory 12-15
12.2.5 Subpart E: Non-Integrated Steelmaking and Hot Forming Subcategory 12-16
12.2.6 Subpart F: Steel Finishing Subcategory 12-18
12.2.7 Subpart G: Other Operations 12-20
12.3 Data Substitutions 12-21
12.4 Data Aggregation 12-21
12.4.1 Aggregation of Field Duplicates 12-22
12.4.2 Aggregation of Grab Samples 12-23
12.4.3 Aggregation of Data Across Outfalls ("Flow-Weighting") 12-24
12.5 Overview of Limitations 12-25
12.5.1 Objective 12-25
12.5.2 Selection of Percentiles 12-26
12.5.3 Compliance with Limitations 12-27
12.6 Summary of Proposed Limitations 12-28
12.7 Estimation of Concentration-Based Limitations 12-30
12.7.1 Calculation of Option Long-Term Averages 12-30
12.7.2 Comparison of Option Long-Term Averages to Baseline Values 12-31

TABLE OF CONTENTS (Continued)

		Page
	12.7.3 Transfer of Option Long-Term Average	12-32
	12.7.4 Calculation of Option Variability Factors	12-32
	12.7.5 Transfers of Option Variability Factors	12-33
	12.7.6 Summary of Steps Used to Derive Concentration-Based Limitations	12-35
12.8	Conversion to Production-Normalized Limitations	12-36
	12.8.1 Conversion from Concentration-Based Limitations	12-36
	12.8.2 Significant Digits for Production-Normalized Limitations	12-38
12.9	Transfers of Limitations	12-38
13	NON-WATER QUALITY ENVIRONMENTAL IMPACTS	13-1
13.1	Energy Requirement Impacts	13-1
	13.1.1 Cokemaking Subcategory	13-1
	13.1.2 Ironmaking Subcategory	13-2
	13.1.3 Integrated Steelmaking Subcategory	13-2
	13.1.4 Integrated and Stand-Alone Hot Forming Subcategory	13-2
	13.1.5 Non-Integrated Steelmaking and Hot Forming Subcategory	13-3
	13.1.6 Steel Finishing Subcategory	13-3
	13.1.7 Other Operations Subcategory	13-3
	13.1.8 Energy Requirements Summary	13-4
13.2	Air Emission Impacts	13-4
13.3	Solid Waste Impacts	13-5
	13.3.1 Cokemaking Subcategory	13-6
	13.3.2 Ironmaking Subcategory	13-7
	13.3.3 Integrated Steelmaking Subcategory	13-7
	13.3.4 Integrated Steelmaking and Stand-Alone Hot Forming Subcategory	13-8
	13.3.5 Non-Integrated and Stand-Alone Hot Forming Subcategory	13-8
	13.3.6 Steel Finishing Subcategory	13-8
	13.3.7 Other Operations Subcategory	13-9
13.4	References	13-10
14	SELECTED OPTIONS AND PROPOSED EFFLUENT LIMITATIONS AND STANDARDS	14-1
14.1	BPT	14-1
	14.1.1 Manufacturing Operations New to the Iron and Steel Category	14-1
	14.1.2 Manufacturing Operations Currently Regulated	14-2
14.2	BCT	14-4
14.3	BAT, NSPS, PSES, and PSNS	14-5

TABLE OF CONTENTS (Continued)

Page

14.3.1 Cokemaking 14-7
14.3.2 Ironmaking 14-12
14.3.3 Integrated Steelmaking 14-16
14.3.4 Integrated and Stand-Alone Hot Forming 14-18
14.3.5 Non-Integrated Steelmaking and Hot Forming Subcategory 14-26
14.3.6 Steel Finishing 14-30
14.3.7 Other Operations 14-43
14.4 References 14-45

15 IMPLEMENTATION OF PART 420 THROUGH THE NPDES AND PRETREATMENT PROGRAMS 15-1
15.1 NPDES Permit Program 15-1
15.2 National Pretreatment Standards 15-3
15.3 NPDES Permit and Pretreatment Production Rates 15-4
15.3.1 Alternatives for Establishing Permit Effluent Limitations . . 15-6
15.4 Applications of Best Professional Judgement 15-10
15.5 Calculating NPDES and Pretreatment Effluent Limitations 15-11
15.5.1 Direct Dischargers 15-12
15.5.2 Indirect Dischargers 15-14
15.6 Water Bubble 15-16
15.7 Monitoring Requirements 15-18
15.7.1 Sample Types 15-18
15.7.2 Monitoring Frequency 15-19
15.7.3 Compliance Monitoring Locations 15-19
15.8 Best Management Practices 15-20
15.9 Bypasses and Upsets 15-22
15.10 NPDES Permit and Pretreatment Variances 15-23
15.10.1 Economic Variances 15-23
15.10.2 Variances Based on Localized Environmental Factors 15-24
15.10.3 Fundamentally Different Factors Variances 15-25
15.10.4 Thermal Discharge Variances 15-25
15.10.5 Net Credits 15-26
15.11 References 15-26

16 GLOSSARY

TABLE OF CONTENTS (Continued)

Appendix A: SURVEY DESIGN AND CALCULATION OF NATIONAL ESTIMATES
Appendix B: REVISED EDITING CRITERIA FOR POTW PASS-THROUGH ANALYSIS
Appendix C: REVISED DATA CONVENTIONS
Appendix D: AGGREGATED DATA LISTING
Appendix E: MODIFIED DELTA-LOGNORMAL DISTRIBUTION
Appendix F: ATTACHMENTS FOR SECTION 12

LIST OF TABLES

		Page
3-1	Iron and Steel Industry Strata	3-14
3-2	Number of Site Visits Conducted in Each State and in Canada	3-15
3-3	Number of Site Visits Conducted at Each Type of Site	3-16
3-4	Number of Sites Visited With Each Type of Manufacturing Process	3-17
3-5	Manufacturing Processes Sampled	3-18
3-6	Treatment Systems Sampled	3-19
3-7	Wastewater Analytical Methods Used During Sampling Program	3-22
4-1	Analytical Methods and Baseline Values	4-16
5-1	1997 National Estimate of Types of Iron and Steel Sites in the United States	5-22
5-2	Survey Response of Sites Producing Steel Types	5-23
5-3	1997 National Estimate of Number of Direct, Indirect, and Zero Discharging Sites	5-24
5-4	1997 National Estimate of Actual Production and Rated Capacity by Manufacturing Operation	5-25
6-1	1982 Subcategorization	6-11
6-2	Proposed Subcategorization	6-14
6-3	Subcategory Comparison of the 1982 and Proposed Regulations	6-17
7-1	1997 National Estimate of Annual Discharge from Manufacturing Operations by Discharge Type	7-35
7-2	Pollutants of Concern Cokemaking Subcategory - By-Product Segment	7-36
7-3	Pollutants of Concern Ironmaking Subcategory - Sintering Segment	7-39

LIST OF TABLES (Continued)

		Page
7-4	Pollutants of Concern Ironmaking Subcategory - Blast Furnace Segment	7-42
7-5	Pollutants of Concern Integrated Steelmaking Subcategory	7-43
7-6	Pollutants of Concern Integrated and Stand-Alone Hot Forming Subcategory - Carbon and Alloy Steel Segment	7-44
7-7	Pollutants of Concern Integrated and Stand-Alone Hot Forming Subcategory - Stainless Steel Segment	7-45
7-8	Pollutants of Concern Non-Integrated Steelmaking and Hot Forming Subcategory - Carbon and Alloy Steel Segment	7-46
7-9	Pollutants of Concern Non-Integrated Steelmaking and Hot Forming Subcategory - Stainless Steel Segment	7-47
7-10	Pollutants of Concern Steel Finishing Subcategory - Carbon and Alloy Steel Segment	7-48
7-11	Pollutants of Concern Stainless Finishing Subcategory - Stainless Steel Segment	7-50
7-12	Pollutants of Concern Other Operations Subcategory - Direct Reduced Ironmaking Segment	7-52
8-1	Iron and Steel In-Process Technologies	8-36
8-2	Iron and Steel End-of-Pipe Treatment and Disposal Technologies	8-38
8-3	Wastewater Treatment Technologies Reported by Industry Survey Respondents for By-Product Recovery Cokemaking Sites	8-43
8-4	High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Blast Furnace Ironmaking and Sintering Sites	8-44
8-5	High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Integrated Steelmaking Sites	8-45

LIST OF TABLES (Continued)

		Page
8-6	High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Integrated and Stand-Alone Hot Forming Sites	8-46
8-7	High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Non-Integrated Steelmaking and Hot Forming Sites	8-47
8-8	In-Process and End-of-Pipe Wastewater Treatment Technologies Reported by Industry Survey Respondents for Steel Finishing Sites	8-48
8-9	High-Rate Recycle Equipment and Blowdown Wastewater Treatment Technologies Reported by Industry Survey Respondents for Direct Reduced Ironmaking and Forging Sites	8-49
9-1	Cost Factors to Determine Investment Costs	9-25
9-2	Iron and Steel Investment Cost Equations	9-26
9-3	Iron and Steel Operating and Maintenance (O&M) Cost Equations	9-30
9-4	Assumptions Used to Estimate Investment Costs	9-42
9-5	Design Specifications for Cokemaking Granular Activated Carbon Treatment Systems	9-43
9-6	Estimated Investment Costs for Cokemaking Granular Activated Carbon Systems (100,000 - 2,700,000 gpd)	9-44
9-7	Design Specifications for Cokemaking Alkaline Chlorination Treatment Systems	9-49
9-8	Estimated Investment Costs for Cokemaking Alkaline Chlorination Treatment Systems (100,000 - 2,700,000 gpd)	9-50
9-9	Design Specifications for Metals Precipitation Systems for Bast Furnace and Sintering Wastewater	9-58
9-10	Estimated Investment Costs for Metals Precipitations Systems for Blast Furnace and Sintering Wastewater (150,000 - 2,000,000 gpd)	9-59

LIST OF TABLES (Continued)

		Page
9-11	Design Specifications for Alkaline Chlorination Systems for Blast Furnace and Sintering Wastewater	9-65
9-12	Estimated Investment Costs for Alkaline Chlorination Systems for Blast Furnace and Sintering Wastewater (150,000 - 2,000;000 gpd)	9-66
9-13	Design Specifications for Metals Precipitation Systems for Basic Oxygen Furnace, Vacuum Degassing, and Continuous Casting Wastewater	9-73
9-14	Estimated Investment Costs for Metals Precipitation Systems for Basic Oxygen Furnace, Vacuum Degassing, and Continuous Casting Wastewater (150,000 - 2,000,000 gpd)	9-74
9-15	Design Specifications for Multimedia Filtration Systems	9-80
9-16	Estimated Investment Costs for Multimedia Filtration Systems (150,000 - 20,000,000 gallons per day)	9-81
9-17	Summary of Costs for the Cokemaking Subcategory (in millions of 1997 dollars)	9-89
9-18	Summary of Costs for the Ironmaking Subcategory (in millions of 1997 dollars)	9-89
9-19	Summary of Costs for the Integrated Steelmaking Subcategory (in millions of 1997 dollars)	9-89
9-20	Summary of Costs for the Integrated and Stand-Alone Hot Forming Subcategory (in millions of 1997 dollars)	9-90
9-21	Summary of Costs for the Non-integrated Steelmaking and Hot Forming Subcategory (in millions of 1997 dollars)	9-90
9-22	Summary of Costs for the Steel Finishing Subcategory (in millions of 1997 dollars)	9-91

LIST OF TABLES (Continued)

		Page
9-23	Summary of Costs for the Other Operations Subcategory (in millions of 1997 dollars)	9-91
10-1	Pollutants of Concern Not Detected in Effluent at Any Site	10-29
10-2	POTW Percent Removal Efficiency	10-33
10-3	Average Baseline Pollutant Concentrations Used for Data Transfers in the Cokemaking Subcategory By-Product Cokemaking Segment	10-36
10-4	Proposed Arithmetic Long-Term Averages for the Cokemaking Subcategory By-Product Cokemaking Segment	10-38
10-5	Summary of Baseline and Post-Compliance Pollutant Loadings for the By-Product Cokemaking Segment Direct Dischargers	10-43
10-6	Summary of Baseline and Post-Compliance Pollutant Loadings for the By-Product Cokemaking Segment Indirect Dischargers	10-43
10-7	Summary of Pollutant Removals for the By-Product Cokemaking Segment Direct Dischargers	10-44
10-8	Summary of Pollutant Removals for the By-Product Cokemaking Subcategory Indirect Dischargers	10-44
10-9	Average Baseline Pollutant Concentrations for the Ironmaking Subcategory Sintering Segment	10-45
10-10	Average Baseline Pollutant Concentrations for the Ironmaking Subcategory Blast Furnace Segment	10-47
10-11	Proposed Arithmetic Long-Term Averages for the Ironmaking Subcategory Sintering Segment	10-49
10-12	Proposed Arithmetic Long-Term Averages for the Ironmaking Subcategory Blast Furnace Segment	10-53
10-13	Summary of Baseline and Post-Compliance Pollutant Loadings for the Ironmaking Subcategory Direct and Indirect Dischargers	10-55

LIST OF TABLES (Continued)

		Page
10-14	Summary of Pollutant Removals for the Ironmaking Subcategory Direct and Indirect Dischargers	10-56
10-15	Average Baseline Pollutant Concentrations for the Integrated Steelmaking Subcategory	10-57
10-16	Proposed Arithmetic Long-Term Averages for the Integrated Steelmaking Subcategory	10-59
10-17	Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated Steelmaking Subcategory Direct and Indirect Dischargers	10-61
10-18	Summary of Pollutant Removals for the Integrated Steelmaking Subcategory Direct and Indirect Dischargers	10-61
10-19	Average Baseline Pollutant Concentrations for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment	10-62
10-20	Average Baseline Pollutant Concentrations for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment	10-63
10-21	Proposed Arithmetic Long-Term Averages for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment	10-65
10-22	Proposed Arithmetic Long-Term Averages for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment	10-66
10-23	Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-67
10-24	Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Direct Dischargers	10-67
10-25	Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-68

LIST OF TABLES (Continued)

		Page
10-26	Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers	10-68
10-27	Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-69
10-28	Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Direct Dischargers	10-69
10-29	Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-70
10-30	Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers	10-70
10-31	Average Baseline Pollutant Concentrations for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment	10-71
10-32	Average Baseline Pollutant Concentrations for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment	10-72
10-33	Proposed Arithmetic Long-Term Averages for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment	10-73
10-34	Proposed Arithmetic Long-Term Averages for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment	10-74
10-35	Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-76
10-36	Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Direct Dischargers	10-76

LIST OF TABLES (Continued)

		Page
10-37	Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-77
10-38	Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers	10-77
10-39	Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-77
10-40	Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Direct Dischargers	10-78
10-41	Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-78
10-42	Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers	10-78
10-43	Average Baseline Pollutant Concentrations for the Steel Finishing Subcategory Carbon and Alloy Steel Segment	10-79
10-44	Average Baseline Pollutant Concentrations for the Steel Finishing Subcategory Stainless Steel Segment	10-90
10-45	Proposed Arithmetic Long-Term Averages for the Steel Finishing Subcategory Carbon and Alloy Steel Segment	10-99
10-46	Proposed Arithmetic Long-Term Averages for the Steel Finishing Subcategory Stainless Steel Segment	10-101
10-47	Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-103
10-48	Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Stainless Steel Segment Direct Dischargers	10-104

LIST OF TABLES (Continued)

		Page
10-49	Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-104
10-50	Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Stainless Steel Segment Indirect Dischargers	10-105
10-51	Summary of Pollutant Removals for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Direct Dischargers	10-105
10-52	Summary of Pollutant Removals for the Steel Finishing Subcategory Stainless Steel Segment Direct Dischargers	10-106
10-53	Summary of Pollutant Removals for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Indirect Dischargers	10-106
10-54	Summary of Pollutant Removals for the Steel Finishing Subcategory Stainless Steel Segment Indirect Dischargers	10-107
10-55	Average Baseline Pollutant Concentrations for the Other Operations Subcategory Forging Segment	10-107
10-56	Proposed Arithmetic Long-Term Averages for the Other Operations Subcategory DRI Segment	10-107
10-57	Proposed Arithmetic Long-Term Averages for the Other Operations Subcategory Forging Segment	10-108
10-58	Summary of Baseline and Post-Compliance Pollutant Loadings for the Other Operations Subcategory Forging Segment Direct Dischargers	10-108
10-59	Summary of Pollutant Removals for the Other Operations Subcategory Forging Segment Direct Dischargers	10-108
11-1	Proposed Regulated Pollutants for the Cokemaking Subcategory	11-25
11-2	Pollutants Considered for Regulation for Direct Dischargers Cokemaking Subcategory - By-Product Recovery Segment	11-26

LIST OF TABLES (Continued)

		Page
11-3	Proposed Regulated Pollutants for the Ironmaking Subcategory	11-30
11-4	Pollutants Considered for Regulation for Direct Dischargers Ironmaking Subcategory - Sintering Segment	11-31
11-5	Pollutants Considered for Regulation for Direct Dischargers Ironmaking Subcategory - Blast Furnace Segment	11-35
11-6	Proposed Regulated Pollutants for the Integrated Steelmaking Subcategory	11-37
11-7	Pollutants Considered for Regulation for Direct Dischargers Integrated Steelmaking Subcategory	11-38
11-8	Proposed Regulated Pollutants for the Integrated and Stand-Alone Hot Forming Subcategory	11-40
11-9	Pollutants Considered for Regulation for Direct Dischargers Integrated and Stand-Alone Hot Forming Subcategory - Carbon and Alloy Steel Segment	11-41
11-10	Pollutants Considered for Regulation for Direct Dischargers Integrated and Stand-Alone Hot Forming Subcategory - Stainless Steel Segment	11-42
11-11	Proposed Regulated Pollutants for the Non-Integrated Steelmaking and Hot Forming Subcategory	11-43
11-12	Pollutants Considered for Regulation for Direct Dischargers Non-Integrated Steelmaking and Hot Forming Subcategory - Carbon and Alloy Steel Segment	11-44
11-13	Pollutants Considered for Regulation for Direct Dischargers Non-Integrated Steelmaking and Hot Forming Subcategory - Stainless Steel Segment	11-45
11-14	Proposed Regulated Pollutants for the Steel Finishing Subcategory	11-47
11-15	Pollutants Considered for Regulation for Direct Dischargers Steel Finishing Subcategory - Carbon and Alloy Steel Segment	11-48

LIST OF TABLES (Continued)

		Page
11-16	Pollutants Considered for Regulation for Direct Dischargers Stainless Finishing Subcategory - Stainless Steel Segment	11-50
11-17	Proposed Regulated Pollutants for the Other Operations Subcategory	11-53
11-18	Pollutants Considered for Regulation for Direct Dischargers Other Operations Subcategory - Direct Reduced Ironmaking Segment	11-54
11-19	POTW Percent Removals	11-55
11-20	POTW Pass-Through Analysis Results for the Cokemaking Subcategory	11-56
11-21	POTW Pass-Through Analysis Results for the Ironmaking Subcategory	11-57
11-22	POTW Pass-Through Analysis Results for the Integrated Steelmaking Subcategory	11-58
11-23	POTW Pass-Through Analysis Results for the Integrated and Stand Alone Hot Forming Subcategory	11-58
11-24	POTW Pass-Through Analysis Results for the Non-Integrated Steelmaking and Hot Forming Subcategory	11-59
11-25	POTW Pass-Through Analysis Results for the Steel Finishing Subcategory	11-60
12-1	Aggregation of Field Duplicates	12-23
12-2	Aggregation of Grab Samples	12-24
12-3	Aggregation of Data Across Streams	12-25
12-4	Option Long-Term Averages Replaced by the Baseline Values	12-32
12-5	Cases where Option Variability Factors Could Not be Calculated	12-33
12-6	O&G Long-Term Averages and Variability Factors	12-34
12-7	Lead Long-Term Averages and Variability Factors	12-35

LIST OF TABLES (Continued)

		Page
12-8	Transfers of Proposed Limitations	12-39
13-1	Summary of Pollutant Removals, Energy Requirements, and Sludge Generation for the Selected Option by Subcategory	13-11
13-2	Incremental Energy Requirements by Subcategory and Option	13-12
13-3	Estimated Maximum VOC Emission Rate From Biological Treatment of Cokemaking Wastewater	13-13
13-4	Incremental Sludge Generation by Subcategory and Option	13-14
14-1	Limitations for Best Practicable Control Technology Currently Available (BPT) Under 1982 Rule	14-46
15-1	Example 1: Application of the Proposed 40 CFR Part 420 Direct Discharge Blast Furnaces and Sinter Plant	15-28
15-2	Example 2: Application of Proposed 40 CFR Part 420 Direct Discharge Stainless Steel Finishing Mill	15-29
15-3	Example 3: Application of Proposed 40 CFR Part 420 Direct Discharge Integrated Steelmaking and Hot Forming	15-30
15-4	Example 4: Application of Proposed 40 CFR Part 420 Indirect Discharge Coke Plant	15-31
15-5	Example 5: Application of Proposed 40 CFR Part 420.4 Example "Water Bubble" Trade for Zinc	15-32
15-6	List of Approved Test Procedures for Pollutants Regulated Under the Proposed Rule for the Iron and Steel Point Source Category	15-33

LIST OF FIGURES

		Page
5-1	Iron and Steelmaking Operations	5-26
5-2	Forming and Finishing Operations	5-27
5-3	Integrated Steel Manufacturing Sites	5-28
5-4	Cokemaking Sites	5-29
8-1	Process Flow Diagram of a Typical Biological Nitrification System	8-50
8-2	Process Flow Diagram of Typical Biological Denitrification Systems	8-51
8-3	Process Flow Diagram of a Typical Chemical Precipitation System for Metals Removal	8-52
8-4	Minimum Solubilities of Various Metal Hydroxides	8-53
8-5	BAT-1 for By-Products Recovery Cokemaking	8-54
8-6	BAT-2 for By-Products Recovery Cokemaking	8-55
8-7	BAT-3 for By-Products Recovery Cokemaking	8-56
8-8	BAT-4 for By-Products Recovery Cokemaking	8-57
8-9	PSES-1 for By-Products Recovery Cokemaking	8-58
8-10	PSES-2 for By-Products Cokemaking	8-59
8-11	PSES-3 for By-Products Recovery Cokemaking	8-60
8-12	PSES-4 for By-Products Recovery Cokemaking	8-61
8-13	BAT-1 for Ironmaking (Blast Furnace and Sintering Operations)	8-62
8-14	PSES-1 for Ironmaking (Blast Furnace and Sintering Operations)	8-63
8-15	BAT-1 and PSES-1 for Integrated Steelmaking (All Segments)	8-64

LIST OF FIGURES (Continued)

		Page
8-16	BAT -1 and PSES-1 for Integrated and Stand-Alone Hot Forming (All Segments)	8-65
8-17	BAT-1 and PSES-1 for Non-Integrated Steelmaking and Hot Forming (All Segments)	8-66
8-18	BAT-1 and PSES-1 for Carbon and Alloy Steel Finishing	8-67
8-19	BAT-1 and PSES-1 for Stainless Steel Finishing	8-68
8-20	BPT-1 for Direct Reduced Ironmaking	8-69
8-21	BPT-1 for Forging	8-70
9-1	Activated Carbon Treatment for By-Products Recovery Cokemaking Wastewater	9-92
9-2	Alkaline Chlorination for By-Products Recovery Cokemaking Wastewater	9-93
9-3	Blowdown Metals Precipitation for Ironmaking Wastewater	9-94
9-4	Alkaline Chlorination for Ironmaking Wastewater	9-95
9-5	Blowdown Metals Precipitation for Steelmaking Wastewater	9-96
9-6	Filtration of Wastewater from All Subcategories	9-97
12-1	Alkaline Chlorination Model Technology Facility	12-5

SECTION 1

APPLICABILITY AND SUMMARY OF PROPOSED REGULATION

This section presents a brief overview of the Iron and Steel Category, discusses the applicability of the effluent limitations guidelines and standards proposed for the category, and presents the applicability interface between the proposed rule and other regulations for the metals industry. This section also briefly summarizes of the proposed rule and describes the Agency's efforts to protect confidential business information.

1.1 Applicability

The Iron and Steel Category comprises sites that produce raw materials used in ironmaking and steelmaking or produce finished or semifinished steel products. Operations include cokemaking, sintering, ironmaking, steelmaking, ladle metallurgy, vacuum degassing, continuous and ingot casting, hot forming, salt bath and electrolytic descaling, acid pickling, cold forming, alkaline cleaning, hot coating, and electroplating. The proposed rule revises the 1982 technology-based effluent limitations guidelines and standards for wastewater discharges associated with the operation of new and existing facilities within the Iron and Steel Category.

Manufacturing operations that may be subject to the proposed Iron and Steel rule are generally reported under one or more of the following North American Industry Classification System (NAICS) codes (Reference 1-1):

- 324199, Other Petroleum and Coal Products Manufacturing;
- 331111, Iron and Steel Mills;
- 331210, Iron and Steel Pipe and Tube Manufacturing from Purchased Steel;
- 331221, Rolled Steel Shape Manufacturing;
- 332812, Metal coating, engraving (except jewelry and silverware), and allied services to manufacturers; and
- 332813, Electroplating, plating, polishing, anodizing, and coloring.

Specifically, the proposed Iron and Steel effluent limitations guidelines and standards apply to wastewater discharges resulting from the following manufacturing operations:

- By-product recovery and other cokemaking operations manufacturing metallurgical coke (both furnace and foundry coke);

- Sintering, briquetting, and other agglomeration operations conducted by heating iron-bearing materials (e.g., iron ore, mill scale, blast furnace flue dust, blast furnace wastewater treatment sludge), limestone, coke fines, and other materials in a traveling grate combustion system to produce an agglomerate for charging to a blast furnace;

- Ironmaking operations in which iron ore and other iron-bearing materials are reduced to molten iron in a blast furnace;

- Direct reduced ironmaking in which iron pellets are produced through a reaction of iron ore with hot reducing gases;

- Basic oxygen furnace (BOF) steelmaking, ladle metallurgy, vacuum degassing, and continuous casting operations at integrated steel mills. The proposed rule also applies to BOF steelmaking conducted at any location;

- Electric arc furnace (EAF) steelmaking, ladle metallurgy, vacuum degassing, and continuous casting operations conducted at non-integrated steel mills. The proposed rule also applies to EAF steelmaking conducted at any location;

- Primary, section, flat, pipe, and tube hot forming operations conducted at integrated steel mills, non-integrated steel mills, and stand-alone hot forming mills;

- Steel forging operations performed at iron and steel mills; and

- Carbon, alloy, and stainless steel finishing operations, including salt bath and electrolytic sodium sulfate descaling, acid pickling, cold forming, alkaline cleaning, continuous electroplating and hot coating (of flat steel products only), and continuous annealing at integrated, non-integrated, and stand-alone facilities.

1.2 Applicability Interface With Other Regulations

Several existing regulations currently establish effluent limitations guidelines and standards for the metals industry. Regulations covering nonferrous materials, including aluminum forming (40 CFR Part 467), copper forming (40 CFR Part 468), nonferrous metals manufacturing (40 CFR Part 421), and nonferrous metals forming (40 CFR Part 471) do not interface with the effluent limitations guidelines and standards proposed for the Iron and Steel Category. Regulations that cover ferrous materials, however, do interface with the proposed rule for the Iron and Steel Category.

For facilities with process operations in more than one category, National Pollutant Discharge Elimination System (NPDES) permit writers must use a building-block approach to

develop technology-based effluent limitations. Similarly, pretreatment control authorities must use the combined wastestream formula (Reference 1-2) to develop pretreatment requirements for facilities with process operations in more than one category. Permit writers and control authorities should refer to the applicability statements of the regulations for further clarification.

1.2.1 Metal Products and Machinery

Some steel finishing facilities covered by the 1982 Iron and Steel rule perform manufacturing operations such as cold forming, hot coating, and drawing. Some of these operations and associated wastewater discharges closely resemble those covered by the Metal Products and Machinery (MP&M) rule to be proposed at 40 CFR Part 438. Therefore, EPA has determined that some processes regulated under the 1982 Iron and Steel Category would be more appropriately regulated under the proposed MP&M Category.

EPA proposes to regulate the following steel finishing operations under the MP&M Category:

- Batch electroplating of steel;
- Continuous electroplating or hot-dip coating of long steel products (e.g., wire, rod, and bar);
- Cold forming of steel pipe and tube or long steel products;
- Batch hot-dip coating of steel; and
- Drawing and coating of steel wire.

EPA proposes to regulate the following steel finishing operations under the Iron and Steel Category:

- Hot forming of steel pipe and tube;
- Salt bath and electrolytic descaling, acid pickling, and alkaline cleaning of flat steel products (e.g., plate, sheet, and strip);
- Cold forming of flat steel products;
- Finishing with continuous electroplating of flat steel products; and
- Continuous hot-dip coating of flat steel products.

The proposed Iron and Steel Category covers hot forming operations on steel pipe and tube; the proposed MP&M Category does not cover these operations. The proposed Iron and Steel Category covers salt bath and electrolytic descaling operations, acid pickling, alkaline

cleaning operations, cold forming operations, finishing with continuous electroplating operations, and continuous hot coating operations on flat steel products because these operations are common to a relatively large number of integrated and non-integrated iron and steel mills. Because EPA is proposing to regulate these operations at integrated and non-integrated iron and steel mills, the Agency is also proposing to regulate these operations at stand-alone steel finishing mills.

1.2.2 Electroplating

Facilities that are covered by the Electroplating Category and discharge to a publicly owned treatment works (POTW) are regulated under 40 CFR Part 413. This category comprises indirect discharging job shop electroplaters and independent printed circuit board manufacturers that were in operation prior to July 15, 1983. The electroplating rule specifically excludes continuous strip electroplating operations conducted at indirect discharging iron and steel facilities; therefore, the electroplating rule does not overlap with the proposed Iron and Steel rule.

1.2.3 Metal Finishing

Wastewater discharges from facilities within the Metal Finishing Category are regulated under 40 CFR Part 433. This category comprises facilities that perform any of the following six metal finishing operations on any basis material: electroplating, electroless plating, anodizing, coating (chromating, phosphating, and coloring), chemical etching and milling, and printed circuit board manufacturing. The Metal Finishing rule establishes effluent limitations guidelines and standards for 40 surface treatment operations at facilities within this category.

Electroplating operations at iron and steel mills are currently regulated under the Metal Finishing Category; however, the Agency proposes to regulate the continuous electroplating of flat steel products under the Iron and Steel Category because this process is common to a relatively large number of integrated and non-integrated steel mills. Iron and steel facilities successfully and cost-effectively co-treat wastewater discharges from continuous strip electroplating operations and other steel finishing operations.

The proposed change in electroplating applicability will assist NPDES permit writers and pretreatment control authorities. Currently, permit writers and control authorities are required to combine production-based and concentration-based limitations and standards when permitting iron and steel mills with electroplating operations because effluent limitations guidelines and standards are production-based under the Iron and Steel Category and concentration-based under the Metal Finishing Category. To provide consistency, the electroplating limitations and standards in the proposed Iron and Steel rule are production-based.

1.2.4 Coil Coating

Wastewater discharges from facilities within the Coil Coating Category are regulated under 40 CFR Part 465. Coil coating facilities typically clean, conversion coat, and apply organic polymeric materials (such as paint) to continuous strips of metal coil (typically steel, galvanized metal, or aluminum). The Coil Coating Category comprises facilities that perform at least two of these three operations. The proposed Iron and Steel rule is not intended to regulate mild acid or mild alkaline cleaning operations conducted at coil coating facilities, nor is it intended to regulate conversion coating or the application of organic polymeric material to steel; therefore, the proposed Iron and Steel rule does not overlap with the Coil Coating rule.

1.2.5 Ferroalloy Manufacturing

Wastewater discharges from facilities within the Ferroalloy Manufacturing Category are regulated under 40 CFR Part 424. This category comprises facilities that smelt ferroalloys in electric furnaces or other devices with wet air pollution control, recover and process furnace slag, produce calcium carbide in covered electric furnaces with and without wet air pollution control, and manufacture electrolytic manganese products and electrolytic chromium products. A ferroalloy is an iron-bearing product, not within the range of those products called steel, which contains a considerable amount of one or more alloying elements, such as manganese, silicon, phosphorus, vanadium, and chromium. The Iron and Steel Category does not cover any ferroalloy manufacturing operations.

1.2.6 Metal Molding and Casting

Wastewater discharges from facilities within the Metal Molding and Casting Category are regulated under 40 CFR Part 464. This category comprises facilities that remelt, mold, and cast aluminum, copper, zinc, and ferrous metals and alloys into intermediate or finished products. The proposed Iron and Steel rule does not overlap with the Metal Molding and Casting rule because the proposed rule applies only to those facilities that cast molten steel produced in BOF and EAF steelmaking furnaces after any ladle metallurgy and vacuum degassing operations.

1.3 Summary of Proposed Regulation

The proposed Iron and Steel rule revises the technology-based effluent limitations guidelines and standards at 40 CFR Part 420 for wastewater discharges associated with the operation of new and existing facilities within the Iron and Steel Category. The proposed rule includes the following features:

- EPA is proposing new effluent limitations guidelines and standards for BAT, NSPS, PSES, and PSNS under a revised subcategory structure for the industry. The Agency does not propose to revise BCT. (See Section 2.1.1 for a discussion of these terms.) The revised subcategory structure does the following:

- Removes defunct manufacturing processes;
- Eliminates manufacturing processes in the hot forming and finishing subcategories;
- Creates a new subcategory for non-integrated steelmaking and hot forming processes; and
- Creates new subcategories and segments for manufacturing processes not regulated under the 1982 rule, including continuous electroplating of flat steel products, direct reduced ironmaking, briquetting, and steel forging.

- The Agency is proposing BPT limitations for direct reduced ironmaking and forging, but proposes to leave the 1982 production-based BPT effluent limitations in place (see Section 2.1.1 for a discussion of BPT). The Agency is considering converting the existing production-based BPT limitations for total suspended solids and oil and grease to concentration-based limitations based on the production-normalized flows used to develop the limitations in the 1982 regulation.

- EPA is proposing two different BAT approaches for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. The options differ in the amount of time that facilities in the segment would have to achieve BAT limitations. Under one option, a facility would be subject to BAT limitations as soon as these limitations are placed in the NPDES permit. Under the other option, a facility could obtain additional time to achieve BAT limitations.

- The Agency is proposing zero discharge as NSPS for the non-integrated steelmaking and hot forming subcategory.

- EPA is considering defining a reasonable measure of actual production for calculating NPDES and pretreatment permit production rates. The Agency is considering the following alternatives:
  - Retaining the essential requirements of the 1982 rule while providing additional instruction for avoiding unrealistically high estimates of actual production;
  - Requiring the permit writer to establish multitiered permit limits;
  - Revising the definition of production to be the average daily operating rate for the year with the highest annual production over the past five years; or

— Establishing production-based maximum monthly average effluent limitations and standards in combination with daily maximum concentration-based effluent limitations and standards.

- EPA is proposing to regulate mercury and selenium based on toxicity and presence in cokemaking wastewater.

- EPA is proposing to regulate 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) in sinter plant wastewater and require compliance monitoring either after the primary treatment of sinter plant wastewater or after sinter plant and blast furnace wastewater discharges are co-treated, but before sinter plant wastewater is combined with any other process or nonprocess discharges. The Agency is considering limiting dioxins and furans in sinter plant wastewater on the basis of 2,3,7,8-TCDD toxicity equivalents, which would measure all of the 17 dioxin and furan congeners with chlorine substitutions at the 2,3,7 and 8 lateral positions. This approach is consistent with the international toxicity equivalents factors approach, EPA's approach to regulating dioxins in other media and conducting risk assessments, and EPA's source characterization work to assess the national inventory of dioxin releases to the environment.

- EPA is considering developing a limit, based on acid purification technology or product substitution, for nitrate/nitrite (in the form of nitrate-nitrite-N) for stainless steel finishing operations with nitric acid and combination acid pickling.

- EPA is considering waiving the pretreatment standards for ammonia as nitrogen for blast furnace wastewater indirectly discharged to POTWs that have the capability to conduct nitrification.

- Similar to the 1982 rule, the proposed rule expresses effluent limitations guidelines and standards for wet air pollution control devices at steel finishing operations in mass of pollutant per day. The proposed rule expresses all other proposed effluent limitations guidelines and standards within the Iron and Steel Category in mass of pollutant per mass of production.

- The proposed rule revises the units of pollutant limitations from kilograms of allowable pollutant discharge per thousand kilograms of production (kg/kkg), also expressed as pounds of allowable pollutant discharge per thousand pounds of production (lbs/1,000 lbs), to pounds of allowable pollutant discharge per ton of production (lbs/ton). The Agency made this change to express effluent limitations in terms of the production value that is standard throughout the industry.

- The proposed rule makes the following revisions to the 1982 "Water Bubble" provision:
  - — Allows trades for cold rolling operations;
  - — Allows trades for cokemaking operations only when more stringent limits result;
  - — Prohibits trades for sintering operations when less stringent limits result; and
  - — Prohibits trades for oil and grease.
- While the 1982 regulation often requires permit writers and control authorities to apply pH limitations at internal discharge monitoring locations, prior to additional treatment or mixing with other wastewater discharges, the proposed rule allows permit writers and control authorities to establish pH effluent limitations at final outfalls such that redundant and unnecessary pH neutralization can be avoided.

1.4 Protection of Confidential Business Information

EPA recognizes that certain data in the proposed rulemaking record have been claimed as confidential business information (CBI). The Agency has removed CBI from the public record in the Water Docket. In addition, the Agency has withheld from disclosure some data not claimed as CBI because the release of these data could indirectly reveal CBI. Furthermore, EPA has aggregated certain data in the public record, masked facility identities, or used other strategies to prevent the disclosure of CBI. The Agency's approach to CBI protection ensures that the data in the public record both explain the basis for the proposed rule and provide the opportunity for public comment, without compromising data confidentiality.

1.5 References

1-1 North American Industry Classification System, U.S. Office of Management and Budget. Washington, D.C., 1997.

1-2 U.S. Environmental Protection Agency. Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream Formula. Washington, D.C., September 1985.

SECTION 2

BACKGROUND

This section provides background information on the development of revised effluent limitations guidelines and standards proposed for the Iron and Steel Category. Sections 2.1 and 2.2 discuss the legal authority and legislative background for the proposed rule. Section 2.3 presents a history of Iron and Steel Category rulemaking activities.

2.1 Legal Authority

EPA is proposing revised effluent limitations guidelines and standards for the Iron and Steel Category under the authority of Sections 301, 304, 306, 307, 308, 402, and 501 of the Clean Water Act, 33 U.S.C. 1311, 1314, 1316, 1317, 1318, 1342, and 1361.

2.1.1 Legislative Background

Congress adopted the Clean Water Act (CWA) to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Section 101(a), 33 U.S.C. 1251(a)). To achieve this goal, the CWA prohibits the discharge of pollutants into navigable waters, except in compliance with the statute. The CWA confronts the problem of water pollution on a number of different fronts; however, it relies primarily on establishing restrictions on the types and amounts of pollutants discharged from various industrial, commercial, and public sources of wastewater.

Congress recognized that regulating only those sources that discharge effluent directly into the nation's waters would not be sufficient to achieve the goals of the CWA. Consequently, the CWA requires EPA to promulgate nationally applicable pretreatment standards that restrict pollutant discharges for those sources that discharge wastewater indirectly through sewers flowing to publicly owned treatment works (POTWs) (Section 307(b) and (c), 33 U.S.C. 1317(b) and (c)). National pretreatment standards apply to wastewater pollutants that may pass through or interfere with POTW operations. Generally, pretreatment standards are designed to ensure that wastewater streams from indirect industrial dischargers are subject to similar levels of treatment as direct industrial dischargers. In addition, POTWs must develop and enforce local treatment limits applicable to their industrial indirect dischargers when necessary to prevent pass-through and/or interference (40 CFR 403.5).

Direct dischargers must comply with effluent limitations in National Pollutant Discharge Elimination System (NPDES) permits; indirect dischargers must comply with pretreatment standards. These limitations and standards are established by regulation for categories of industrial dischargers and are based on the degree of control that can be achieved using various levels of pollution control technology.

Best Practicable Control Technology Currently Available (BPT) – Section 304(b)(1) of the CWA

EPA defines BPT effluent limitations for conventional, nonconventional, and priority[1] pollutants. In specifying BPT, EPA looks at a number of factors. EPA first considers the cost of achieving effluent reductions in relation to the effluent reduction benefits. The Agency also considers the age of equipment and facilities, the processes employed and any required process changes, engineering aspects of the control technologies, non-water quality environmental impacts (including energy requirements), and other factors the Agency deems appropriate (CWA 304(b)(1)(B)). Traditionally, EPA establishes BPT effluent limitations based on the average of the best performances of facilities within the industry, grouped to reflect various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, however, EPA may establish limitations based on higher levels of control than currently in place in an industrial category if the Agency determines that the technology is available in another category or subcategory and can be practically applied.

Best Conventional Pollutant Control Technology (BCT) – Section 304(b)(4) of the CWA

The 1977 amendments to the CWA required EPA to identify effluent reduction levels for conventional pollutants associated with BCT technology for discharges from existing industrial point sources. In addition to other factors specified in Section 304(b)(4)(B), the CWA required that EPA establish BCT limitations after consideration of a two-part "cost reasonableness" test. EPA explained its methodology for the development of BCT limitations in July 1986 (51 FR 24974).

Section 304(a)(4) designates the following as conventional pollutants: biochemical oxygen demand, total suspended solids, fecal coliform, pH, and any additional pollutants defined by the Administrator as conventional. The Administrator designated oil and grease as an additional conventional pollutant on July 30, 1979 (44 FR 44501).

Best Available Technology Economically Achievable (BAT) – Section 304(b)(2) of the CWA

In general, BAT effluent limitations guidelines represent the best economically achievable performance of facilities in the industrial subcategory or category. EPA considers the following factors in assessing BAT: the cost of achieving BAT effluent reductions, the age of

[1]In the initial stages of the CWA regulation, EPA efforts emphasized the achievement of BPT limitations for control of the conventional pollutants (e.g., total suspended solids, pH, and biochemical oxygen demand). However, nothing on the face of the statute explicitly restricted BPT limitations to such pollutants. Following passage of the CWA of 1977, with its requirement for point sources to achieve best available technology limitations to control discharges of toxic pollutants, EPA shifted the focus of the effluent limitations guidelines program to address the listed priority pollutants. BPT guidelines may continue to include effluent limitations to address all pollutants.

equipment and facilities involved, the processes employed, potential process changes, and non-water quality environmental impacts, including energy requirements. The Agency retains considerable discretion in assigning the weights of these factors. Unlike BPT limitations, BAT limitations may be based on effluent reductions attainable through changes in a facility's processes and operations. As with BPT, where existing performance in a category or subcategory is uniformly inadequate, BAT may require a higher level of performance than is currently being achieved based on technology transferred from a different category or subcategory. BAT may be based upon process changes or internal controls, even when these technologies are not common industry practice.

New Source Performance Standards (NSPS) – Section 306 of the CWA

NSPS reflect effluent reductions that are achievable based on the best available demonstrated control technology. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS should represent the most stringent controls attainable through the application of the best available control technology for all pollutants (that is, conventional, nonconventional, and priority pollutants). In establishing NSPS, EPA must take into consideration the cost of achieving the effluent reduction and any non-water quality environmental impacts and energy requirements.

Pretreatment Standards for Existing Sources (PSES) – Section 307(b) of the CWA

PSES are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. The CWA authorizes EPA to establish pretreatment standards for pollutants that pass through POTWs or interfere with treatment processes or sludge disposal methods at POTWs. Pretreatment standards are technology-based and analogous to BAT effluent limitations guidelines.

The General Pretreatment Regulations, which set forth the framework for the implementation of categorical pretreatment standards, are found at 40 CFR Part 403. Those regulations contain a definition of pass-through that addresses local rather than national instances of pass-through and establishes pretreatment standards that apply to all nondomestic dischargers (52 FR 1586, January 14, 1987).

Pretreatment Standards for New Sources (PSNS) – Section 307(c) of the CWA

Like PSES, PSNS are designed to prevent the discharges of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. PSNS are to be issued at the same time as NSPS. New indirect dischargers have the opportunity to incorporate into their facilities the best available demonstrated technologies. The Agency considers the same factors in promulgating PSNS as it considers in promulgating NSPS.

2.1.2 Section 304(m) Requirements and Litigation

Section 304(m) of the CWA, added by the Water Quality Act of 1987, requires EPA to establish schedules for: (1) reviewing and revising existing effluent limitations guidelines and standards; and (2) promulgating new effluent limitations guidelines and standards. On January 2, 1990, EPA published an Effluent Guidelines Plan (55 FR 80) that established schedules for developing new and revised effluent limitations guidelines and standards for several industry categories, one of which was the Iron and Steel Category.

The Natural Resources Defense Council (NRDC) and Public Citizen, Inc. filed suit against the Agency, alleging violation of Section 304(m) and other statutory authorities requiring promulgation of effluent limitations guidelines and standards. See NRDC *et al.* v. Browner, Civ. No. 89-2980 (D.D.C.). Under the terms of a consent decree dated January 31, 1992, which settled the litigation, EPA agreed, among other things, to conduct a study of the iron and steel industry. The Agency completed this study, discussed in Section 2.2.3 of this document, in 1995. After the study, the Agency named the Iron and Steel rule as one of the new or revised rules to be developed under the terms of the consent decree. On November 18, 1998, the court approved modifications to the consent decree to revise the deadline for the Iron and Steel rule to October 2000 for proposal and April 2002 for final action. EPA provided notice of these modifications on March 30, 1999 (64 FR 15158).

2.2 History of Iron and Steel Category Rulemaking Activities

This subsection presents a brief history of Iron and Steel Category rulemaking activities. Section 2.2.1 discusses prior Iron and Steel Category wastewater discharge regulations. Section 2.2.2 discusses the 1982 Iron and Steel rule. Section 2.2.3 discusses the Preliminary Study of the Iron and Steel Category.

2.2.1 Prior Regulations

On June 28, 1974, EPA promulgated effluent limitations for BPT and BAT, NSPS, and PSNS for basic steelmaking operations (Phase I) of the integrated steel industry (39 FR 24114-24133, 40 CFR Part 420, Subparts A-L). The regulation covered the following 12 subcategories of the industry:

- By-product cokemaking;
- Beehive cokemaking;
- Sintering;
- Blast furnace (iron);
- Blast furnace (ferromanganese);
- Basic oxygen furnace (semi-wet air pollution control methods);
- Basic oxygen furnace (wet air pollution control methods);
- Open hearth furnace;
- Electric arc furnace (semi-wet air pollution control methods);
- Electric arc furnace (wet air pollution control methods);

- Vacuum degassing; and
- Continuous casting and pressure slab molding.

In response to several petitions for review, the United States Court of Appeals for the Third Circuit remanded portions of that regulation on November 7, 1975. See American Iron & Steel Inst., et al. v. EPA, 526 F.2d 1027 (3d Cir. 1975). While the court rejected all technical challenges to the BPT limitations, it held that the BAT effluent limitations and NSPS for certain subcategories were "not demonstrated." In addition, the court ruled that EPA had not adequately considered the impact of plant age on the cost or feasibility of retrofitting pollution controls, had failed to assess the impact of the regulation on water scarcity in arid and semi-arid regions of the country, and had failed to make adequate "net/gross" provisions for pollutants found in intake water supplies.

On March 29, 1976, EPA promulgated BPT and BAT effluent limitations, NSPS, and PSNS for steel forming and finishing operations (Phase II) within the steel industry (41 FR 12990-13030, 40 CFR Part 420, Subparts M-Z). The regulation covered the following 14 subcategories of the industry:

- Hot forming - primary;
- Hot forming - section;
- Hot forming - flat;
- Pipe and tube;
- Pickling - sulfuric acid - batch and continuous;
- Pickling - hydrochloric acid - batch and continuous;
- Cold rolling;
- Hot coating - galvanizing;
- Hot coating - terne;
- Miscellaneous runoff - storage piles, casting, and slagging;
- Combination acid picking - batch and continuous;
- Scale removal - Kolene and Hydride;
- Wire pickling and coating; and
- Continuous alkaline cleaning.

The U.S. Court of Appeals for the Third Circuit remanded portions of that regulation on September 14, 1977. See American Iron & Steel Inst., et al. v. EPA, 568 F.2d 284 (3d Cir. 1977). The court again rejected all technical challenges to the BPT limitations, though it ruled that EPA had not adequately considered age/retrofit and water scarcity issues for BAT. In addition, the court invalidated the regulation as it applied to the specialty steel industry for lack of proper notice. The court also directed EPA to reevaluate its cost estimates in light of "site-specific costs" and to reexamine its economic impact analysis for BAT. The court also held that the Agency had no statutory authority to exempt plants in the Mahoning Valley region of Eastern Ohio from compliance with the BPT limitations for the Iron and Steel Category.

On January 28, 1981, the Agency promulgated General Pretreatment Regulations applicable to existing and new indirect dischargers within the iron and steel industry and other major industries (40 CFR Part 403, 47 FR 4518).

2.2.2 1982 Regulation

On May 27, 1982, EPA promulgated effluent limitations for BPT, BAT, BCT, and NSPS, PSES, and PSNS for the Iron and Steel Category (47 FR 23258, 40 CFR Part 420). The regulation covered the following 12 subcategories of the industry:

- Cokemaking;
- Sintering;
- Ironmaking;
- Steelmaking;
- Vacuum degassing;
- Continuous casting;
- Hot forming;
- Salt bath descaling;
- Acid pickling;
- Cold forming;
- Alkaline cleaning; and
- Hot coating.

The 1982 regulation was the first promulgated by EPA under the 1977 amendments to the CWA, and, thus, was the first to distinguish between conventional, nonconventional, and priority pollutants in the regulatory scheme established by the 1977 amendments.

The American Iron and Steel Institute, certain members of the iron and steel industry, and the NRDC filed petitions to review the 1982 regulation. Their challenges were consolidated into one lawsuit by the Third Circuit Court of Appeals. See National Steel Corp. v. EPA, No. 82-3225 and Consolidated Cases. On February 4, 1983, the parties in the consolidated lawsuit entered into a comprehensive settlement agreement that resolved all issues raised by the petitioners. In accordance with the settlement agreement, EPA modified and clarified certain parts of the Iron and Steel rule and published additional preamble language regarding the rule.[2] EPA published the amended Iron and Steel rule on May 17, 1984 (49 FR 21024). Some of the modifications made to the rule include the following:

- EPA included a method for calculating production-based pretreatment standards. This method largely mirrored the method given at 40 CFR

[2]EPA also agreed to take final action on an amendment to the General Pretreatment Regulations (40 CFR Part 403) to permit the reclassification of noncontact cooling water flows contaminated with significant quantities of pollutants from "dilute" to "unregulated" for purposes of the combined wastestream formula at 40 CFR 403.6 (e).

122.45(b)(2) for calculating production-based effluent limitations for direct dischargers.

- While the "Water Bubble" provision (40 CFR 420.03) in the 1982 rule originally provided that the alternative effluent limitations established under the provision must result in *no increase* in the discharge of pollutants beyond that allowed by the generally applicable limitations, the amended provision provided that alternative effluent limitations must result in a specified *decrease* in the discharge of traded pollutants from the amount allowed by the generally applicable limitations.

- EPA included a provision at 40 CFR Part 420.06 to grant removal credits for total phenols when used as an indicator or surrogate pollutant.

- EPA raised BAT effluent limitations and NSPS, PSES, and PSNS for lead and zinc in the ironmaking and sintering subcategories.

- EPA modified BAT effluent limitations and PSES for total cyanide and established a new segment for existing indirect blast furnace dischargers. The new segment contained standards identical to the generally applicable PSES, except that the promulgated ammonia-N and total phenols standards were less stringent.

- EPA raised BPT and BAT effluent limitations and NSPS, PSES, and PSNS for zinc in the sulfuric and hydrochloric acid pickling segments of the acid pickling subcategory.

- While the 1982 regulation originally limited all cold worked pipe and tube operations to zero discharge for BPT, BAT, and BCT effluent limitations and NSPS, PSES, and PSNS, the amended rule permitted nominal discharges (rather than contract hauling) of spent oil or water solution and specified that limitations and standards for types of process wastewater not covered under the 1982 regulation were to be developed on a case-by-case basis.

- EPA modified effluent limitations and standards for zinc under the hot coating subcategory, provided that facilities achieving zinc discharge levels more stringent than the amended limitations and standards continued to do so. The amended rule also provided that the modified limitations for the hot coating subcategory could be used as a basis for determining alternative limitations under the "Water Bubble" provision, even for those facilities achieving discharge levels more stringent than the amended limitations and standards.

EPA based the pretreatment standards in the 1982 rule upon a reasonable measure of actual production, such as the production during the high month of the previous year or the monthly average for the highest of the previous five years (40 CFR 420.04).

Under the "Water Bubble" provision in the 1982 rule, any facility within the Iron and Steel Category may qualify for alternative effluent limitations for a number of processes representing the degree of effluent reduction attainable by the application of BPT, BAT, and BCT. The alternative effluent limitations for each pollutant are determined for a combination of outfalls by totaling the mass limitations of each pollutant allowed under the rule and subtracting from each total an appropriate net reduction amount. Permit writers may determine appropriate net reduction amounts based on additional available control measures that would substantially reduce the effluent without requiring significant additional expenditures. The 1982 provision prohibits alternative effluent limitations for the cokemaking and cold forming subcategories.

The "Central Treatment Facilities" provision in the 1982 rule temporarily excluded 21 facilities due to economic considerations, provided the owner(s) or operator(s) of the facilities requested that the Agency consider establishing alternative effluent limitations and supplied EPA with information consistent with 40 CFR 420.01(b)) on or before July 26, 1982.[3]

2.2.3 Preliminary Study of the Iron and Steel Category

Under the terms of the 1992 consent decree with the NRDC, EPA must initiate preliminary reviews of a number of categorical effluent limitations guidelines and standards on a set schedule. Pursuant to these legislative and judicial requirements, EPA published the Preliminary Study of the Iron and Steel Category (EPA 821-R-95-037) in September 1995. The study includes the following:

- A preliminary assessment of the status of the industry with respect to the Iron and Steel rule promulgated in 1982 and amended in 1984;
- Identification of better-performing mills using conventional and innovative in-process pollution prevention and end-of-pipe treatment technologies;
- Estimation of possible effluent reduction benefits if the industry was upgraded to the level of better-performing mills; and
- Identification of regulatory and implementation issues with the Iron and Steel rule and possible solutions to these issues.

[3]Currently, each of these 21 facilities has a permit with effluent limitations derived from Part 420. The proposed rule establishes new BAT limitations that EPA believes are economically achievable for all iron and steel subcategories. Therefore, EPA believes that provisions for alternative effluent limitations are no longer necessary for these facilities and proposes to withdraw this exclusion from Part 420.

The study found that the iron and steel industry had restructured during the decade following the 1984 amendments to the Iron and Steel rule. The study found that the industry had improved manufacturing techniques, water conservation, pollution prevention, and wastewater treatment practices. The study also found that the industry had consolidated and modernized in response to domestic and world competition. While the market for integrated mills continued to decrease, the market for non-integrated mills using steel scrap as their primary material continued to expand due to improvements in the quality of steel manufactured from scrap. Cokemaking was declining due to changes in ironmaking processes, while direct reduced ironmaking was increasing. Also, continuous casting became the new industry standard due to the increased energy efficiency of the process compared with ingot casting.

Overall, the study found that the industry was operating with greater efficiency. Pollutant loadings had decreased due to increased wastewater recycle rates on manufacturing processes and improved wastewater treatment processes. At the time of the study, many better-performing mills were discharging wastewater loadings far below the limitations and standards established in the 1982 rule; however, not all of the industry had improved wastewater treatment or implemented proactive pollution prevention practices. At the time of the study, discharges from some mills continued to exceed allowances specified in the 1982 rule.

SECTION 3

DATA COLLECTION

EPA gathered and evaluated information and data from various sources in the course of developing the proposed effluent limitations guidelines and standards for the iron and steel industry. EPA used these data to develop the industry profile, to determine the applicability of the rule, to subcategorize the industry, and to determine wastewater characteristics, technology options, compliance costs, pollutant loading reductions, and non-water quality impacts. This section discusses the following data collection activities:

- Surveys, including descriptions of the survey instruments and determination of survey recipients (Section 3.1);
- Site visits, including descriptions of the types of sites visited, the geographical locations, and the manufacturing processes at the sites visited (Section 3.2);
- Sampling episodes, including the types of sites sampled, the manufacturing processes and treatment systems sampled, and the sampling process (Section 3.3);
- Other data sources (Section 3.4); and
- Public participation, including meetings with stakeholders from industry trade associations, individual steel companies, environmental groups, and nongovernmental organizations (Section 3.5).

3.1 Surveys

The principal source of information and data used in developing effluent limitations guidelines and standards is the industry response to surveys distributed by EPA under the authority of Section 308 of the Clean Water Act. EPA designed these surveys to obtain information concerning manufacturing operations, wastewater generation and treatment, discharge practices, and analytical data. The Agency developed related surveys to obtain financial data for use in assessing economic impacts and the economic achievability of technology options.

EPA developed an Information Collection Request (ICR) entitled U.S. Environmental Protection Agency Collection of 1997 Iron and Steel Industry Data that explains the regulatory basis and intended use of the industry surveys. The Office of Management and Budget (OMB) approved the ICR in August 1998 (OMB Control No. 2040-0193, approval expires 08/31/2001) (Reference 3-1). The Agency published three Federal Register notices announcing: (1) the intent to distribute the surveys (62 FR 54453; October 20, 1997), (2) the submission of the ICR to the OMB (63 FR 16500; April 3, 1998), and (3) OMB's approval of the ICR (63 FR 47023; September 3, 1998) (References 3-2 through 3-4). The Agency consulted

with industry trade associations and visited a number of sites to develop survey instruments and to ensure an accurate mailing list.

EPA distributed four industry surveys. The first two surveys were similar in content and purpose, designed to collect detailed technical and financial information from iron and steel facilities. In October 1998, EPA mailed the first survey, entitled U.S. EPA Collection of 1997 Iron and Steel Industry Data (detailed survey), to 176 iron and steel industry sites and the second survey, entitled U.S. EPA Collection of 1997 Iron and Steel Industry Data (Short Form) (short survey), to 223 iron and steel industry sites. The short survey is an abbreviated version of the detailed survey and was designed for those iron and steel industry sites that do not have manufacturing processes found only at integrated and non-integrated mills (the cokemaking, ironmaking, and steelmaking processes described in Section 5). Section 5 describes the types of sites that received a detailed or short survey. EPA mailed the third and fourth surveys to subsets of the facilities that received the first or second survey to obtain more detailed information on wastewater treatment system costs, analytical data, and facility production. EPA mailed the third survey, entitled U.S. EPA Collection of Iron and Steel Industry Wastewater Treatment Capital Cost Data (cost survey), to 90 iron and steel industry sites. EPA mailed the fourth survey, entitled U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (analytical and production survey), to 38 iron and steel industry sites.

The detailed and short survey were divided into two parts: Part A: Technical Information and Part B: Financial and Economic Information. The "Part A" technical questions in the detailed survey comprised four sections, with Sections 3 and 4 being combined in the short survey, as follows:

- Section 1: General Site Information;
- Section 2: Manufacturing Process Information;
- Section 3: In-Process and End-of-Pipe Wastewater Treatment and Pollution Prevention Information; and
- Section 4: Wastewater Outfall Information.

The financial and economic information in Part B of the detailed survey also comprised four sections, as shown below:

- Section 1: Site Identification;
- Section 2: Site Financial Information;
- Section 3: Business Entity Financial Information; and
- Section 4: Corporate Parent Financial Information.

Part B of the short survey contained a single section for site identification and financial information. More detailed descriptions of financial information data collection and analysis are included in the Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (Reference 3-5).

The detailed survey requested detailed descriptions of all manufacturing processes and treatment systems that EPA determined were included in the iron and steel industry. The short survey contained manufacturing process questions for only forming and finishing operations. EPA eliminated the cokemaking, ironmaking, and steelmaking questions from the short survey because they were not applicable to the types of facilities that received the short survey. The Agency also reduced the amount of detail requested in the short survey. EPA determined that if, for example, it received detailed descriptions of hot forming mills from an adequate number of integrated, non-integrated, and stand-alone hot forming mills to understand the different processes, then it could make assumptions about industry trends from the reduced detail collected in the short survey.

Part A Section 1 requested site contacts and addresses and general information regarding manufacturing operations, age, and location. The Agency used this information to develop the subcategorization for the proposed regulation.

Part A Section 2 requested information on products, types of steel produced, production levels, unit operations, chemicals and coatings used, quantity of wastewater discharged from unit operations, miscellaneous wastewater sources, flow rates, pollution prevention activities, and air pollution control. The Agency used data received in response to these questions to evaluate manufacturing processes and wastewater generation, and to develop regulatory options. EPA also used these data to develop the proposed subcategorization and to estimate compliance costs and pollutant removals associated with the regulatory options EPA considered for proposal.

Part A Section 3 requested detailed information (including diagrams) on the wastewater treatment systems and discharge flow rates, monitoring analytical data, and operating and maintenance cost data (including treatment chemical usage). The Agency used data received in response to these questions to identify treatment technologies in place, to determine the feasibility of regulatory options, and to estimate compliance costs and pollutant removals associated with the proposed regulatory options.

Part A Section 4 requested permit information, discharge location, wastewater sources to each outfall, flow rates, regulated pollutants and limits, and permit monitoring data. The Agency used this information to calculate the effluent limitations guidelines and standards and pollutant loadings associated with the proposed regulatory options.

The cost survey requested detailed capital cost data on selected wastewater treatment systems installed since 1993, including equipment, engineering design, and installation costs. EPA incorporated these data into a costing methodology and used them to determine

incremental investment costs and incremental operating and maintenance costs associated with the proposed regulatory options.

The analytical and production survey requested detailed daily analytical and flow rate data for selected sampling points and monthly production data and operating hours for selected manufacturing operations. The Agency used the analytical data to estimate baseline pollutant loadings and pollutant removals from facilities with treatment in place similar to the proposed options and to evaluate the variability associated with iron and steel industry discharges. The Agency used the production data collected to evaluate the production basis for applying the proposed rule in National Pollutant Discharge Elimination System (NPDES) permits and pretreatment permits.

EPA sent the iron and steel industry surveys by mail to facilities that were identified from the following sources:

- Association of Iron and Steel Engineers' 1997 Directory: Iron and Steel Plants Volume 1, Plants and Facilities (Reference 3-6);
- Iron and Steel Works of the World (12th edition) directory (Reference 3-7);
- Iron and Steel Society's Steel Industry of Canada, Mexico, and the United States: Plant Locations map (Reference 3-8);
- Member lists from the following trade associations:
  - American Coke and Coal Chemicals Institute (Reference 3-9),
  - American Galvanizers Association (Reference 3-10),
  - American Iron and Steel Institute (Reference 3-11),
  - American Wire Producers Association (Reference 3-12),
  - Cold Finished Steel Bar Institute (Reference 3-13),
  - Specialty Steel Industry of North America (Reference 3-14),
  - Steel Manufacturers Association (Reference 3-15),
  - Steel Tube Industry of North America (Reference 3-16), and
  - Wire Association International (Reference 3-17);
- Dun & Bradstreet Facility Index database (Reference 3-18);
- EPA Permit Compliance System (PCS) database (Reference 3-19);
- EPA Toxic Release Inventory (TRI) database (Reference 3-20);
- Iron and Steelmaker Journal "Roundup" editions (Reference 3-21);
- 33 Metalproducing Journal "Roundup" editions (Reference 3-22);

- 33 Metalproducing Journal "Census of the North American Steel Industry" (Reference 3-23); and

- Thomas Register (Reference 3-24).

The Agency cross-referenced these sources with one another to develop a list of individual sites. Based on these sources, EPA identified 822 candidate facilities to receive surveys. These candidates include facilities that EPA now proposes to include in the Metal Products and Machinery (MP&M) Category and will be regulated under 40 CFR Part 438. To minimize the burden on the respondents, EPA grouped them into 12 strata. In general, EPA determined the strata based on its understanding of the manufacturing processes at each facility. The Agency also developed two "certainty strata," one for the detailed survey and one for the short survey. Table 3-1 presents the stratification of the iron and steel industry.

Depending on the amount or type of information EPA required for the rulemaking, EPA either solicited information from all facilities within a stratum (i.e., performed a census) or selected a random sample of facilities within each stratum. EPA sent a survey to all facilities in the certainty strata (strata 5 and 8) because the Agency determined it was necessary to capture the size, complexity, or uniqueness of the steel operations present at these sites. EPA also sent surveys to all facilities in strata 1 through 4 (all cokemaking sites, integrated steel sites, and sintering and direct reduced iron sites) because the number of sites in each stratum is relatively low and because of the size, complexity, and uniqueness of raw material preparation and steel manufacturing operations present. The Agency statistically sampled the remaining sites in strata 6, 7, and 9 through 12. EPA gave survey weights to each selected facility based on a facility's probability of selection. If the Agency sent a survey to every facility in a stratum, each facility represents only itself. For statistically sampled strata, each facility was given a survey weight that allows it to represent itself and other facilities within that stratum that were not selected to receive an industry survey. See Appendix A for more details.

Of the 822 candidate facilities, EPA mailed either a detailed survey or a short survey to 399 facilities. Detailed survey recipients included integrated mills, non-integrated mills, stand-alone cokemaking sites, stand-alone sintering sites, stand-alone direct reduced ironmaking sites, stand-alone hot forming sites, and stand-alone finishing sites. Short survey recipients included stand-alone cold forming sites, stand-alone pipe and tube sites, stand-alone hot dip coating sites, and stand-alone wire sites. Section 5 describes these types of sites. Eleven sites receiving a survey did not return a completed survey and, thus, are considered non-respondents. EPA did not consider 10 sites receiving surveys for further review: seven of these sites were closed, two sites were considered part of another site owned by the same company, and one site received two surveys under two mailing addresses and, therefore, only one survey was completed. EPA received 378 completed surveys, including those from 33 sites that certified that they were not engaged in iron and steel activities.

One hundred fifty-four of the returned surveys were from sites with operations that were later determined to be within the scope of the MP&M Category. Similarly, two recipients of MP&M surveys were determined to be within the scope of the Iron and Steel Category.

Therefore, the Agency used the data from 191 returned surveys and the two MP&M industry surveys in the development of the proposed rule.

Once the Agency completed a review of the detailed and short surveys and defined the treatment technology options, EPA identified survey respondents who had installed wastewater treatment systems in the last 10 years (since 1990) that were similar to the technology options and mailed them the cost survey. Of the 90 cost survey recipients, 88 returned completed surveys. EPA selected 38 facilities to receive the analytical and production survey based on survey respondents who had indicated that: (1) they had treatment trains similar to the treatment technology options, (2) they had collected analytical data for that treatment train, (3) they had a treatment train with a dedicated outfall from which EPA could evaluate performance, and (4) they did not add excessive dilution water to the outfall before sampling. All 38 analytical and production survey recipients returned completed surveys. EPA included in the public record all information and data collected for which sites have not asserted claims of confidential business information.

3.2 Site Visits

EPA conducted 67 site visits at iron and steel facilities in 19 states and Canada between January 1997 and May 1999. Table 3-2 presents the number of site visits performed in each state. The purpose of the site visits was to collect information about each site's manufacturing operations, wastewater generation, wastewater management practices, and wastewater treatment systems and to evaluate each facility for potential inclusion in the sampling program. EPA also used information collected during site visits to aid in the development of the industry surveys. EPA selected sites to visit based on the type of site (as described in Section 5.1), the manufacturing operations at each facility, the type of steel produced (carbon, alloy, stainless), and the wastewater treatment operations. The Agency wanted to visit all types of iron and steel manufacturing operations as well as all types of wastewater treatment operations. Before sites returned completed surveys, EPA used information collected from the sources used to develop the survey database to select sites to visit. After EPA evaluated the completed surveys, the Agency used information provided by the sites to select additional sites to visit. Table 3-3 summarizes the number of site visits performed at each type of site.

EPA collected detailed information during each site visit on the manufacturing processes, wastewater generation, in-process treatment and recycling systems, management practices and pollution prevention, end-of-pipe treatment technologies, and, if the facility was a candidate for sampling, the logistics of collecting samples. The Agency observed the following manufacturing processes: coke plants, sinter plants, briquetting plants, blast furnaces, direct reduced ironmaking plants, an iron carbide plant, basic oxygen furnaces, electric arc furnaces, vacuum degassers, ladle metallurgy stations, continuous and ingot casting facilities, hot forming mills, and cold forming mills. The Agency also observed acid pickling, descaling, and surface cleaning and coating operations (i.e., manufacturing lines or areas with acid cleaning, alkaline cleaning, annealing, electroplating, and/or hot dip coating operations). Table 3-4 summarizes the number of sites visited that performed any of these manufacturing processes.

EPA observed in-process wastewater treatment and recycling systems, pretreatment systems, and end-of-pipe wastewater treatment systems that were either dedicated to a manufacturing process or shared by multiple processes. Wastewater treatment operations included biological treatment, metals precipitation, solids settling, alkaline chlorination, and filtration systems. EPA included in the public record all information and data collected during site visits for which sites have not asserted claims of confidential business information.

3.3 Sampling

After evaluating information obtained during the site visits, EPA selected 16 sites at which to perform wastewater sampling. EPA selected sites for sampling using the following criteria:

- The site performed operations either currently regulated under 40 CFR Part 420 or identified in the Preliminary Study as being operations performed in the iron and steel industry;
- The site performed high-rate recycling, in-process treatment, or end-of-pipe treatment operations that EPA believed may represent potential model treatment technology; and
- The site's compliance monitoring data indicated that it was among the better performing treatment systems in the industry, based on comparisons of monitoring data from other facilities and with limits from the 1982 regulation.

Table 3-5 shows the type and number of manufacturing processes sampled during the EPA sampling program.

During each sampling episode, EPA collected samples of untreated process wastewater, treatment system effluents, source water to characterize background concentrations, and other samples to characterize the performance of individual treatment units. Table 3-6 summarizes the treatment systems sampled during the sampling program.

In general, the Agency collected 24-hour composite samples from wastewater sampling points each day of the sampling episode. Exceptions to this rule include samples collected for volatile organics analysis and oil and grease (O&G), which EPA collected as multiple grabs over each 24-hour period (laboratory personnel composited the volatile organics samples before analysis, while EPA mathematically composited the O&G analytical results after the analyses were performed). EPA collected a one-time grab sample from each water source contributing to the manufacturing processes sampled. The Agency collected all waste oil and treatment system sludge samples as one-time grab samples.

EPA analyzed wastewater samples for up to approximately 300 analytes spanning the following pollutant classes: conventional, priority, and nonconventional pollutants, including

metals, volatile organic constituents, semivolatile organic constituents, and dioxins and furans. Analyte selection was based on knowledge of the manufacturing processes and raw materials used. EPA generally collected samples using the following guidelines:

- Five days of samples for conventionals, nonconventional and priority metals, and certain other nonconventional pollutants, including total dissolved solid (TDS), chlorides, fluorides, sulfates, total organic carbon (TOC), chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN), nitrate/nitrite, ammonia as nitrogen, and total phenols;

- Five days of samples from biological treatment systems for five-day biochemical oxygen demand (BOD_5) and five-day carbonaceous biochemical oxygen demand ($CBOD_5$);

- Five days of samples from cokemaking, blast furnace ironmaking, and sintering wastewater for total sulfide, thiocyanate, amenable cyanide, total cyanide, and weak acid dissociable (WAD) cyanide;

- Five days of samples from cokemaking wastewater for organics and dioxins/furans, because the Agency believed limitations development for these parameters was likely;

- Three days of samples from all noncokemaking wastewater for organics to screen and provide sufficient data for potential limitations development;

- Two days of samples from blast furnace ironmaking, sintering, and basic oxygen furnace steelmaking wastewater for dioxins/furans to screen and provide sufficient data for potential limitations development;

- Five days of samples from carbon and alloy steel finishing treatment systems containing chromium-bearing wastewater from electroplating or hot coating operations and stainless steel finishing treatment systems for hexavalent chromium;

- On two occasions (one cokemaking plant and one direct reduced ironmaking plant), the Agency performed a one-day screening for pollutants of concern.

Table 3-7 shows the EPA wastewater analytical methods used and parameters analyzed for during the sampling program, the manufacturing processes for which the analyte was analyzed, and the general frequency with which samples were collected during the sampling program. EPA analyzed one-time grab waste oil and sludge samples for metals, volatile and semivolatile organic constituents, total phenols, and dioxins/furans, depending on the treatment system from which they were collected.

Analytical results from untreated samples contributed to EPA's characterization of the industry, development of the list of pollutants of concern, and development of raw wastewater characteristics. EPA used data from both untreated wastewater samples and treated effluent samples to evaluate treatment system performance, to develop pollutant loadings and removals, and, under the focused rulemaking approach described in Section 8, to develop the proposed model treatment technology options for the iron and steel industry. EPA used data collected from treated effluent sampling points to calculate the long-term averages (LTAs) and limitations for each of the proposed regulatory options. During each sampling episode, EPA also collected flow rate data corresponding to each sample collected and production information from each associated manufacturing operation for use in calculating pollutant loadings and production-normalized flow rates. EPA included in the public record all information and data collected during sampling episodes for which sites have not asserted claims of confidential business information.

3.4 Other Data Sources

EPA evaluated existing data sources to gather technical and financial information about the iron and steel industry, as discussed below.

The Agency gathered technical information from iron and steel industry trade journals published from 1985 through 1997 as well as information from Iron and Steel Society conference proceedings. Trade journals included Iron and Steel Engineer, published by the Association of Iron and Steel Engineers (AISE) (Reference 3-25), Iron and Steelmaker, published by the Iron and Steel Society (ISS) (Reference 3-26), and New Steel (formerly Iron Age), published by Chilton Publications (Reference 3-27). EPA obtained the following types of information from these sources: storm-water and wastewater issues, new and existing wastewater treatment technologies, wastewater treatment and manufacturing equipment upgrades and installations, and company mergers, acquisitions, and joint ventures. EPA also used these sources to identify potential survey recipients and facilities for site visits.

EPA consulted the following publications: Census Manufacturers - Industry Series and Current Industrial Reports (U.S. Bureau of Census) (References 3-28 and 3-29); World Steel Dynamics (Paine Webber) (References 3-30 through 3-36); and The Annual Statistical Report (American Iron and Steel Institute) (Reference 3-37). These sources provided a variety of financial information, ranging from aggregate data on employment and payroll to steel shipments by product, grade, and market.

The Agency performed searches on the following on-line databases: Pollution Abstracts, Water Resources Abstracts, Engineering Index, Materials Business File, National Technical Information Service (NTIS), Enviroline, Compendex, and Metadex (References 3-38 through 3-45). The Agency also searched EPA's TRI (Reference 3-20) and PCS databases (Reference 3-19). In addition, the Agency reviewed secondary sources, including data, reports, and analyses published by government agencies, reports and analyses published by the iron and steel industry and its associated organizations, and publicly available financial information compiled by both government and private organizations.

3.5 Public Participation

EPA has encouraged participation of all interested parties throughout the development of the proposed Iron and Steel Category effluent limitations guidelines and standards. EPA has conducted outreach with the following trade associations (which represent the vast majority of the facilities that will be affected by this guideline): American Iron and Steel Institute (AISI), Steel Manufacturers Association (SMA), Specialty Steel Industry of North America (SSINA), Cold Finished Steel Bar Institute (CFSBI), Wire Association International, Incorporated (WAI), American Wire Producers Association (AWPA), Steel Tube Institute of North America (STINA), American Galvanizers Association, Incorporated (AGA), and American Coke and Coal Chemicals Institute (ACCCI). EPA has met on several occasions with various industry representatives to discuss aspects of the regulation development. EPA has also participated in industry meetings and has given presentations on the status of the regulation development.

Because some facilities affected by the proposal are indirect dischargers, the Agency also conducted outreach to publicly owned treatment works (POTWs). EPA also made a concerted effort to consult with pretreatment coordinators and state and local entities who will be responsible for implementing the iron and steel regulation.

EPA sponsored five stakeholders' meetings between December 1998 and January 2000. Four were held in Washington, D.C. and the fifth was held in Chicago, Illinois. The primary objectives of the meetings were to present the Agency's current thinking regarding the technology bases for the proposed revisions to 40 CFR Part 420 and to seek dialogue, discuss issues, and obtain new ideas from interested stakeholders, including industry representatives and members of environmental groups such as the Natural Resources Defense Council (NRDC), the Environmental Defense Fund (now Environmental Defense), Atlantic States Legal Foundation, Friends of the Earth, and Save the Dunes.

During the meetings, EPA presented process flow diagrams showing preliminary technology options and potential best management practices (BMPs) that may be incorporated into a revised Part 420 and/or included in NPDES permit and pretreatment guidance. The presentations were organized by type of manufacturing process. In addition to soliciting comments on the preliminary options, EPA requested ideas from the stakeholders to identify useful incentives for greater pollution control.

At the meetings, EPA encouraged participants to supplement their oral statements with written comments and supporting data. In that regard, EPA provided a set of data quality protocols for use when submitting data for the iron and steel rulemaking effort. This handout, along with all other handouts and meeting summaries, is posted on the EPA iron and steel industry web site at *http://www.epa.gov/OST/ironsteel/*. All of the materials presented at the stakeholders' meetings, as well as meeting summaries and any written comments from participants not containing confidential business information, are also in the public record for the proposed regulation.

3.6 References

3-1 U.S. Environmental Protection Agency. Information Collection Request. U.S. Environmental Protection Agency Collection of 1997 Iron and Steel Industry Data, EPA ICR 1830.01. Washington, D.C., March 1998.

3-2 Agency Announcement of Information Collection Activities: 1997 Iron and Steel Industry Survey (EPA ICR No. 1830.01). Federal Register: October 20, 1997 (Volume 62, Number 202, Page 54453-54454).

3-3 Agency Announcement of Information Collection Activities: Submission for OMB Review; Comment Request; Collection of 1997 Iron and Steel Industry Data (EPA ICR 1830.01). Federal Register: April 3, 1998 (Volume 63, Number 64, Page 16500-16501).

3-4 Agency Information Collection Activities; OMB Responses. Federal Register: September 3, 1998 (Volume 63, Number 171, Page 47023-47024).

3-5 U.S. Environmental Protection Agency. Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category, EPA 821-B-00-009, Washington, D.C., December 2000.

3-6 Association of Iron and Steel Engineers. Directory: Iron and Steel Plants Volume 1, Plants and Facilities. Pittsburgh, PA, 1997 and 1998.

3-7 Iron and Steel Works of the World (11th and 12th edition). Metal Bulletin Books Ltd., Surrey, England, 1994 and 1997.

3-8 Iron and Steel Society. The Steel Industry of Canada, Mexico, and the United States: Plant Locations. Warrendale, PA, 1995.

3-9 American Coke and Coal Chemicals Institute. Member List. 1997.

3-10 American Galvanizers Association. Member List. 1997.

3-11 American Iron and Steel Institute. Member List. 1998.

3-12 American Wire Producers Association. Member List. 1997.

3-13 Cold Finished Steel Bar Institute. Member List. 1997.

3-14 Specialty Steel Industry of North America. Member List. 1997.

3-15 Steel Manufacturers Association. Member List. 1997.

3-16 Steel Tube Institute. Member List. 1997.

3-17 Wire Association International. Member List. 1997.

3-18 Dun & Bradstreet. Facility Index Database. 1997.

3-19 U.S. EPA. Permit Compliance System (PCS) Database.

3-20 U.S. EPA. Toxic Release Inventory (TRI) Database. 1995.

3-21 Iron and Steel Society. Iron and Steelmaker, "Roundup: Electric Arc Furnace," May 1996 and May 1997; "Roundup: Blast furnace," August 1996 and August 1997; "Roundup: Continuous Caster," November 1996 and November 1997.

3-22 33 Metalproducing. "Roundup." Penton Publications, Cleveland, OH, May 1989 and May 1991.

3-23 33 Metalproducing. "Census of the North American Steel Industry." Penton Publications, Cleveland, OH, March 1996, July 1996, September 1996, October 1996, November 1996, and March 1997.

3-24 Thomas Register. Thomas Publishing Company, New York, NY, 1996.

3-25 Association of Iron and Steel Engineers (AISE). Iron and Steel Engineer. Pittsburgh, PA, 1985 through 1997.

3-26 Iron and Steel Society (ISS). Iron and Steelmaker. Warrendale, PA, 1985 through 1997.

3-27 New Steel (formerly Iron Age). 1985 through 1997.

3-28 U.S. Bureau of the Census. Census Manufacturers - Industry Series. 1992.

3-29 U.S. Bureau of the Census. Current Industrial Reports. 1992.

3-30 Paine Webber. World Steel Dynamics. "Steel's Thin-Slab/ Flat-Rolling Revolution: Provoking Changed." January 1996.

3-31 Paine Webber. World Steel Dynamics. "Steel Dynamics Inc. Progress Report." May 1996.

3-32 Paine Webber. World Steel Dynamics. "PriceTrack # 55." April 1997.

3-33 Paine Webber. World Steel Dynamics. "Trico Steel: Raising the Ante in Steel's Flat-Rolling Revolution." June 1997.

3-34 Paine Webber. World Steel Dynamics. " PriceTrack #56." August 1997.

3-35 Paine Webber. World Steel Dynamics. "Flat-Rolled Process-by-Process Costs." December 1997.

3-36 Paine Webber. World Steel Dynamics. "Long Product Process-by-Process Costs." December 1997.

3-37 American Iron and Steel Institute. The Annual Statistical Report. 1997.

3-38 Pollution Abstracts (on-line).

3-39 U.S. Geological Survey. Water Resources Abstracts (on-line).

3-40 Engineering Index (on-line).

3-41 Material Business File (on-line).

3-42 U.S. Environmental Protection Agency. National Technical Information Service (NTIS) (on-line).

3-43 Congressional Information Service, Inc. Enviroline (on-line).

3-44 Engineering Information, Inc. Compendex (on-line).

3-45 Cambridge Scientific Abstracts. Metadex (on-line).

Table 3-1

Iron And Steel Industry Strata

Stratum Number	Stratum Name	Number of Sites in Stratum	Number of Sites Receiving Surveys
1	Integrated steel sites with cokemaking	9	9
2	Integrated steel sites without cokemaking	12	12
3	Stand-alone cokemaking sites	16	16
4	Stand-alone direct reduced ironmaking and sintering sites	5	5
5	Detailed survey certainty stratum[a, b]	60	60
6	Non-integrated steel sites	69	40
7	Stand-alone finishing sites and stand-alone hot forming sites	54	35
8	Short survey certainty stratum[b, c]	13	13
9	Stand-alone cold forming sites	62	37
10	Stand-alone pipe and tubes sites	164	59
11	Stand-alone hot coating sites	106	49
12	Stand-alone wire sites	252	67
	Total	**822**	**402**

[a]This stratum includes facilities from strata 6 and 7.
[b]This stratum includes data transferred from one site that received an MP&M survey.
[c]This stratum includes facilities from strata 9 through 12.

Table 3-2

Number of Site Visits Conducted in Each State and in Canada

State	Number of Site Visits Conducted
Alabama	6
Arizona	1
Arkansas	1
California	2
Canada	2
Illinois	6
Indiana	10
Kentucky	1
Louisiana	1
Maryland	2
Michigan	2
New York	2
Ohio	10
Oregon	1
Pennsylvania	10
South Carolina	1
Texas	2
Utah	2
Virginia	2
West Virginia	3
Total	**67**

Table 3-3

Number of Site Visits Conducted at Each Type of Site

Type of Site	Number of Site Visits Conducted
Integrated mill with cokemaking	11
Integrated mill without cokemaking	9
Stand-alone cokemaking plant	12
Stand-alone sintering plant[a]	1
Stand-alone direct reduced ironmaking plant[b]	1
Non-integrated mill	16
Stand-alone hot forming mill	1
Stand-alone finishing mill	10
Stand-alone pipe and tube mill	5
Stand-alone iron carbide mill	1
Total	**67**

[a]EPA visited eight additional sintering plants at integrated mills.
[b]EPA visited one additional direct reduced ironmaking mill at a non-integrated mill.

Table 3-4

Number of Sites Visited With Each Type of Manufacturing Process

Manufacturing Process	Number of Sites with Each Type of Manufacturing Process
Cokemaking	23
Sintering	9
Briquetting	4
Blast furnace ironmaking	20
Direct reduced ironmaking	2
Iron carbide	1
Basic oxygen furnace steelmaking	19
Electric arc furnace steelmaking	18
Vacuum degassing	17
Ladle metallurgy	33
Casting[a]	33
Hot forming[b]	36
Cold forming	34
Acid pickling or descaling	28
Surface cleaning and coating[c]	28

[a]Casting operations include ingot casting and continuous casting.
[b]Hot forming operations include hot rolling, forging, seamless pipe and tube, and butt-welded pipe and tube.
[c]Surface cleaning and coating operations include acid cleaning, alkaline cleaning, annealing, electroplating, and hot coating operations.

Table 3-5

Manufacturing Processes Sampled

Manufacturing Process	Number of Processes Sampled
Cokemaking	4
Sintering	2
Blast furnace ironmaking	3
Direct reduced ironmaking	1
Basic oxygen furnace steelmaking	5
Vacuum degassing	2
Continuous casting	6
Hot forming[a]	7
Descaling	2
Acid pickling	7
Cold forming	5
Surface cleaning or coating[b]	4

[a]Hot forming operations include hot rolling, forging, seamless pipe and tube, and butt-welded pipe and tube.
[b]Surface cleaning and coating operations include acid cleaning, alkaline cleaning, annealing, electroplating, and hot coating operations.

Table 3-6

Treatment Systems Sampled

Treatment System	Treatment System Description	Samples Collected
1	Coke plant treatment system with ammonia stripping and biological treatment	Ammonia still influent, ammonia still effluent, biological treatment system effluent
2	Coke plant treatment system with ammonia stripping and biological treatment	Ammonia still influent, ammonia still effluent, biological treatment system effluent
3	Coke plant treatment system with ammonia stripping, biological treatment, and sand and granular activated carbon filtration	Flushing liquor, by-products recovery wastewater, equalization tank effluent, biological treatment system effluent, sand filter effluent, carbon filter effluent
4	Coke plant treatment system with ammonia stripping and biological treatment	Ammonia still influent, ammonia still effluent, biological treatment system effluent
5	Sinter plant treatment and high-rate recycle system	Sinter plant untreated wastewater, treatment system effluent
6	Blast furnace and sinter plant blowdown treatment and high-rate recycle system	Blast furnace scrubber untreated wastewater, sinter plant scrubber untreated wastewater, blast furnace treatment blowdown, sinter plant treatment blowdown, combined final effluent, treatment system sludge
7	Blast furnace treatment and high-rate recycle system	Blast furnace untreated wastewater, recycle wastewater, filter press sludge
8	Blast furnace treatment and high-rate recycle system	Blast furnace untreated wastewater, treatment system blowdown, treatment system filter cake
9	Direct reduced iron treatment and high-rate recycle system	Clarifier influent, sand filter influent, treatment system effluent
10	Basic oxygen furnace treatment and high-rate recycle system	Basic oxygen furnace untreated wastewater, recycle water
11	Basic oxygen furnace blowdown treatment system	Classifier effluent, thickener effluent, treatment system effluent, vacuum filter cake
12	Steelmaking (vacuum degasser, continuous caster) treatment and high-rate recycle system	Vacuum degasser untreated wastewater, clarifier overflow, filter effluent, continuous caster untreated wastewater, treatment system effluent
13	Basic oxygen furnace treatment and high-rate recycle system	Basic oxygen furnace untreated wastewater, untreated gas cooling water, thickener overflow, drum filter sludge, filter press sludge

Table 3-6 (Continued)

Treatment System	Treatment System Description	Samples Collected
14	Steelmaking (basic oxygen furnaces, vacuum degasser, continuous casters) treatment and high-rate recycle system	Continuous caster untreated wastewater, vacuum degasser untreated wastewater, clarifier underflow, thickener underflow, treatment system blowdown
15	Continuous caster treatment and high-rate recycle system	Scale pit influent, treatment system effluent
16	Continuous caster treatment and high-rate recycle system	Continuous caster untreated wastewater, sand filter effluent
17	Continuous caster treatment and high-rate recycle system	Continuous caster scale pit influent, sand filter effluent, scale pit waste oil
18	Continuous caster treatment and high-rate recycle system	Continuous caster untreated wastewater, treatment system effluent, scale pit waste oil
19	Hot strip mill treatment and high-rate recycle system	Hot strip mill untreated wastewater, treatment system effluent
20	Hot strip mill treatment and high-rate recycle system	Continuous caster untreated wastewater, vacuum degasser untreated wastewater, hot strip mill untreated wastewater, treatment system blowdown
21	Hot strip mill treatment and high-rate recycle system	Roughing mill untreated wastewater, finishing mill untreated wastewater, roughing mill sand filter effluent, finishing mill sand filter effluent, waste oil
22	Hot strip mill blowdown treatment and high-rate recycle system	Hot strip mill untreated wastewater, treatment system blowdown, scale pit waste oil
23	Hot strip mill treatment and high-rate recycle system	Hot mill scale pit influent, treatment system effluent, scale pit waste oil
24	Hot mill treatment and high-rate recycle system	Hot mill untreated wastewater, treatment system effluent, blowdown polishing system blowdown, scale pit waste oil
25	Hot strip mill treatment and high-rate recycle system	Sand filter influent, treatment system effluent
26	Oily wastewater treatment system	Oily wastewater influent, treatment system effluent
27	Plate mill treatment system	Scale pit influent, scale pit effluent, scale pit waste oil
28	Steel finishing chemical precipitation system	Acid pickling untreated wastewater, galvanizing untreated wastewater, sand filter influent, sand filter effluent
29	Steel finishing chemical precipitation system with chromium reduction pretreatment	Acid pickling untreated wastewater, chromium reduction pretreatment influent, chromium reduction pretreatment effluent, sand filter influent, sand filter effluent

Table 3-6 (Continued)

Treatment System	Treatment System Description	Samples Collected
30	Steel finishing chemical precipitation system with chromium reduction pretreatment	Acid pickling untreated wastewater, cold forming untreated wastewater, electrogalvanizing untreated wastewater, hot dip coating untreated wastewater, oily wastewater, chromium reduction pretreatment effluent, intermediate treatment, final effluent
31	Steel finishing chemical precipitation system	Acid pickling untreated wastewater, cold forming untreated wastewater, treatment system effluent
32	Steel finishing chemical precipitation system with chromium reduction pretreatment	Acid pickling untreated wastewater, descaling untreated wastewater, chromium reduction pretreatment effluent, treatment system effluent
33	Steel finishing chemical precipitation system	Electroplating solution, treatment system influent, clarifier effluent, sand filter effluent
34	Steel finishing chemical precipitation system	Acid pickling untreated wastewater, oily wastewater, treatment system effluent
35	Steel finishing chemical precipitation system with oily wastewater pretreatment and chromium pretreatment	Continuous annealing untreated wastewater, alkaline cleaning untreated wastewater, electroplating untreated wastewater, hot dip coating untreated wastewater, acid pickling untreated wastewater, oily wastewater pretreatment influent, oily wastewater pretreatment effluent, chromium reduction pretreatment influent, chromium reduction pretreatment effluent, treatment system influent, treatment system effluent
36	Steel finishing chemical precipitation system	Acid pickling untreated wastewater, electrogalvanizing untreated wastewater, treatment system effluent

Table 3-7

Wastewater Analytical Methods Used During Sampling Program

EPA Method	Parameter	Manufacturing Processes	Typical Sampling Frequency (Days/Episode)
160.2	Total suspended solids (TSS)	All	5
160.1	Total dissolved solids (TDS)	All	5
325.2 or 325.3	Chlorides	All	5
340.1, 340.2, 340.3	Fluorides	All	5
375.1, 375.3, 375.4	Sulfates	All	5
150.1	pH	All	5
415.1	Total organic carbon (TOC)	All	5
410.1, 410.2, or 410.4	Chemical oxygen demand (COD)	All	5
351.1, 351.2, 351.3, 351.4	Total Kjeldahl nitrogen (TKN)	All	5
353.1, 353.2, or 353.3	Nitrate/nitrite	All	5
350.1, 350.2, or 350.3	Ammonia as nitrogen	All	5
405.1	Five-day biochemical oxygen demand (BOD_5)	Cokemaking	5
405.1	Five-day carbonaceous biochemical oxygen demand ($CBOD_5$)	Cokemaking	5
1664	Hexane extractable material (oil and grease)	All	5
1664	Silica-gel treated hexane extractable material (total petroleum hydrocarbons)	All	5
420.1 or 420.2	Total phenols	All	5
376.1, 376.2	Total sulfide	Cokemaking, blast furnace ironmaking, sintering	5
4500CN Part M	Thiocyanate	Cokemaking, blast furnace ironmaking, sintering	5
335.1, 335.2, and 1677	Cyanide (amenable), cyanide (total), and weak acid dissociable cyanide, respectively	Cokemaking, blast furnace ironmaking, sintering	5

Table 3-7 (Continued)

EPA Method	Parameter	Manufacturing Processes	Typical Sampling Frequency (Days/Episode)
1613B	Dioxins/furans	Cokemaking, blast furnace ironmaking, sintering, basic oxygen furnace steelmaking	2 (blast furnace ironmaking, sintering, basic oxygen furnace steelmaking) 5 (cokemaking)
218.4	Hexavalent chromium	Chromium-bearing electroplating and hot coating wastewater from carbon and alloy finishing operations, stainless steel finishing operations	5
1620	Metals	All	5
1624C	Volatile organics	All	3 5 (cokemaking)
1625C	Semivolatile organics	All	3 5 (cokemaking)

SECTION 4

ANALYTICAL METHODS AND BASELINE VALUES

This section describes the analytical methods associated with the concentration data used to develop the proposed limitations and standards. Depending on the subcategory and segment, the proposed rule requires dischargers to measure for up to seven metals, three organic contaminants, 2,3,7,8-TCDF, ammonia as nitrogen, fluoride, oil and grease as hexane extractable material (HEM), thiocyanate, total cyanide, total residual chlorine (TRC), total suspended solids (TSS), and pH. In addition, the preamble to the proposed rule solicits comments on whether nitrate/nitrite should be regulated.

This section discusses the methods used to analyze the samples that EPA and the industry collected from iron and steel wastewater. Section 3 discusses these sampling efforts. This section also discusses how EPA used the results of its wastewater analyses for purposes of calculating the proposed limitations and standards (Section 12 describes the methodology used for those calculations).

Section 4.1 briefly describes baseline values for the pollutants and their importance. Section 4.2 describes the reporting conventions laboratories used in expressing the results of the analysis. Sections 4.3 and 4.4 further explain nominal quantitation limits and baseline values, respectively. Section 4.5 describes the specific analytical methods and the corresponding baseline value for each pollutant that EPA proposes to regulate (pH is excluded from this discussion as the baseline value concept is not relevant[1]). Table 4-1 presents the analytical methods and baseline values used for each pollutant in calculating limitations and standards.

4.1 Explanation and Importance of Baseline Values

The database that EPA used to calculate the proposed limitations and standards consists of two types of analytical data: 1) data collected and analyzed by EPA ("sampling episodes"), and 2) industry-supplied data ("self-monitoring episodes"). EPA analyzed all of its wastewater samples using methods identified in Table 4.1. EPA consistently used the same method to analyze all samples for a particular pollutant. However, the methods used for the industry-supplied data varied; these are also identified in Table 4.1. Generally, industry used either EPA methods from Methods for Chemical Analysis of Water and Wastes (MCAWW) or the American Public Health Association's Standard Methods for the Examination of Water and Wastewater (References 4-1 and 4-2).

[1]For pH, the proposed limitations and standards are specified as a range of values between 6 and 9. In analyzing pH levels, laboratories typically use methods such as EPA Method 150.1 or Standard Method 4500 H^+ B, which are classical wet chemistry methods. The baseline concept is not relevant because the lowest pH readings would be extremely acidic and unexpected in treated effluent from this industry regardless of the treatment technology.

As described further in Section 4.4, in using this database, EPA compared the reported concentrations for each pollutant to a baseline value. Regardless of the data source, EPA needed to use a single baseline value for each pollutant in these comparisons. EPA used the nominal quantitation limits associated with the analytical methods employed in its sampling episodes as the basis for determining each "baseline value." EPA determined that this was appropriate because EPA consistently used a single method for each pollutant while industry used a range of different methods. Consequently, the baseline value for each pollutant is the nominal quantitation limit associated with the analytical method EPA used to analyze that pollutant in its sampling episodes. Table 4-1 identifies these baseline values.

In general, the term "nominal quantitation limit" describes the smallest quantity of an analyte that can be measured reliably with a particular analytical method. In some cases, however, EPA used a value lower than the nominal quantitation limit as the baseline value because submitted data demonstrated that reliable measurements could be obtained at a lower level. In a few instances, EPA concluded that the nominal quantitation limit for a specified method was less than the level that laboratories could reliably achieve. For those pollutants, EPA modified the nominal quantitation limit upward and used a higher value as the baseline value. Section 4.3 discusses these instances and the nominal quantitation limit for each pollutant further.

4.2 Reporting Conventions Associated with Analytical Results

Most of the analytical data were reported as liquid concentrations in weight/volume units (e.g., micrograms per liter (µg/L)). In a few instances, the results were provided in weight/weight solids units (e.g., milligrams per kilogram (mg/kg)). In those instances, EPA converted the solids results into weight/volume units by using a conversion factor based upon the percent of solids in the sample. In addition, EPA converted data supplied in weight/time units to weight/volume units.[2]

The laboratories expressed the result of the analysis either numerically or as "not quantitated"[3] for a pollutant in a sample. When the result is expressed numerically, then the pollutant was quantitated[4] in the sample. For example, for a hypothetical pollutant X, the result would be reported as "15 µg/L" when the laboratory quantitated the amount of pollutant X in the sample as being 15 µg/L. For the nonquantitated results for each sample, the laboratories reported a "sample-specific quantitation limit."[5] For example, for the hypothetical pollutant X,

[2]Some facilities reported the results in lbs/day and included the flow rates for each day. EPA used this information to convert the results to mg/L.

[3]Elsewhere in this document and in the preamble to the proposed rule, EPA refers to pollutants as "not detected" or "nondetected." This section uses the term "not quantitated" or "nonquantitated" rather than nondetected.

[4]Elsewhere in this document and in the preamble to the proposed rule, EPA refers to pollutants as "detected." This section uses the term "quantitated" rather than detected.

[5]Elsewhere in this document and in the preamble to the proposed rule, EPA refers to a "sample-specific quantitation limit" as a "sample-specific detection limit" or, more simply, as a "detection limit."

the result would be reported as "<10 µg/L" when the laboratory could not quantitate the amount of pollutant X in the sample. That is, the analytical result indicated a value less than the sample-specific quantitation limit of 10 µg/L, meaning the actual amount of pollutant X in that sample is between zero (i.e., the pollutant is not present) and 10 µg/L. The sample-specific quantitation limit for a particular pollutant is generally the smallest quantity in the calibration range that can be measured reliably in any given sample. If a pollutant is reported as not quantitated in a particular wastewater sample, it does not mean that the pollutant is not present in the wastewater, merely that analytical techniques (whether because of instrument limitations, pollutant interactions or other reasons) do not permit its measurement at levels below the sample-specific quantitation limit.

In its calculations, EPA generally substituted the value of the reported sample-specific quantitation limit for each nonquantitated result. In a few cases when the sample-specific quantitation limit was less than the baseline value, EPA substituted the baseline value for the nonquantitated result. In a few instances when the quantitated value was below the baseline value, EPA considered these values to be nonquantitated in the statistical analyses and substituted the baseline value for the measured value. Section 4.3 further discusses these cases.

4.3 Nominal Quantitation Limits

Protocols used for determining nominal quantitation limits in a particular method depend on the definitions and conventions that EPA used at the time the method was developed. As stated previously, the nominal quantitation limit is the smallest quantity of an analyte that can be reliably measured with a particular method. The nominal quantitation limits associated with the EPA methods addressed in the following sections fall into three general categories. The first category includes Methods 1613B, 1625, and 1664, which use the minimum level (ML) definition as the lowest level at which the entire analytical system must give a recognizable signal and an acceptable calibration point for the analyte. The second category pertains specifically to Method 1620, and is explained in detail in Section 4.5.2. The third category pertains to the remainder of the methods in which a variety of terms are used to describe the lowest level at which measurement results are quantitated. These include the classical wet chemistry methods and several EPA methods for the determination of metals and organics. In some cases (especially with the classical wet chemistry analytes), the methods are older (1970s and 1980s) and different concepts of quantitation apply. These methods typically list a measurement range or lower limit of measurement. The terms differ by method and, as discussed in subsequent sections, the levels presented do not always represent the lowest levels laboratories can currently achieve. For those methods associated with a calibration procedure, the laboratories demonstrated through a low point calibration standard that they were capable of reliable quantitation at method-specified (or lower) levels. In such cases, these nominal quantitation limits are operationally equivalent to the ML (though not specifically identified as such in the methods). In the case of titrimetric or gravimetric methods, the laboratory adhered to the established lower limit of the measurement range published in the methods. Section 4.5 presents details of the specific methods.

4.4 Comparisons to Baseline Values

Depending on the analytical method, EPA performed one of two types of comparisons of the concentration data to the baseline values. This subsection describes each type of comparison and its application.

4.4.1 Comparison Type 1

Comparison Type 1 was used when the baseline value was based upon method-defined minimum levels of Methods 1613B, 1625, or 1664 (see Section 4.5.1). For these methods, the baseline values are based upon minimum levels (ML) that are developed through inter-laboratory studies to determine the lowest measurable level (Section 4.5.1 provides a more precise definition).

EPA applied Comparison Type 1 *before* using the data to calculate the long-term averages and variability factors[6] used for the proposed limitations and standards. EPA compared each analytical result (i.e., quantitated value or sample-specific quantitation limit for a non-quantitated value) to the baseline value for the pollutant. The objective of this comparison was to identify any results reported below the method-defined ML of quantitation. Results reported below the method-defined ML were changed to the ML to ensure that all results used by EPA were quantitatively reliable. In addition, any quantitated value changed to the ML was also considered to be nonquantitated[7] in calculating the proposed limitations and standards. In most cases, the quantitated values and sample-specific quantitation limits were equal to or greater than the baseline values.

An example of Comparison Type 1: Suppose a facility dataset had five values for HEM, of which two were nonquantitated with sample-specific quantitation limits of 2 mg/L and 6 mg/L and the remaining three values were quantitated at 4 mg/L, 25 mg/L, and 50 mg/L. In applying Comparison Type 1, EPA used the baseline value of 5 mg/L for HEM and compared this to all five values. Because the sample-specific quantitation limit of 2 mg/L is less than 5 mg/L, EPA changed this sample-specific quantitation limit to 5 mg/L. EPA also changed the quantitated value of 4 mg/L to 5 mg/L and considered the value to be a sample-specific quantitation limit (i.e., nonquantitated) rather than a quantitated value. The remaining sample-specific quantitation limit of 6 mg/L and the two quantitated values of 25 mg/L and 50 mg/L remained the same because they were greater than the baseline value of 5 mg/L.

4.4.2 Comparison Type 2

Comparison Type 2 was used when the baseline value was based upon methods that do not use the minimum level concept to define quantitation limits (i.e., all methods except Methods 1613B, 1625, and 1664). The baseline values corresponding to Comparison Type 2

[6]Section 12 describes the calculations of long-term averages and variability factors.

[7]As explained in Appendix E, EPA applied different statistical assumptions to quantitated and nonquantitated results.

generally were the nominal quantitation limit associated with the method used for EPA's sampling episodes. For example, total cyanide's baseline value of 0.02 mg/L is equal to the nominal quantitation limit of 0.02 mg/L for total cyanide by Method 335.2, which was used to analyze EPA samples. In the case of several pollutants, however, EPA determined that the baseline value should differ from the nominal quantitation limit as specified in the method for the pollutant. EPA made exceptions based upon its knowledge about the methods, experiences with laboratories using those methods, and the need for a single baseline value for each pollutant. Section 4.5 notes specific exceptions.

EPA applied Comparison Type 2 *after* using the data to calculate the long-term average and the variability factors for each option and subcategory. In this comparison, EPA compared the calculated long-term average to the baseline value for the pollutant. If the calculated long-term average was less than the baseline value, EPA used the baseline value to calculate the proposed limitation (which is calculated as the product of the long-term average and the variability factor). EPA used this approach because some laboratories have demonstrated that, under certain conditions, they can measure to levels lower than those specified in some of the methods. EPA believes that these results are quantitatively reliable, and therefore can be used to calculate long-term averages. However, EPA also recognizes that not all laboratories consistently quantitate to these lower levels. To ensure the proposed limitations reflect "typical" laboratory reporting levels for the approved methods, EPA established the long-term averages at values equal to or greater than the reporting levels specified in the approved methods. Table 12-4 identifies the cases for which EPA used the baseline values instead of the calculated long-term averages.

An example of Comparison Type 2: Suppose the long-term average for a particular option was 2 mg/L, and the daily variability factor was 2.0. Further suppose that the baseline value was 10 mg/L. Without this comparison, EPA would have proposed a limitation of 4 mg/L (=2 mg/L × 2.0), which is less than the baseline value of 10 mg/L. However, by performing this comparison, EPA would have identified that the baseline value was greater than the long-term average. As a result, EPA would have substituted the baseline value for the long-term average and proposed a limitation of 20 mg/L (=10 mg/L × 2.0).

The following subsection briefly describes the analytical methods and explains any differences between the nominal quantitation limits and the baseline values.

4.5 Analytical Methods

Table 4-1 summarizes the analytical methods, the associated pollutants measured by the method, the nominal quantitation levels, the baseline levels, and the assumptions for values reported below the baseline levels. The following subsections provide additional information supporting Table 4-1 which is located at the end of Section 4. (The subsections are listed in the order by method number.)

In developing the proposed limitations and standards, EPA generally used only data from analytical methods approved for compliance monitoring or those that EPA has used for

decades in support of effluent limitations guidelines and standards development. The exceptions included industry-supplied data from one facility. The facility did not include any information on the analytical methods corresponding to these reported concentration values. However, because the data were collected at the sampling points specified for compliance monitoring, EPA has assumed that the data were measured by analytical methods specified in or approved under 40 CFR Part 136 that facilities are required to use for compliance monitoring. (The remainder of this section refers to such methods as 'NPDES-approved'[8] or 'nonapproved.') For the final rule, EPA intends to contact the facility to confirm its assumption for these data. Other exceptions were for nonapproved methods as explained in the following sections. Except for TSS determined by Method 209C (see Section 4.5.3), EPA excluded data from nonapproved methods from its calculations of limitations and standards. Pending receipt of additional information about such data from the industry, EPA will reevaluate the exclusion of these data for the final rule.

4.5.1 Methods 1613B, 1625, 1664 (TCDF, Benzo(a)pyrene, Naphthalene, Phenol, HEM)

As stated earlier, Method 1613B for dioxins, Method 1625 for semivolatile organic compounds, and Method 1664 for HEM and silica gel treated n-hexane extractable material (SGT-HEM)[9] use the ML concept for quantitation of the pollutants measured by the methods. The ML is defined as the lowest level at which the entire analytical system must give a recognizable signal and an acceptable calibration point for the analyte. When an ML is published in a method, the Agency has demonstrated that at least one well-operated laboratory can achieve the ML, and when that laboratory or another laboratory uses that method, the laboratory is required to demonstrate, through calibration of the instrument or analytical system, that it can make measurements at the ML.

For these methods, EPA's methodology is that if a quantitated value or sample-specific quantitation limit was reported with a value less than the ML specified in a method, EPA substituted the value of the ML and assumed that the measurement was nonquantitated. For example, if the ML was 10 µg/L and the laboratory reported a quantitated value of 5 µg/L, EPA assumed that the concentration was nonquantitated with a sample-specific quantitation limit of 10 µg/L.

Of the analytes measured by these three methods, EPA is proposing to regulate 2,3,7,8-tetrachlorodibenzo-furan (TCDF) (Method 1613B); benzo(a)pyrene, naphthalene, and phenol (Method 1625); and HEM (Method 1664). For these pollutants, EPA selected the ML as basis for the baseline values. None of the reported values from these methods were less than the ML; therefore, no substitutions were made to data from EPA's sampling episodes. However, in calculating the limitations and standards for naphthalene, EPA also included data generated from Method 625 (see Section 4.5.14).

---

[8]NPDES is the acronym for the National Pollutant Discharge Elimination System.

[9]SGT-HEM measures nonpolar material (i.e., n-hexane extractable material that is not absorbed by silica gel). Method 1664 measures both oil and grease and nonpolar material.

4.5.2 Method 1620 and 200.7 (Chromium, Lead, Mercury, Nickel, Selenium, Zinc)

Method 1620 for metals determination uses the concept of an instrument detection limit (IDL), which is defined as "the smallest signal above background noise that an instrument can detect reliably."[10] EPA used Method 1620 to determine metals in the samples collected during its sampling episodes. While Method 1620 is not an approved method for compliance monitoring, it represents a consolidation of several 40 CFR 136 approved methods such as Method 200.7 (inductively coupled plasma atomic emission (ICP) spectroscopy for trace elements) and Method 245.1 (mercury by cold vapor atomic absorption technique). Some industry-supplied results for chromium, lead, nickel, and zinc were determined by Method 200.7. Other industry-supplied results for metals were determined by Methods 239.2, 245.1, 3120B, 3130B, as discussed in Sections 4.5.5 through 4.5.8. In calculating the proposed limitations and standards, EPA included data from these methods and also chromium and nickel data for which industry did not identify the analytical methods used.

Data-reporting practices for Method 1620 analysis follow conventional metals reporting practices used in other EPA programs, in which values are required to be reported at or above the IDL. In applying Method 1620, each analytical laboratory participating in the data gathering efforts by EPA's Engineering and Analysis Division (EAD) determine IDLs on a quarterly basis. The IDLS are, therefore, laboratory- and time-specific. Though Method 1620 does contain MLs, these MLs predate EPA's recent refinement of the minimum level concept described in Section 4.5.1. The ML values associated with Method 1620 are based on a consensus reached by EPA and laboratories during the 1980s regarding levels that could be considered reliable quantitation limits when using Method 1620. These limits do not reflect advances in technology and instrumentation since the 1980s. Consequently, EPA used the IDLs as the lowest values for reporting purposes, with the general understanding that reliable results can be produced at or above the IDL.

EPA is proposing to regulate chromium, lead, mercury, nickel, selenium, and zinc. For the samples collected during its sampling episodes, EPA used Method 1620 to measure these analytes. The Agency used the Method 1620 ML values as the baseline values for these analytes, with the exception of lead. In Method 1620, lead has an ML of 5 µg/L for graphite furnace atomic absorption (GFAA) spectroscopy analysis; EPA determined, however, that it was not necessary to measure down to such low levels, and that lead could instead be analyzed by inductively coupled plasma atomic emission (ICP) spectroscopy. Consequently, for the purposes of EAD's data gathering efforts, the required ML for lead was adjusted to 50 µg/L.

Though the baseline values were derived from the ML (or adjusted ML) in Method 1620, EPA used the laboratory-reported quantitated values and sample-specific quantitation limits, which captured concentrations down to the IDLs, in calculating the proposed limitations and standards. EPA calculated each limitation and standard as the product of the long-term

[10]Keith, L.H., W. Crummett, J. Deegan, R.A. Libby, J.K. Taylor, G. Wentler. "Principles of Environmental Analysis," Analytical Chemistry, Volume 55, 1983, Page 2217.

average and the variability factor. If the long-term average for a pollutant was less than the baseline value, EPA used the baseline value instead of the long-term average in the calculations. This was the case for lead for several subcategories (see Table 12-4).

4.5.3 Method 160.2, 209C, and 2540D (Total Suspended Solids)

Total suspended solids (TSS) was determined by Method 160.2 for samples collected by EPA and some samples collected by the industry. Industry also used Method 209C and 2540D to measure TSS. (EPA also used TSS data for which industry did not identify the analytical methods used.) Methods 160.2 and 2540D are NPDES-approved and are essentially identical methods. While it is not currently NPDES-approved, Method 209C for TSS appears in the 15th and 16th editions of Standard Methods and was approved in the CFR in 1986. Since then, the method numbers have been updated in more recent editions of Standard Methods and in the CFR, but the analytical procedures in Method 209C are identical to those of Method 2540D. Therefore, EPA determined that the data from all three methods should produce similar results and thus are usable for the purposes of rulemaking development.

Because EPA used Method 160.2 for its sampling episodes, the Agency selected the nominal quantitation limit of 4 mg/L from Method 160.2 as the basis for the baseline value. In calculating the proposed limitations and standards, EPA used the laboratory-reported quantitated values and sample-specific quantitation limits. If the long-term average was less than the baseline value, however, EPA substituted the baseline value for the long-term average. This was the case for the TSS new source performance standard (NSPS) for the Stainless Steel Segment of the Steel Finishing Subcategory.

4.5.4 Method 218.4 (Hexavalent Chromium)

For EPA-collected samples, hexavalent chromium was determined by Method 218.4, an NPDES-approved procedure that utilizes atomic absorption for the determination of hexavalent chromium after chelation and extraction. In developing the proposed limitations and standards, EPA included industry-supplied data for which industry did not cite the analytical methods used. Industry also supplied data determined by Method 3120. Because of concerns about the use of this method (see Section 4.5.7), EPA excluded these data from the calculation of the proposed limitations and standards.

In Method 218.4, the nominal quantitation limit or lower limit of the measurement range is 0.01 mg/L. Because EPA used this method, this nominal quantitation limit was used as the baseline value used for all hexavalent chromium results. None of the hexavalent chromium data determined by Method 218.4 had quantitated values or sample-specific quantitation limits lower than the baseline value.

4.5.5 Method 239.2 (Lead)

In developing the proposed limitations and standards for lead, EPA included industry-supplied data from Method 239.2. This NPDES-approved method utilizes atomic

absorption as the determinative technique to measure lead. Its nominal quantitation limit of 0.005 mg/L is expressed in the method as the lower limit of the measurement range.[11]

The industry-supplied lead data included results that were lower than the baseline value. EPA used these values as reported in calculating the long-term averages and variability factors. Before using the long-term averages to calculate the proposed limitations and standards, EPA compared the long-term averages to the baseline value of 0.05 mg/L for lead (see Section 4.5.2). Because the calculated long-term averages were less than the baseline value, EPA used the baseline value instead of the calculated long-term averages in developing the proposed lead limitations and standards.

4.5.6 Method 245.1 (Mercury)

In developing the proposed limitations and standards for mercury, EPA included industry-supplied data from Method 245.1. This NPDES-approved method utilizes cold vapor atomic absorption as the determinative technique to measure mercury. Its nominal quantitation limit of 0.0002 mg/L is expressed in the method as the lower limit of the measurement range[12]

The industry-supplied mercury data included results lower than the baseline value (see Section 4.5.2). EPA used these data as reported in calculating the long-term averages and variability factors. Before using the long-term averages to calculate the proposed limitations and standards, EPA compared the long-term averages to the baseline value for mercury. None of the long-term averages were less than the baseline value.

4.5.7 Method 3120B (Chromium and Hexavalent Chromium)

Industry-supplied results for chromium and hexavalent chromium were determined by Method 3120B, an inductively coupled plasma (ICP) method. Its nominal quantitation limit of 0.01 mg/L is cited in the method as the lower limit of the measurement range.

Method 3120B is NPDES-approved for chromium determination and EPA included these data in calculating the chromium limitations and standards. (As described in Section 4.5.2, EPA used Method 1620 to determine chromium in the samples it collected.) None of the chromium data from Method 3120B had quantitated values or sample-specific quantitation limits lower than the baseline value of 0.01 mg/L (see Section 4.5.2).

Because of EPA's concerns about the quality of the hexavalent chromium measurements from Method 3120B, EPA excluded them when developing the proposed limitations and standards. Method 3120B is used for determination of total metals (including chromium), but is not typically used for hexavalent chromium determination. It is technically possible to analyze for hexavalent chromium by this method if, during sample preparation, the

[11]This method refers to the lower value of the "optimum concentration range."

[12]This method calls it a detection limit.

hexavalent chromium is separated from other forms of chromium (i.e., Cr^{+3}). For the final rule, EPA will reevaluate its decision to exclude these data pending a full review of the laboratory reports (if industry provides them to EPA) to determine if the appropriate procedures were followed, and to determine if all quality assurance/quality control (QA/QC) criteria were met. The industry-supplied data from Method 3120B included quantitated values or sample-specific quantitation limits lower than the baseline value for hexavalent chromium (see Section 4.5.4). If EPA determines that it is appropriate to use these data in calculating the limitations and standards, EPA will use the quantitated values or sample-specific quantitation limits as reported. However, before using the long-term averages to calculate the limitations and standards, EPA will compare the long-term averages to the baseline value. If any long-term average is less than the baseline value, then EPA will use the baseline value in calculating the limitations and standards.

4.5.8 Method 3130B (Lead, Zinc)

Method 3130B was used to determine lead and zinc in some industry-supplied data. Method 3130B is an anodic stripping voltammetry (ASV) method that does not require sample digestion. EPA has excluded these data in developing the proposed rule for three reasons. First, EPA must still determine whether samples were acid digested. EPA requires acid digestion of samples for determination of total lead and zinc to ensure that lead and zinc complexes are broken down to a detectable form, and to reduce analytical interferences. Second, EPA must determine whether the results are associated with acceptable laboratory and matrix QA/QC. Finally, as there are no NPDES-approved ASV methods for the determination of lead or zinc in wastewater, EPA must assess if the application of the ASV method to wastewater effluents analyzed was appropriate (i.e., not subject to substantial interferences).

EPA will reconsider its decision to exclude data if and when industry provides the associated laboratory reports and QA/QC data. If review of the reports and QA/QC data shows that proper digestion was performed, that the method was in control, and that the method was successfully applied to the effluents, EPA may use the data in developing the final rule.

The industry-supplied data from Method 3130B included quantitated values or sample-specific quantitation limits lower than the baseline value for zinc (see Section 4.5.2). If EPA determines that it is appropriate to use these data in calculating the limitations and standards, EPA will use the quantitated values or sample-specific quantitation limits as reported. However, before using the long-term averages to calculate the limitations and standards, EPA will compare the long-term averages to the baseline value. If any long-term average is less than the baseline value, then the baseline value will be used rather than the long-term average.

4.5.9 Method 335.2 (Total Cyanide)

EPA and industry determined total cyanide using Method 335.2, which is an NPDES-approved method for determining total cyanide. Industry also used Method 4500 CN-E to determine total cyanide.

The nominal quantitation limit for Method 335.2 is expressed in the method as the lower limit of the measurement range.[13] Because EPA used Method 335.2, the Agency used its nominal quantitation limit of 0.02 mg/L as the baseline value for all total cyanide results. Although some laboratories have demonstrated that they can quantitate to lower levels, none of the total cyanide data determined from Method 335.2 had quantitated values or sample-specific quantitation limits lower than the baseline value.

For total cyanide, industry also used the NPDES-approved 4500-CN procedures for sample analysis. In the listings of data for the proposal, EPA has identified this procedure with three different references provided by industry: 4500-CNC; 4500 CN E; and 4500-CNE. Method 4500-CNC refers to the distillation process used to prepare samples for analysis and Methods 4500 CN E and 4500-CNE refer to the colorimetric method of cyanide determination. EPA compared the data determined from these analyses to the baseline value of 0.02 mg/L associated with the nominal quantitation limit from Method 335.2. These values were used as reported in calculating the long-term averages and variability factors. Before using the long-term averages to calculate the proposed limitations and standards, EPA compared the long-term averages to the baseline value. None of the long-term averages were less than the baseline value.

4.5.10 Method 340.2 (Fluoride)

For samples collected by EPA, fluoride was determined by Method 340.2, an NPDES-approved potentiometric method that uses a fluoride electrode. Industry did not supply any additional data for this analyte. The nominal quantitation limit of 0.1 mg/L for Method 340.2 is expressed in the method as the lower limit of the measurement range,[14] and was used as the baseline value for fluoride. None of the fluoride data had quantitated values or sample-specific quantitation limits lower than the baseline value.

4.5.11 Methods 350.2, 417/350.2, and 4500-NH_3 (Ammonia as Nitrogen)

For EPA's sampling episodes, ammonia as nitrogen was determined by Method 350.2. Industry also supplied data determined by Methods 417/350.2 and 4500-NH_3. In developing the proposed limitations and standards, EPA also included industry-supplied data for which industry did not identify the analytical methods used.

Method 350.2 uses either colorimetric, titrimetric, or electrode procedures to measure ammonia, and has a lower measurement range limit of 0.05 mg/L for the colorimetric and electrode procedures and 1.0 mg/L for the titrimetric procedure. Rather than use different baseline values, EPA used 0.05 mg/L because it represented a value at which ammonia as N can be reliably measured by several determinative techniques in Method 350.2, as well as in other 40

[13]The method states that is "sensitive to about 0.02 mg/L for the colorimetric procedure; the titrimetric procedure is used for measuring concentrations above 1 mg/L," so these do represent the lower limit of the measurement range.

[14]The method states that "Concentrations from 0.1... may be measured."

CFR 136 approved methods.[15] None of the ammonia-as-nitrogen data had quantitated values or sample-specific quantitation limits lower than the baseline value.

One facility supplied concentration data and reported the method as '417/350.2.' Based on additional information received from the facility, the method utilized is equivalent to NPDES-approved Method 350.2; therefore, EPA included these data in developing the proposed limitations and standards.

Some facilities used the 4500-NH_3 procedure. In the listings of data for the proposal, EPA has identified this procedure in four different ways: 4500-NH_3; 4500NH, BE; 4500NH_3-E; and 4500-NH_3F. With the exception of Method 4500-NH_3, which is a general method citation applicable to a group of specific methods, all these citations refer to 40 CFR 136 approved procedures for ammonia as nitrogen. 4500-NH_3-B refers to the primary distillation step performed prior to analysis. 4500-NH_3-E refers to the ammonia-selective electrode determinative technique, and 4500-NH_3-F refers to the spectrophotometric determination of ammonia by reaction with phenate. For the final rule, EPA will verify that approved techniques were utilized for the data identified only as Method 4500-NH_3.

EPA compared the data determined by these three methods to the baseline value of 0.05 mg/L that was derived from Method 350.2 because this is the method associated with EPA's sampling episodes. None of the ammonia-as-nitrogen data had quantitated values or sample-specific quantitation limits lower than the baseline value.

4.5.12 Methods 353.1, 353.2, and 353.3 (Nitrate/Nitrite)

The preamble to the proposed rule solicits comments on whether nitrate/nitrite should be regulated. Nitrate/nitrite can be determined by three EPA methods, each of which lists slightly different nominal quantitation limits which are expressed in the methods as the lower limit of the measurement range. Methods 353.1 and 353.2 are automated colorimetric procedures with quantitation limits of 0.01 and 0.05 mg/L, respectively. Method 353.3 is a cadmium reduction, spectrophotometric procedure with a nominal quantitation limit of 0.01 mg/L. If EPA determines that regulation of nitrate/nitrite is necessary, it intends to use the Method 353.1 quantitation limit of 0.01 mg/L as the baseline value. Before using the long-term averages to calculate the limitations and standards, EPA will compare the long-term averages to the baseline value. If any long-term average is less than the baseline value, then EPA will use the baseline value rather than the long-term average in calculating the limitations and standards.

4.5.13 Methods 4500-CN M and D4374-98 (Thiocyanate)

Because no NPDES-approved method exists for thiocyanate, EPA is proposing two consensus standards, Method 4500-CN M (Standard Methods for the Examination of Water

[15]To demonstrate compliance, facilities are required to use analytical methods that are capable of measuring the concentration levels required by the promulgated limitations and standards.

and Wastewater, 20th Edition, 1998) and D4374-98 (Annual Book of ASTM Standards, Volume 11.02, 1999). In the preamble to the proposed rule, EPA solicits comments on these standards and, specifically, invites the public to identify additional potentially applicable voluntary consensus standards and to explain why such standards should be used to measure thiocyanate. For the data used to calculate the proposed limitations and standards, EPA and industry used the 4500-CN M procedure in determining the concentrations. EPA has not collected data to calculate the proposed limitations for thiocyanate by ASTM Method D4374-98. Because it wishes to provide facilities with additional options for test methods, EPA solicits comments on this method. Method D4374-98 is an automated procedure that has been shown to generate reliable results, with the added advantage of potentially eliminating more interferences than other methods from sample matrices.

In the listings of the data used to calculate the proposed limitations and standards, EPA has identified this method in three ways: 4500-CN; 4500-CN M.; and 4500CN-M. EPA has confirmed that the associated data were all generated by Method 4500-CN M. The nominal quantitation limit for Method 4500-CN M is cited in the method as the lower limit of the measurement range.[16] Because EPA used Method 4500-CN M, the Agency used its nominal quantitation limit of 0.1 mg/L as the baseline value for all thiocyanate results. None of the thiocyanate data had quantitated values or sample-specific quantitation limits lower than this baseline value.

4.5.14 Method 625 (Naphthalene)

In developing the proposed limitations and standards for naphthalene, EPA included industry-supplied data from Method 625. This is an NPDES-approved GC/MS method for semivolatile organics. Its nominal quantitation limit is expressed as the lower limit of the measurement range, typically the concentration of the lowest calibration standard. EPA selected 0.01 mg/L as the baseline value based on the minimum level for Method 1625 (see Section 4.5.1).

The industry-supplied naphthalene data included quantitated values or sample-specific quantitation limits lower than the baseline value. EPA replaced these data with the value of the baseline value and assumed that the measurements were nonquantitated in developing the limitations and standards.

4.5.15 Method 8270 (Benzo(a)pyrene)

Industry supplied benzo(a)pyrene data generated from Method 8270 that is not approved for NPDES compliance monitoring. EPA recognizes that a number of similarities exist between Method 8270 and NPDES-approved methods. The estimated quantitation limit of 10 ug/L for benzo(a)pyrene in Method 8270 is the same as Method 1625's ML, which is also the basis for the baseline value for this analyte. Many of the QC checks and procedures of Method 8270 are analogous to procedures utilized by the approved NPDES methods, Method 625 in

[16]The method lists this value as the lower limit under "application" in natural waters or wastewaters.

particular. However, one major drawback for Method 8270 is that it only requires a subset of target analytes to be evaluated in the matrix spike, while Method 625 requires a full target analyte matrix spike. Furthermore, the calibration requirement in Method 8270 could be interpreted to mean that the calibration standard should be at or below the known or anticipated regulatory compliance level.

Because of the reasons expressed above, EPA has concerns about the quality of the benzo(a)pyrene data generated by Method 8270. Consequently, EPA excluded them from developing the proposed limitations and standards. For the final rule, EPA will reconsider using these data pending a full review of the laboratory reports (if industry provides them to EPA) including initial precision and recovery (IPR) analyses, instrument tunes, calibrations, blanks, laboratory control sample (LCS) analyses, matrix spikes, surrogates, and all sample data. EPA will review any submitted calibration data to confirm that the GC/MS was calibrated at the ML of 10 ug/L, thereby demonstrating that reliable measurements could be made to this level. EPA will also evaluate the data to determine if appropriate extraction and cleanup procedures were used in analyzing the samples.

The industry-supplied data from Method 8270 included quantitated values or sample-specific quantitation limits lower than the baseline value. If EPA determines that it is appropriate to use these data in calculating the limitations and standards, EPA may replace these data with the value of the baseline value and assume that the measurements are nonquantitated.

4.5.16 Methods 330.1, 330.2, 330.3, 330.4, 330.5 (Total Residual Chlorine)

The proposed limitations and standards for total residual chlorine are based upon limitations and standards developed during the 1982 Iron and Steel rule. The term "total residual chlorine" is used interchangeably with "chlorine" and, in aqueous samples, represents a measure of both free and combined chlorine that is present in the sample.

To comply with the proposed limitations and standards, a facility will be required to use an NPDES-approved method such as Method 330.1, 330.2, 330.3, 330.4, or 330.5 to ensure that it implemented appropriate analytical protocols.

If EPA collects or the industry supplies appropriate data from the model technologies prior to promulgation of the final rule, EPA will compare the long-term average to the baseline value of 0.1 mg/L derived from the quantitation limits in Methods 330.3 and 330.4. If any values are less than the baseline value, they will be used as reported. However, EPA will compare the baseline value to the long-term averages used in calculating the final limitations and standards. If any long-term average is less than the baseline value, the baseline value will be used for purposes of calculating the limitations and standards.

4.6 References

4-1 U.S. Environmental Protection Agency. Methods for Chemical Analysis of Water and Wastes. EPA 821-C-99-004. Washington, D.C., June 1999.

4-2 American Public Health Association, American Water Works Association, and Water Environment Federation. Standard Methods for the Examination by Water and Wastewater, 20th Edition. Washington, D.C., 1998.

Table 4-1

Analytical Methods and Baseline Values

Analyte	Chemical Abstract Service (CAS) Number	Baseline Value (mg/L)	Samples Collected and Analyzed by	Method Used to Analyze Samples	Nominal Quantitation Value (mg/L) for Method	Assumption for Reported Values [a] < Baseline Value (BV)
Ammonia as Nitrogen	7664417	0.05	EPA, Industry	350.2	0.05	All ≥BV
			Industry	417/350.2	0.05	All ≥BV
				4500-NH_3	0.1[b]	All ≥BV
				4500-NH_3F	0.1	All ≥BV
				4500NH, BE	0.8	All ≥BV
				4500NH_3-E	0.8	All ≥BV
				NA	NA	All ≥BV
Fluoride	16984488	0.1	EPA	340.2	0.1	All ≥BV
Hexane Extractable Material (HEM)	C036	5	EPA	1664	5	All ≥BV
Nitrate/Nitrite	C005	0.01	[c]	353.1	0.01	[c]
Thiocyanate	302045	0.1	EPA	4500-CN	0.1	All ≥BV
			EPA	4500-CN M.	0.1	All ≥BV
			Industry	4500CN-M	0.1	All ≥BV
			Proposed	D4374-98	0.0001	See §4.5.13
Total Cyanide	57125	0.02	EPA, Industry	335.2	0.02	All ≥BV
			Industry	4500 CN E	.005	All ≥BV
				4500-CNC	.005[d]	All ≥BV
				4500-CNE	.005	Used as reported
Total Residual Chlorine	7782505	0.1	[e]	330.1 - 330.5	0.1[f]	[e]
Total Suspended Solids (TSS)	C009	4	EPA, Industry	160.2	4	All ≥BV
			Industry	160.2	4	Used as reported
				209C	4	Used as reported
				2540 D	4	All ≥BV
				NA	NA	Used as reported
Chromium	7440473	0.01	EPA	1620	0.01	Used as reported
			Industry	200.7	0.01	Used as reported
				3120B	0.01	All ≥BV
				NA	NA	All ≥BV
Hexavalent Chromium	18540299	0.01	EPA	218.4	0.01	All ≥BV
			Industry	3120B	NI	Excluded data
				NA	NA	All ≥BV

Table 4-1 (Continued)

Analyte	Chemical Abstract Service (CAS) Number	Baseline Value (mg/L)	Samples Collected and Analyzed by	Method Used to Analyze Samples	Nominal Quantitation Value (mg/L) for Method	Assumption for Reported Values [a] < Baseline Value (BV)
Lead	7439921	0.05	EPA	1620	0.05	Used as reported
			Industry	200.7	0.05	Used as reported
				239.2	0.005	Used as reported
				3130B	NI	Excluded data
Mercury	7439976	0.0002	EPA	1620	0.0002	Used data as reported
			Industry	245.1	0.0002	All ≥BV
Nickel	7440020	0.04	EPA	1620	0.04	Used as reported
			Industry	200.7	0.04	Used as reported
				NA	NA	Used as reported
Selenium	7782492	0.005	EPA	1620	0.005	All ≥BV
Zinc	7440666	0.02	EPA	1620	0.02	Used as reported
			Industry	200.7	0.02	Used as reported
				3130B	NI	Excluded data
Benzo(a)pyrene	50328	0.01	EPA	1625	0.01	Used as reported
			Industry	8270	0.01	Excluded data
Naphthalene	91203	0.01	EPA	1625	0.01	All ≥BV
			Industry	625	0.01	Modified to BV
Total Phenol	108952	0.01	EPA	1625	0.01	All ≥BV
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207319	10 pg/L	EPA	1613B	10 pg/L	All ≥BV

NA - The facility did not provide the specific analytical method. However, because the data were collected at the sampling points specified for complaiance monitoring, EPA assumed that the methods would have been NPDES-approved methods that facilites are required to use for compliance monitoring

NI - EPA needs information form the facility about the laboratory analysis.

[a]If the entry in this column indicates that EPA "used as reported" for a particular analyte, then EPA used either the quantitated value or the sample-specific quantitation limit reported by the laboratory.

[b]For some of the industry-submitted data, "4500-NH_3" was cited as the method used. This reference is vague in that it potentially refers to seven different procedures. Consequently, EPA has listed the lowest of the measurement ranges cited in the methods.

[c]EPA is soliciting comment on whether nitrate/nitrite should be regulated (see Section Ix.G.2.a in the preamble to the proposed rulemaking). EPA used data sources other than its sampling episodes as a basis for evaluating this pollutant. If EPA decides to regulate this pollutant, Method 353.1 is likely to be the basis of the baseline value used in calculating the final limitations and standards for nitrate/nitrite.

[d]Method 4500-CN-C is the distillation process by which to prepare samples for analysis by either 4500-CN-D or -E. Because EPA does not have complete information on which determinative technique industry used, the quantitation limit reflected in the citation for 4500-CN-C is the lower quantitation limit of the two procedures.

[e]EPA is proposing effluent limitations and standards for total residual chlorine based upon data from the 1982 rule (see Section 12.2.1.1 for further discussion). In measuring for total residual chlorine in its sampling episodes for the final rule, EPA intends to use Methods 330.1 - 330.5.

[f]Baseline value and nominal quantitation limit are based on capabilities of approved EPA methods.

SECTION 5

DESCRIPTION OF THE INDUSTRY

The United States is the third largest steel producer in the world with 12 percent of the market, an annual output of approximately 105 million tons per year, and nearly 145,000 employees. The iron and steel rule would apply to approximately 254 iron and steel sites. The 254 sites are owned by 115 companies, as estimated by the EPA survey. The global nature of the industry is illustrated by the fact that 18 companies have foreign ownership. Twelve other companies are joint entities, with at least one U.S. company partner. Excluding joint entities and foreign ownership, 85 are U.S. companies, more than half of which are privately owned.

This section describes the iron and steel industry, including types of sites and the manufacturing operations performed. All estimates included in this section represent 1997 data.

5.1 Types of Sites

For purposes of the proposed rule, EPA classified manufacturing facilities in the iron and steel industry into three groups on the basis of raw material consumption and manufacturing processes: integrated steel mills, non-integrated steel mills, and stand-alone facilities. Integrated and non-integrated mills produce molten steel by different methods. Stand-alone facilities include certain raw material preparation facilities and steel forming and finishing mills. Stand-alone facilities do not produce molten steel.

Integrated steel mills produce molten iron in blast furnaces using coke, limestone, beneficiated iron ore, and preheated air as the principal raw materials. Other raw materials may include sinter, other iron-bearing materials, oxygen, and alternate sources of carbon. These mills charge molten iron (or hot metal) and steel scrap to basic oxygen furnaces (BOFs) to produce molten steel. Depending on final product specifications, the molten steel then undergoes various refining steps prior to casting, hot forming, and finishing operations. Several integrated mills also have cokemaking and sintering plants that produce raw materials for blast furnace operations. There are 20 integrated steel mills located in the United States that account for approximately 60 percent of annual raw steel production.

Non-integrated steel mills produce molten steel by melting steel scrap in electric arc furnaces (EAFs). Some non-integrated steel mills also use high-quality iron materials such as pig iron or direct reduced iron with scrap. As at integrated mills, the molten steel undergoes various refining, casting, hot forming, and finishing operations. There are about 94 non-integrated steel mills located in the United States that account for approximately 40 percent of annual raw steel production.

Figure 5-1 shows the steelmaking, refining, and casting operations that occur at integrated and non-integrated steel mills. Figure 5-2 shows the various hot forming and finishing operations that steel may undergo to form semi-finished or finished products.

Stand-alone mills that do not produce molten steel conduct many of the hot forming and steel finishing operations conducted at integrated and non-integrated steel mills. A number of stand-alone operations produce raw materials for ironmaking and steelmaking (e.g., by-product and non-recovery coke plants, sinter plants, and direct reduced iron plants). There are approximately 138 different types of stand-alone facilities located in the United States, described below:

- Coke plants and sinter plants manufacture feed materials for blast furnaces.
- Direct reduced ironmaking plants manufacture feed materials for electric arc furnaces.
- Stand-alone hot forming mills receive cast products from integrated and non-integrated steel mills. These facilities perform hot forming operations and, depending on the product, a limited number may perform steel finishing operations.
- Finishing operations include acid pickling and descaling, cold rolling and annealing, acid and alkaline cleaning, and coating operations such as electroplating and hot coating. Stand-alone carbon steel finishing mills may perform acid pickling, cold rolling and annealing, acid and alkaline cleaning, electroplating, and hot coating on carbon steel products received from other mills. Stand-alone stainless steel finishing mills typically perform acid pickling and descaling and cold rolling and annealing operations on stainless steel products received from other mills.
- Stand-alone pipe and tube mills include:
  - — Facilities that manufacture butt-welded or seamless pipe and tube through hot forming operations,
  - — Facilities that manufacture pipe and tube using other operations such as electric resistance welding, and
  - — Facilities that receive pipe and tube and perform other operations, such as drawing.

  Only the stand-alone pipe and tube mills that manufacture butt-welded or seamless pipe and tube through hot forming operations are included in the proposed regulation for the Iron and Steel Category.

Table 5-1 presents EPA's national estimates of the types of iron and steel sites in the United States. Non-integrated steel mills outnumber integrated steel mills by more than four to one. Stand-alone finishing facilities form the second largest group, and stand-alone hot forming facilities form the third largest group. This reflects two trends in the industry over the

past 25 years - a shift of steel production from older, larger integrated steel mills to newer, smaller non-integrated steel mills, and the emergence of specialized, stand-alone finishing facilities that process semi-finished sheet, strip, bars, and rods obtained from integrated or non-integrated facilities.

Integrated steel mills are primarily located east of the Mississippi River in Illinois, Indiana, Michigan, Ohio, Pennsylvania, West Virginia, Maryland, Kentucky, and Alabama; one integrated steel mill is located in Utah. Figure 5-3 shows the locations in the United States of integrated steel mills. Stand-alone coke plants and those at integrated steel mills are located in Illinois, Indiana, Michigan, Ohio, New York, Pennsylvania, Virginia, Kentucky, Alabama, and Utah. Figure 5-4 shows the locations in the United States of stand-alone and colocated coke facilities. Non-integrated steel mills are located throughout the continental United States, as are stand-alone hot forming and finishing mills.

For purposes of the proposed iron and steel rule, EPA classified steel produced at integrated and non-integrated steel mills as carbon steels, alloy steels, and stainless steels. Carbon steels owe their properties to varying concentrations of carbon, with relatively low concentrations of alloying elements (i.e., less than 1.65 percent manganese, 0.60 percent silicon, 0.60 percent copper). Alloy steels contain concentrations of manganese, silicon, or copper greater than those for carbon steels, or other specified alloying elements added to impart unique properties to the steel. Stainless steels are a subset of alloy steels that are corrosion resistant and heat resistant. The principal alloying elements are chromium, nickel, and silicon. Industry practice is to call steels stainless when the chromium content is 10 percent or greater.

Table 5-2 lists the types of steels manufactured or processed at integrated and non-integrated steel mills and stand-alone hot forming, finishing, and pipe and tube mills, as reported in industry surveys. All integrated steel mills produce carbon steels. Some also produce alloy steels and process stainless steels. Based on industry survey responses, 56 of the 66 surveyed non-integrated steel mills, 14 of the 17 surveyed stand-alone hot forming mills, and 28 of the 38 surveyed stand-alone finishing mills produce or process carbon steels.

Steel mills may discharge wastewater directly to surface water (direct discharge), to publicly owned treatment works (POTWs) (indirect discharge), or not at all (zero or alternative discharge). Table 5-3 shows the discharge status of integrated and non-integrated steel mills and stand-alone facilities that would be subject to a revised 40 CFR Part 420. A single mill may discharge process wastewater from one operation directly to surface waters and from another operation indirectly to a POTW. All but one integrated mill are direct dischargers; two discharge both directly and indirectly. The Agency's national estimate for non-integrated steel mills is, out of 94 mills, 46 are direct dischargers, 32 are zero or alternative dischargers, and 19 are indirect dischargers. For the 70 stand-alone finishing mills, the Agency national estimate is 34 indirect dischargers, 28 direct dischargers, and 11 zero or alternative dischargers.

5.2 Manufacturing Operations

The following subsections describe the types of manufacturing operations performed at integrated and non-integrated steel mills and stand-alone iron and steel facilities. Information presented includes production and capacity, wastewater generation, discharge destinations, and discharge type. Table 5-4 presents the various manufacturing operations, the national estimate of sites for each type of operation, the national estimate of production, and the national estimate of production capacity by operation.

5.2.1 Cokemaking

Blast furnaces use carbon in the form of metallurgical coke to reduce iron oxides to metallic iron. Foundries also use metallurgical coke for similar purposes. There are two types of coke plants operated in the United States: (1) the traditional by-product recovery coke plant, in which coke, coke oven gas, and several chemical by-products are derived from coal; and (2) non-recovery or heat recovery coke plants, in which the only by-product is heat, which is used to generate steam and electric power. There are 24 by-product recovery coke plants and two non-recovery coke plants located in the United States. By-product recovery plants produce approximately 90 percent of the coke. Coke used for blast furnace operations is called *furnace coke*, while coke used for foundry operations is called *foundry coke*. Presently, foundry coke is produced only in by-product coke plants, whereas furnace coke is produced in both by-product recovery and non-recovery coke plants. Of the 24 coke plants, 19 primarily produce blast furnace coke, four primarily produce foundry coke, and one routinely produces both.

By-Product Recovery Coke Plants

By-product recovery coke plants comprise coal handling and preparation facilities, one or more coke batteries (i.e., groups of 40 or more vertical, slot-type coke ovens located side by side) equipped with coal charging and coke pushing equipment, coke oven gas collection and cleaning facilities, by-product recovery systems, coke quenching stations, and associated air and water pollution control facilities and solid waste processing operations.

Blends of high-, low-, and medium-volatile coals and other carbonaceous materials such as petroleum coke are pulverized and screened to desired size (e.g., > 80 percent, minus 1/8 inch) and charged into the tops of coke ovens with charging machines called larry cars. The ovens are operated on a sequential batch basis. The ovens are positive pressure ovens in which the coal charge is heated in the absence of air to drive off volatile materials and water to leave the carbonaceous residue called coke. Different blends of coals are used to produce foundry coke. The coking time is approximately 16 hours for furnace coke and typically 28 to 30 hours for foundry coke. Coking temperatures in the ovens range from approximately 1,650 to 2,000°F.

When the coking cycle is completed, the oven doors are removed and the incandescent coke is pushed from the oven into a rail car called a coke quench car. Plants usually control air emissions from pushing operations with baghouses or wet scrubbers. The quench car is positioned under a quench station where large volumes of water quench the coke to halt further

combustion. All United States coke plants recycle and evaporate to extinction coke quench water. Make-up water for coke quenching stations is typically plant service water (i.e., the plant's water supply). The coke is then sized and stored for future use. Relatively fine coke particles collected in quench station sumps are called coke breeze. Coke breeze is used as a charge material for production of foundry coke, for sinter plant operations, or sold for other uses.

Coke oven gas from the coke ovens is scrubbed in gas collector mains located on top of the coke battery with a fluid called flushing liquor, to condense tars and moisture derived from the coal. The flushing liquor is processed in tar decanter tanks that essentially use gravity to separate tar from the flushing liquor stream. Flushing liquor is recycled to the collector mains at a high rate. Excess flushing liquor, also called waste ammonia liquor, comprises principally the moisture in the coal charged to the coke ovens. Excess flushing liquor is rejected from the flushing liquor circuit and is the principal process wastewater stream generated at by-product coke plants. Sludge collected at the bottom of the tar decanters is a listed hazardous waste and is typically mixed with coke breeze and other carbonaceous material and recycled to the coke ovens with the coal charge. Crude coal tars collected from the tar decanters is typically stored in tanks on site and sold as a by-product.

The coke oven gas is further processed to remove additional materials that are also sold as by-products. Primary gas coolers and tar precipitators remove additional tars. Scrubbing the gas with sulfuric acid to produce ammonium sulfate removes ammonia, and scrubbing it with a recirculated wash oil solution removes light oil (an unrefined oil rich in benzene, toluene, xylene, and solvent naphthas). The collected tars and naphthalene from final gas cooling operations are typically mixed with coal tars recovered from tar decanters and sold with the tars. Many by-product recovery coke plants have coke oven gas desulfurization systems that recover sulfur removed from the coke oven gas as elemental sulfur. Ammonia is also steam stripped from the excess flushing liquor and returned to the coke oven gas before the gas is scrubbed with sulfuric acid.

The by-product recovery cokemaking industry uses a variety of chemical processing technologies to recover materials such as crude coal tar, crude light oil (e.g., aromatics, paraffins, cycloparaffins and naphthenes, sulfur compounds), anhydrous ammonia or ammonium sulfate, naphthalene, and sodium phenolate. These technologies include:

- *Crude coal tar recovery.* Coal tar from the flushing liquor and primary coolers is collected for resale or further processing on or off site. By-products recovery coke plants recover crude coal tar in tar decanters.

- *Crude light oils recovery.* Light oils are scrubbed from the coke oven gas, recovered for resale, reused as a solvent for phenolics, or sent for further refining on or off site.

- *Recovery of ammonia and ammonia compounds.* Free ammonia is commonly steam stripped from waste ammonia liquors. A number of sites remove fixed ammonia by elevating the pH of the wastewater with lime

slurry or caustic soda solutions. The liberated ammonia is combined with coke oven gas (COG) and removed with ammonia contained in the COG with sprays of sulfuric acid or phosphoric acid in an absorber, or by scrubbing ammonia from gas with fresh water, which is recirculated to produce concentrated ammonium hydroxide.

- *Recovery of phenol, phenolates, and carbolates.* Vapor recirculation or liquid/liquid extraction with suitable solvents removes and recovers phenolic compounds. In vapor recirculation, the steam leaving the free leg of the ammonia still is scrubbed with dilute caustic soda to form sodium phenolate. This steam recirculates to the ammonia stills for further treatment and recovery. In liquid/liquid extraction, the benzol, light oil, or other suitable solvent extracts phenolic compounds from the wastewater. The phenolized solvent is separated and extracted with caustic. Again, sodium phenolates separate out, and the phenolized solvent is reused in the recovery system.

- *Recovery of sulfur and sulfur compounds.* Desulfurization systems recover elemental sulfur or sulfur compounds from COG. Techniques developed include iron oxide boxes using Fe_2O_3 on wood shavings, absorption and desorption with soda ash, Wilputte vacuum carbonate systems, Seaboard actified solution systems, and Claus sulfur recovery systems.

- *Naphthalene.* Crystals of naphthalene are condensed in the final cooler and recovered from the recirculating final cooler wastewater by skimming, filtration, or centrifugation. Naphthalene may be recovered by solidification at temperatures below 74°C (165°F).

Non-Recovery Coke Plants

Non-recovery coke plants carbonize coal in large dome-shaped oven chambers. Volatile components evolved from the coal are partially combusted in the oven chamber, thus providing some of the heat for coking. The gas is also used to underfire the ovens. Heat in the waste gases is partially recovered in waste heat boilers to generate steam, which can be used for electric power generation or for other uses. Because non-recovery plants combust all materials evolved from the coal, there are no by-products recovered other than heat in the waste gases and coke breeze. The pushing and quenching operations are similar to those performed at by-product recovery coke plants.

5.2.2 Sintering

Sintering is an agglomeration process in which iron-bearing materials (generally fines) are mixed with iron ore, limestone, and finely divided fuel such as coke breeze. During iron and steel production operations, blast furnaces, basic oxygen furnaces, continuous casters, and hot forming mills generate large quantities of particulate matter (e.g., fines, mill scale, flue dust,

wastewater sludge). Mills remove the particulate matter from process gases by dry or wet air pollution control devices to reduce air emissions or to clean the gases for reuse as fuel. Sintering operations recover mill scale from process wastewater discharged from continuous casting and hot forming operations. These operations can recover a large percentage of this iron-rich material, provided the oil content is low enough to prevent objectionable fumes.

Sinter plants consist of raw material handling facilities and raw material storage bins, sinter strand (traveling grate combustion device), a mixing drum for each sinter strand, a windbox (draws air through the traveling grate), a discharge end, and a cooling bed for sintered product. The particulate matter is mixed in sinter machines and charged to the traveling grate at a depth of approximately one foot. The mixture is ignited, and air is drawn through the bed as it travels toward the discharge end to promote combustion and fusing of the iron-bearing materials. The sinter product serves as a supplementary raw material for blast furnace operations.

Out of the nine sinter plants operating in 1997, seven operate wet air pollution control systems and eight operate dry air pollution control systems. Since 1997, one facility with wet air pollution controls has been shut down on an indefinite basis.

5.2.3 Briquetting

Briquetting is another agglomeration process used to recycle and reuse fine materials that otherwise could not be charged to blast furnaces or steelmaking furnaces. The operation forms materials into discrete shapes of sufficient size, strength, and weight for charging to a subsequent process (e.g., blast furnaces, BOFs). Materials can be similar to those charged to sintering operations. Briquetting operations can be performed with or without heating the raw materials, and do not generate process wastewater.

5.2.4 Blast Furnace Ironmaking

Blast furnaces produce molten iron, which makes up two-thirds to nearly three-quarters of the metallic charge to basic oxygen steelmaking furnaces; the balance is cold steel scrap. The blast furnace has several zones: crucible-shaped hearth (bottom of the furnace), intermediate zone called a bosh (between the hearth and the stack), a vertical shaft called the stack (between the bosh and top of furnace), and the furnace top, which contains the mechanism for charging the furnace. The hearth and bosh walls are lined with carbon-type refractory blocks, and the stack is lined with high-quality fireclay bricks. To protect these refractory materials from burning out, cooling water circulates through exterior plates, staves, or sprays. Blast furnace sizes range between 70 and 120 feet in height, with hearth diameters between 20 and 45 feet. The rated capacity of blast furnaces ranges from under one million tons per year to over four million tons per year.

The raw materials charged to the top of the blast furnace include coke, limestone, beneficiated iron ores or iron pellets, and sinter. Iron pellets, the dominant burden material (material charged to the furnace) in North America, include acid pellets and fluxed pellets, which are typically produced at or near iron ore mine sites. Coke supports the furnace burden. Iron-

bearing materials are reduced to molten iron and slag as they descend through the furnace. A continuous feed of alternating layers of coke, iron-bearing materials, and limestone are charged to the top of the furnace. Hot blast (preheated air) at temperatures between 1,650 and 2,300°F and injected fuel (e.g., pulverized coal, oil, natural gas) are blown into the bottom of the furnace (top of the hearth) through a bustle pipe and tuyeres (orifices) located around the circumference of the furnace. The preheated air reacts with the coke to produce the reducing agent, carbon monoxide. The reducing gases ascend through the furnace to react with the iron-bearing materials to produce the molten iron and slag. The limestone is a fluxing agent that forms the fluid slag, which combines with unwanted impurities in the ore. The molten iron, at approximately 2,800 to 3,000°F, accumulates in the hearth and is tapped at regular intervals into refractory-lined cars for transport to the steelmaking furnaces. Molten slag, which floats on top of the molten iron, is also tapped and processed for sale as a by-product.

Blast furnace slag uses include railroad ballast, aggregate in cement manufacturing, and other construction uses. There are 20 integrated steel mills with blast furnace operations in the United States.

Below is a simplified summary of the chemical reactions that occur in the blast furnace:

$3Fe_2O_3 + H_2 \rightarrow 2Fe_3O_4 + H_2O$
$3Fe_2O_3 + CO \rightarrow 2Fe_3O_4 + CO_2$

$Fe_3O_4 + H_2 \rightarrow 3FeO + H_2O$
$Fe_3O_4 + CO \rightarrow 3FeO + CO_2$

$FeO + H_2 \rightarrow Fe + H_2O$
$FeO + CO \rightarrow Fe + CO_2$

$3Fe + CO \rightarrow Fe_3C + H_2O$
$3Fe + 2CO \rightarrow Fe_3C + CO_2$

$CO_2 + C \rightarrow 2CO$
$H_2O + C \rightarrow CO + H_2$

$FeO + C \rightarrow Fe + CO$

$3Fe + C \rightarrow Fe_3C$

The hot blast exits the furnace top as blast furnace flue gas in enclosed piping. A combination of dry dust catchers and high-energy venturi scrubbers clean and cool the gas. Stoves combust the cleaned gas to preheat the incoming air and for use as fuel elsewhere in integrated mills. Direct contact water is applied in the gas coolers and high-energy scrubbers. All sites operating blast furnaces use wet air gas cleaning systems.

Blast furnace manufacturing operations may use wastewater or plant service water for slag cooling or quenching. Nineteen of the 20 integrated facilities surveyed use water for slag cooling at blast furnace operations.

5.2.5 Direct Reduced Ironmaking

Another method of producing iron is through direct reduction. This process produces relatively pure iron in solid pellet form by reducing iron at a temperature below the melting point of the iron produced. Direct reduced iron (DRI) is used as a substitute for scrap steel in EAF steelmaking to minimize contaminant levels in the melted steel and to allow economic steel production when market prices for scrap steel are high. There are two direct reduced ironmaking plants in the United States.

The prime ingredient in DRI is iron oxide ore. The DRI process removes the oxygen from the iron ore. The DRI process uses a slightly inclined rotating kiln, where the raw materials and heat are added. Raw materials include iron ore, coal, and recycled material. The heat may be supplied by oil or gas burners. One common DRI process uses natural gas as both an energy source and a reducing gas. The process involves blending oxide pellets and lump ores and charging this mixture to the top of the furnace. The top zone of the furnace is where reduction occurs and the bottom zone of the furnace is where cooling occurs. While in the furnace, the blended ore mixture is saturated with a reducing gas mixture of carbon monoxide and hydrogen, which is produced from the natural gas in gas reformers. This gas is preheated to a temperature of approximately 1,500°F. The descending iron ore pellets are reduced as they descend through the kiln. The oxide ore and the reducing gas remain in the furnace for several hours, resulting in direct reduced iron.

5.2.6 Steelmaking: Basic Oxygen Furnaces (BOFs) and Electric Arc Furnaces (EAFs)

Steelmaking in the United States is performed in either BOFs or EAFs. BOF and EAF processes are batch operations with tap-to-tap (batch cycle) times of about 45 minutes for BOFs and in the range of 1 to more than 1.5 hours for EAFs. BOFs typically produce high-tonnage carbon steels, while EAFs produce carbon steels and low-tonnage alloy and stainless steels.

Basic Oxygen Furnace (BOF)

The open hearth furnace process for steelmaking was replaced after World War II with the basic oxygen process (BOP). This process involves blowing oxygen through a lance into the top of a pear-shaped vessel. Lime addition to the charge removes phosphorus and sulfur impurities in the form of slag. Compared with the open hearth furnace, steelmaking using BOP became a much quicker process, with tap-to-tap times of approximately 60 minutes compared to 12 or more hours. In addition, up to 35 percent of the charge could be steel scrap.

After its invention, the BOP was modified. In addition to blowing oxygen directly onto the charge, the process involved also blowing burnt lime through the lance with the oxygen. This process allowed refining of pig iron smelted from high-phosphorus ores. The next process modification, developed in Canada and Germany in the mid-1960s, was the bottom-blown steelmaking process. This process used two concentric tuyeres, the outer with hydrocarbon gas and the inner with oxygen. This new process became know as Q-BOP. Both the BOP and Q-BOP process are types of BOF steelmaking which are used today.

The BOF steelmaking process refines the product of the blast furnace (hot metal), which contains approximately 3.5 to 4.4 percent carbon, ≤0.05 percent sulfur, and ≤0.04 percent phosphorus. In steelmaking operations, the furnace charge consists of approximately two-thirds molten iron and one-third scrap steel. The furnace melts the charge and refines it by oxidizing silicon, carbon, manganese, phosphorus, and a portion of the iron in the molten bath. Various alloying elements are added to produce different grades of steel. Common alloying elements include aluminum, boron, chromium, copper, magnesium, molybdenum, niobium, nickel, silicon, and vanadium.

Vessels used in the BOF process are generally vertical cylinders surmounted by a truncated cone. Typical heat sizes in BOFs range between under 100 tons per heat to over 300 tons per heat.

Scrap and molten iron are first placed in the vessel. Oxygen is then injected into the molten bath either through the top of the furnace (top blown), bottom of the furnace (bottom blown), or both (combination blown). A violent reaction occurs immediately, bringing the molten metal and hot gases into intimate contact, causing impurities to burn off quickly. Management of furnace slag processes controls residual sulfur. The slag is separated and removed from the molten steel. Finally, alloys are added to the bath or as the steel is tapped (poured) into ladles. Slag material is charged back to the blast furnace to recover iron or used as railroad ballast. The BOF allows close control of steel quality and the ability to process a wide range of raw materials.

Off-gases from BOFs exit the vessel at temperatures of approximately 3,000°F. This gas contains approximately 90 percent carbon monoxide and 10 percent carbon dioxide, and may also contain ferrous oxide dust. BOF off-gas control systems include two types: full or open combustion and suppressed combustion. The full combustion system burns the off-gas above the mouth of the vessel using excess air. Air pollution control systems then clean the off-gas. The suppressed combustion system lowers a ring-shaped hood over the vessel mouth, collecting the gases, which are used as heating sources.

Sites may operate wet, semi-wet, or both types of air pollution control systems at BOF processes. Fourteen of the 20 sites operating BOFs in 1997 used wet air pollution control, and eight used semi-wet air pollution control. United States facilities control off-gases from BOFs by one of three methods: semi-wet, wet-open, or wet-suppressed. In semi-wet combustion, BOF off-gases are conditioned with moisture prior to processing in electrostatic precipitators or bag houses. In wet-open combustion, excess air is admitted to the off-gas collection system, allowing carbon monoxide to combust prior to high-energy wet scrubbing. In wet-suppressed

combustion, excess air is not admitted to the off-gas collection system prior to high-energy wet scrubbing.

Similar to blast furnaces, BOF manufacturing operations may use wastewater or plant service water for slag cooling or quenching. Eighteen of the 20 integrated facilities surveyed use water instead of air for slag cooling in BOF operations.

Electric Arc Furnace (EAF)

The EAF is designed to produce specific grades of steel. The first EAFs developed in the late 1800s and early 1900s could melt approximately one ton per heat. Typical heat sizes in current EAFs range between under one ton per heat to over 350 tons per heat.

The furnace is a cylindrical vessel with a dish-shaped refractory hearth and three electrodes that lower from the dome-shaped, removable roof. Depending on heat sizes, shell diameters range from 8 feet for a 10-ton vessel to 30 feet for a 300-ton vessel. Tar-bonded magnesite bricks form the lining of the furnace. The walls typically contain water-cooled panels that are covered to minimize heat loss. The electrodes may also be equipped with water cooling systems.

The cycle in EAF steelmaking consists of scrap charging, melting, refining, deslagging, and tapping. In addition to scrap steel, the charge may include pig iron and alloying materials. As the steel scrap is melted, additional buckets of scrap may be added to the furnace. The EAF generates heat by passing an electric current between electrodes through the charge in the furnace. Lime-rich slag removes the steel impurities (e.g., silicon, sulfur, and phosphorus) from the molten steel. Oxygen may be added to the furnace to speed up the steelmaking process. At the end of a heat, the furnace tips forward and the molten steel is poured off. Non-integrated steelmaking facilities typically operate EAFs.

5.2.7 Vacuum Degassing

Vacuum degassing is a refining process in which gases are removed from molten steel under vacuum after steelmaking and prior to casting to produce steels of high metallurgical quality. Vacuum degassing may be used to control composition and temperature, remove oxygen (deoxidation) and hydrogen (degassing), decarburize, and otherwise remove impurities from the steel. Steam jet ejectors generate the vacuum for high-tonnage vacuum degassing units. The gases and water used to condense the steam come in direct contact in barometric condensers. While the molten steel is under vacuum, elements that have a relatively higher vapor pressure (such as manganese and zinc) volatilize and exit with the gases. Vacuum degassers are common at integrated and non-integrated mills that produce low carbon, stainless, and certain alloy steels. Vacuum degassers often operate as part of ladle metallurgy stations where additional steel refining is conducted. EPA estimates that 44 sites operate vacuum degassing systems.

5.2.8 Ladle Metallurgy and Secondary Steelmaking

Ladle metallurgy and secondary steelmaking are steel refining operations that molten steels undergo under atmospheric conditions (i.e., no vacuum is applied) prior to continuous or ingot casting. The purpose of ladle metallurgy and secondary steelmaking may include one or more of the following:

- To control gases in the steel;
- To remove, add, or adjust concentrations of metallic or nonmetallic compounds (alloying); and
- To adjust physical properties (e.g., temperature)..

Common types of ladle metallurgy include argon or nitrogen bubbling or stirring, argon-oxygen decarburization, lance injection, magnetic stirring, and other alloy addition operations. Common types of secondary steelmaking include electroslag refining and other alloy addition operations. EPA estimates that 103 sites use ladle metallurgy and/or secondary steelmaking; some sites may operate more than one type of process. The following table lists the types of ladle metallurgy and secondary steelmaking performed at iron and steel sites in 1997.

1997 National Estimate for Types of Ladle Metallurgy and Secondary Steelmaking Processes

Type of Ladle Metallurgy or Secondary Steelmaking	Number of Sites
Argon bubbling	66
Argon-oxygen decarburization	16
Electroslag remelting	10
Lance injection	19
Other[a]	37

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).

[a] Other types of ladle metallurgy include alloy addition, reheating, magnetic stirring, ladle stirring, and carbon addition/adjustment.

EPA estimates that only four of the 103 sites with ladle metallurgy and secondary steelmaking operations operate wet air pollution control systems.

5.2.9 Casting

An integral part of the steelmaking process is converting molten steel into a semifinished product or shape that is suitable for further processing. There are two main casting operation types: continuous and ingot casting. Molten steel is tapped from the BOF or EAF into ladles large enough to hold an entire heat. The ladles are then processed in ladle metallurgy stations and/or vacuum degassers prior to teeming (pouring) the steel into ingot molds or direct casting it into semi-finished shapes using continuous casters. EPA estimates that 113 sites operate casters.

Continuous Casting

Continuous casting is the most efficient and most common method of casting performed at steel mills. In the continuous casting process, molten steel is poured from the ladle into a refractory lined tundish (mold). The molten metal from the tundish pours through nozzles into an oscillating water-cooled copper mold, where the metal partially solidifies. The copper molds oscillate to prevent the molten steel from sticking to their sides. Lubricants spray into the molds to keep the steel moving through the mold. After passing through the water-cooled molds, the partially solidified product passes into a secondary cooling zone, where sprays of contact water cool the semi-finished product enough to solidify. The product then passes into the cut-off zone where it is cut to the desired length.

Casting machines are either single-strand or multiple-strand. The four main types of continuous casters are based on the shape of the cast product: billet, bloom, round, and slab. Billet casters form squares or rounds between 3 and 7 inches and are multiple-strand casters. Bloom casters form sections ranging between 7 by 7 inches and 14.6 by 23.6 inches and are usually three-strand. Round casters form steel for seamless tube production with diameters between 5 and 9 inches, and are usually multiple-strand. Slab casters form sections up to 12 inches thick and 100 inches wide, and are usually single- or twin-strands. In addition, casters may form beams that are fed directly to I-beam or H-beam rolling mills. Modern slab casters used to manufacture flat-rolled products universally have a curved-mold design, while those used for bar products may have a straight vertical mold design with vertical cutoff or bending with horizontal cutoff. The following table presents continuous casting products and the number of sites casting these products in 1997.

1997 National Estimate For Types of Continuous Casting Products

Type of Cast Product	Number of Sites
Slab	28
Thin slab	8
Round billet	6
Rectangular or square billet	47
Bloom	12
Other[a]	7

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a]Other types of cast products include beam blanks and near net-shape products.

Continuous casters usually include two separate closed-loop noncontact cooling water systems: one for the copper mold (mold-cooling water system) and one for all other mechanical equipment (machine-cooling water system). Facilities use direct contact water systems for spray cooling and for flume flushing to remove scale from the caster run-out table.

Ingot Casting

Ingot casting involves teeming the molten steel into ingot molds, and then cooling and stripping the ingots out of the molds. The ingots are then heated and rolled into blooms, billets, or slabs during hot forming. Continuous casting, on the other hand, directly forms the molten steel into blooms, billets, or slab, which eliminates the ingot casting steps, increases productivity, and conserves energy. Continuous casting has replaced nearly all ingot casting operations. Ingot casting is used typically for small, specialty batches and for certain applications for producing plate.

5.2.10 Hot Forming

Hot forming is a process in which preheated (typically in the range of 1,800°F), solidified steel is reduced in cross-section through a series of forming steps, in which mechanical pressure is applied through work rolls. These products have numerous cross-sections, lengths, and tonnages. While several different types of hot forming mills are in operation today, the hot forming mills can be grouped into one of the following four types:

- Primary mills;
- Section mills;
- Flat mills (plate, hot strip, and sheet); and
- Pipe and tube mills (seamless and butt-weld).

In general, hot forming primary mills reduce ingots to slabs or blooms, or blooms to billets. Section mills reduce billets to form rod, bar products, structural shapes (e.g., channels, angles), or other forms. Flat mills reduce slabs to plates or strips. Products from section and flat mills may be used to manufacture pipe and tubes. Seamless pipe and tube manufacturing involves piercing round billets, and butt-welded pipe and tube manufacturing begins with strip.

Flat mills, specifically hot strip mills, are the most common type of hot forming mill at integrated steel mills. Hot rolled strip begins with slab, which is heated in one or more furnaces and then undergoes scale breaking in a two-high rolling mill with vertical rolls. The rolls loosen the scale, and high-pressure water jets remove the scale. The slab rolls through four-high roughing stands to a thickness around 1.2 inches. The slab then passes to the finishing train, where a crop-shear cuts both ends and high-pressure steam jets remove scale. Six or seven four-high finishing stands roll the strip to a thickness between 0.06 and 0.4 inches. Both the roughing and finishing stands are usually arranged in tandem.

Forging is another form of steel forming where steel shapes are produced by hammering or by processing in a hydraulic press. Most forging operations are performed on preheated steel. The following table presents the national estimate for types of hot forming operations and the number of sites performing these operations in 1997.

1997 National Estimate for Hot Forming Operations

Hot Forming Operation	Number of Sites
Rolling mill	122
Pipe and tube mill	6
Forging	14

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).

The following table presents the national estimate for types of hot forming products and the number of sites producing these products in 1997.

1997 National Estimate for Hot Forming Products

Type of Hot Forming Product	Number of Sites
Bar	67
Beam[a]	8
Billet	25
Bloom[a]	7
Plate	21
Railroad rail[a]	4
Reinforcing bar	25
Rod	17
Sheet	11
Slab[a]	16
Small structural	23
Strip	25
Tube and pipe	21
Other[b]	44

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a] Estimate is based on detailed survey only. Short surveys did not collect this level of detail.
[b] Other hot forming products include various miscellaneous product shapes.

Hand chipping, machine chipping, manual scarfing, grinding, milling, and machine scarfing are methods used to remove surface defects from blooms, billets, and slabs prior to hot rolling. Scarfing removes a thin layer of the steel surface by localized melting and oxidation. The process may be done manually (continuously moving an oxyacetylene torch along the length of the product), or using a scarfing machine located near the entry of the hot forming mill.

Exhaust gases from scarfers contain metal fumes comprising mainly iron oxides and the alloying elements of the steel. These gases are saturated at a temperature of 60°C (140°F) when exiting the scarfer hood. Because the gases are saturated, the following three types of gas cleaning equipment systems are generally used:

1. Wet precipitator - intermittent spray wash;

2. Wet precipitator - continuous wash; and
3. High energy venturi scrubber.

The wet precipitator - intermittent spray wash sprays water on a timed cycle to clean the fume residue that is collected dry on the precipitator plates. The wet precipitator - continuous wash continuously sprays water to remove collected fume residue from precipitator plates. The high energy scrubber requires 45 to 50 inches of water column pressure drop to clean the gases.

Butt-weld pipe or tube is made from hot rolled strip with square or slightly beveled edges called skelp. The width of skelp corresponds to the circumference of the pipe, while the gauge corresponds to the wall thickness. Skelp is preheated to welding temperature in a reheat furnace and drawn through a die or roll forming a cylindrical shape. The edges are pressed together forming a butt-weld. Seamless tubular products are usually made by a piercing process. The process heats, pierces, and shapes a solid round bar or billet to the desired diameter and wall thickness.

Hot forming mills use water for scale breaking, flume flushing, and direct contact cooling. The water often recirculates in cooling water systems. Sites may have multiple hot forming contact water and/or rolling solution systems.

5.2.11 Finishing

Steel finishing operations follow hot forming operations; therefore, integrated steel mills and those stand-alone steel finishing mills that receive steel from integrated steel mills are most likely to perform steel finishing operations. Integrated steel mills in the United States principally produce flat-rolled steel products that require finishing, such as hot rolled strip (hot bands), pickled and oiled strip, cold rolled and annealed strip and sheet, hot coated strip (principally zinc and zinc/aluminum), electroplated strip (principally chromium, tin, zinc), and plates. Several non-integrated steel mills produce flat-rolled products, but most produce bar and bar products and structural and other shapes. Non-integrated steel mills are more likely to ship hot rolled products without further surface treatments or finishing.

The type of steel finishing operation is closely related to the type of steel processed. For carbon steels, acid pickling with hydrochloric acid, cold rolling and annealing, temper rolling, acid and/or alkaline cleaning, hot coating, and electroplating are performed. For stainless steels, descaling (molten salt bath and electrolytic sodium sulfate), sulfuric, nitric, nitric/hydrofluoric acid and sometimes hydrochloric acid pickling, cold rolling and annealing, and temper rolling are likely to be performed. A number of steel finishing mills also perform surface coating of electrical steels.

Acid Pickling and Descaling

Acid pickling and descaling operations clean the steel surface prior to further processing (e.g., cold forming, application of protective and decorative coatings). The steel surface must also be cleaned at various production stages to ensure that oxides that form on the

surface are not worked into the finished product, causing marring, staining, or other surface imperfections.

The acid pickling process chemically removes oxides and scale from the surface of the steel by the action of water solutions of inorganic acids. While acid pickling is only one of several methods of removing undesirable surface oxides, it is most widely used because of comparatively low operating costs and ease of operation. Carbon steel is usually pickled with hydrochloric acid; stainless steels are pickled with sulfuric, hydrochloric, nitric, and hydrofluoric acids. The Agency estimates that 38 of the 75 acid pickling sites use hydrochloric acid, 33 use sulfuric acid, 28 use hydrofluoric acid, and 28 use nitric acid. The pickling process uses various organic chemicals that inhibit the acid from attacking the base metal while permitting it to attack the oxides. Wetting agents improve the effective contact of the acid solution with the metal surface. After the pickling bath, the steel passes through one or more rinse operations.

In addition to the acid pickling operations, finishing mills may regenerate or recover the spent acid by removing the iron. Acids can then be reused by the mill. Hydrochloric acid and sulfuric acid are the more commonly regenerated or recovered acids, although stainless steel finishing mills also recover nitric and mixed nitric/hydrofluoric acids.

Two common types of descaling operations are blast cleaning and salt bath descaling. Blast cleaning (mechanical descaling) uses abrasives such as sand, steel, iron grit, or shot to clean the steel surface. The abrasives come in contact with the steel using either a compressed air blast cleaning apparatus or by a rotary-type blasting cleaning machine. Salt bath descaling, a surface treatment operation, processes stainless or alloy steel products in molten salt solutions. This operation uses the physical and chemical properties of molten salt baths to loosen heavy scale from selected stainless and high-alloy steels; the scale is removed in subsequent water-quenching steps. Two processes, oxidizing and reducing, are commonly referred to by the names of proprietary molten salt descaling baths, Kolene® and Hydride®, respectively. Descaling may also be performed using an electrolytic solution of sodium sulfate.

EPA estimates that, of the 69 sites operating acid pickling and descaling systems, 41 use wet air pollution control and 14 use dry air pollution control.

Cold Forming

Cold forming mills process hot rolled and pickled steels at ambient temperatures to impart desired mechanical and surface properties in the steel. Most cold rolling operations reduce the thickness of the steel much less than hot forming. The following table shows common products formed during cold forming.

1997 National Estimate for Type of Cold Forming Product

Type of Cold Forming Product	Number of Sites
Plate	5
Sheet	21
Strip	47

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).

Common cold rolling mills in the iron and steel industry include tandem and temper mills. Tandem mills modify steel sheet properties, including strength, surface properties, and thickness. They are typically used in a series of three to five stands. Temper mills slightly improve the finish of steel sheet, such as shiny, dull, or grooved surfaces, and generally do not modify shape or thickness. They primarily improve flatness, alter mechanical properties, and minimize surface disturbances. Temper mills are typically used with only one or two stands.

Sendzimir cold rolling mills, commonly referred to as Z-mills, are another type of cold rolling operation. They have various configurations; typically, however, steel passes through work rolls that are supported and driven by first- and second-intermediate rolls. The mill design allows for quick adjustments to vary the width, thickness, and hardness of the rolled steel. These mills typically use hydraulic fluid or oil emulsions rather than aqueous rolling solutions.

Cold forming operations generate heat that is dissipated by flooded lubrication systems. These systems use palm oil or synthetic oils that are emulsified in water and directed in jets against the rolls and the steel surface during rolling.

Surface Treatment and Annealing Operations

Surface treatment and annealing operations include a wide range of operations, including alkaline cleaning, annealing, hot coating, and electroplating. Facilities performing finishing operations often have a number of these operations on a single line.

Alkaline cleaners remove mineral and animal fats and oils from the steel surface. Caustic, soda ash, alkaline silicates, and phosphates are common alkaline cleaning agents. Passing the steel through alkaline solutions of specified compositions, concentrations, and temperatures is often enough to clean the product; however, for large-scale production or a cleaner product, sites may use electrolytic cleaning. Sometimes adding wetting agents to the cleaning bath facilitates cleaning.

The annealing process heats steel to modify its bulk properties, which makes the steel easier to form and bend. Steel is heated and kept at a designated temperature and then

cooled at a designated rate. Through the annealing process, the metal grain size increases, new bonds are formed at the higher temperature, and the steel becomes more ductile. Sites perform annealing through a batch or continuous process; they may follow annealing operations with a water quench to cool the steel for further processing.

Steel coating operations, such as hot coating and electroplating, improve resistance to corrosion or improve appearance. Hot coating operations involve immersing precleaned steel into molten baths of tin, zinc (hot galvanizing), combinations of lead and tin (terne coating), or combinations of aluminum and zinc (galvalume coating), any associated cleaning or fluxing (used to facilitate metal application) steps prior to immersion, and any post-immersion steps (e.g., chromium passivation). Based on survey responses, the metals used for hot coating operations include zinc, zinc/aluminum alloy, aluminum, chromium, lead, antimony, tin/lead alloy, and zinc/nickel alloy.

Electroplated steel production uses electrodes to deposit a metal coating onto the steel. Historically, electroplating at steel mills was limited to tin and chromium electroplating for food and beverage markets and relatively low-tonnage production of zinc electroplated (electrogalvanized) steel for the automotive market. In recent years, electrogalvanized steel production has increased substantially in response to automobile manufacturers' demand. New coatings consisting of combinations of iron, nickel, and other metals have been developed. Based on survey responses, the metals used for electroplating operations include zinc, chromium, tin, nickel, brass, cobalt, copper, nickel/tin alloy, zinc/nickel alloy, and zinc/iron/aluminum alloy.

EPA estimates that, of the 98 sites performing surface treatment operations, 38 operate wet air pollution control systems and 16 operate dry systems.

5.3 References

5-1 U.S. Environmental Protection Agency. Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. Volume 1. EPA 440/1-82/024, Washington, D.C., May 1982

5-2 U.S. Environmental Protection Agency. Preliminary Study of the Iron and Steel Category: 40 CFR Part 420 Effluent Limitations Guidelines and Standards. EPA 821-R-95-037, Washington, D.C., September 1995.

5-3 Association of Iron and Steel Engineers. The Making, Shaping and Treating of Steel (10th edition). ISBN 0-930767-00-4, Pittsburgh, PA, 1985.

5-4 Georgetown Steel Corporation. "Beginning with Iron Ore: The DRI Process," Georgetown Steel Corporation brochure, Georgetown, SC.

5-5 The Forging Industry Association. The Forging Industry Association's How Are Forgings Produced?. http://www.forging.org/facts/wwhy6.htm, 2000.

5-6 American Iron and Steel Institute. AISI's Everything You Always Wanted to Know About Steel. . . A Glossary of Terms and Concepts. Courtesy of Michelle Applebaum, Managing Director (Summer 1998). Salomon Smith Barney Inc, http://www.steel.org/learning/glossary/, 2000.

5-7 Association of Iron and Steel Engineers. The Making, Shaping and Treating of Steel (11th edition), Ironmaking Volume. Pittsburgh, PA, 1999.

5-8 Encyclopaedia Britannica. Britannica.com. http:\\www.britannica.com, Chicago, IL.

Table 5-1

1997 National Estimate of Types of Iron and Steel Sites in the United States

Type of Site	Total Number of Sites Operating in 1997 (% of Industry Total)
Integrated steel mill with coke plant	9 (3.5%)
Integrated steel mill without coke plant	11 (4.5%)
Stand-alone coke plant[a]	15 (6.0%)
Stand-alone sintering plant[b]	2 (<1%)
Stand-alone direct reduced ironmaking plant[c]	1 (<1%)
Non-integrated steel mill	94 (37%)
Stand-alone hot forming mill	39 (15.5%)
Stand-alone finishing mill	70 (28%)
Stand-alone pipe and tube mill	11 (4.5%)
TOTAL[d]	**254**

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a]One of the stand-alone coke plants is a non-recovery coke plant. One additional non-recovery coke plant started operations after 1997 and is not reflected in this table.
[b]One stand-alone sinter plant has been shut down indefinitely since 1997.
[c]A stand-alone direct reduced ironmaking plant started operations after 1997.
[d]Columns do not sum to totals because of rounding each number and because two sites are counted as one integrated steel mill.

Table 5-2

Survey Response of Sites Producing Steel Types

Type of Site[a]	Total Number of Sites Responding to Survey	Number of Survey-Responding Sites Producing Each Type of Steel		
		Carbon Steel	Stainless Steel	Alloy Steel
Integrated steel mill with coke plant	9	9	1	6
Integrated steel mill without coke plant	11	11	2	5
Non-integrated steel mill	66	56	16	43
Stand-alone hot forming mill	17	14	7	13
Stand-alone finishing mill	38	28	13	12
TOTAL	**141**	**118**	**39**	**79**

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a]Totals for stand-alone pipe and tube mills not disclosed to prevent compromising confidential business information.

Table 5-3

1997 National Estimate of Number of Direct, Indirect, and Zero Discharging Sites

Type of Site	Total Number of Sites[a]	Number (%) of Direct Dischargers	Number (%) of Indirect Dischargers	Number (%) of Zero or Alternative Dischargers[b]
Integrated steel mill with coke plant	9	8 (89%)	3 (33%)	0[c]
Integrated steel mill without coke plant	11	11 (100%)	0[c]	0[c]
Stand-alone coke plant	15	9 (60%)	5 (33%)	1 (7%)
Stand-alone sintering plant	2	1 (50%)	0[c]	1 (50%)
Stand-alone direct reduced ironmaking plant	1	0[c]	1 (100%)	0[c]
Non-integrated steel mill	94	46 (49%)	19 (20%)	32 (34%)
Stand-alone hot forming mill	39	22 (56%)	6 (15%)	12 (31%)
Stand-alone finishing mill	70	28 (40%)	34 (49%)	11 (16%)
Stand-alone pipe and tube mill	11	8 (72%)	3 (27%)	0[c]
TOTAL [d]	**254**	**133 (53%)**	**70 (28%)**	**56 (22%)**

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a]The sum of direct dischargers, indirect dischargers, and zero dischargers may not equal the total number of sites. Sites may directly and indirectly discharge wastewater from their site.
[b]Zero dischargers include sites that do not discharge process wastewater as well as sites that are completely dry.
[c]Cells with a zero (0) value indicate that none of the survey respondents have the characteristic. However, it is possible for nonsurveyed facilities to have the characteristic corresponding to that cell.
[d]Columns do not sum to totals because of rounding each number and because two sites are counted as one integrated mill.

Table 5-4

1997 National Estimate of Actual Production and Rated Capacity by Manufacturing Operation

Manufacturing Operation	Total Number of Sites with this Operation	Total 1997 Production (million standard tons)	Total 1997 Rated Capacity (million standard tons)
Cokemaking	24	20.4	22.6
Sintering	9	12.4	17.9
Blast furnace ironmaking	20	54.5	68.6
BOF steelmaking	20	65.9	78.3
EAF steelmaking	96	50.8	75.8
Vacuum degassing	44	18.0	39.1
Ladle metallurgy	103	102	158
Casting	113	110	142
Hot forming	153	127	177[a]
Acid pickling and descaling	69	48.3	67.9[a]
Cold forming	103	72.8	105
Surface cleaning and coating	98	35.3	40.1
Briquetting or other agglomeration process	4	nd	nd
Direct reduced ironmaking	2	nd	nd

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
[a]This estimate is from the detailed survey only.
nd - Not disclosed to prevent comprimising confidential business information.

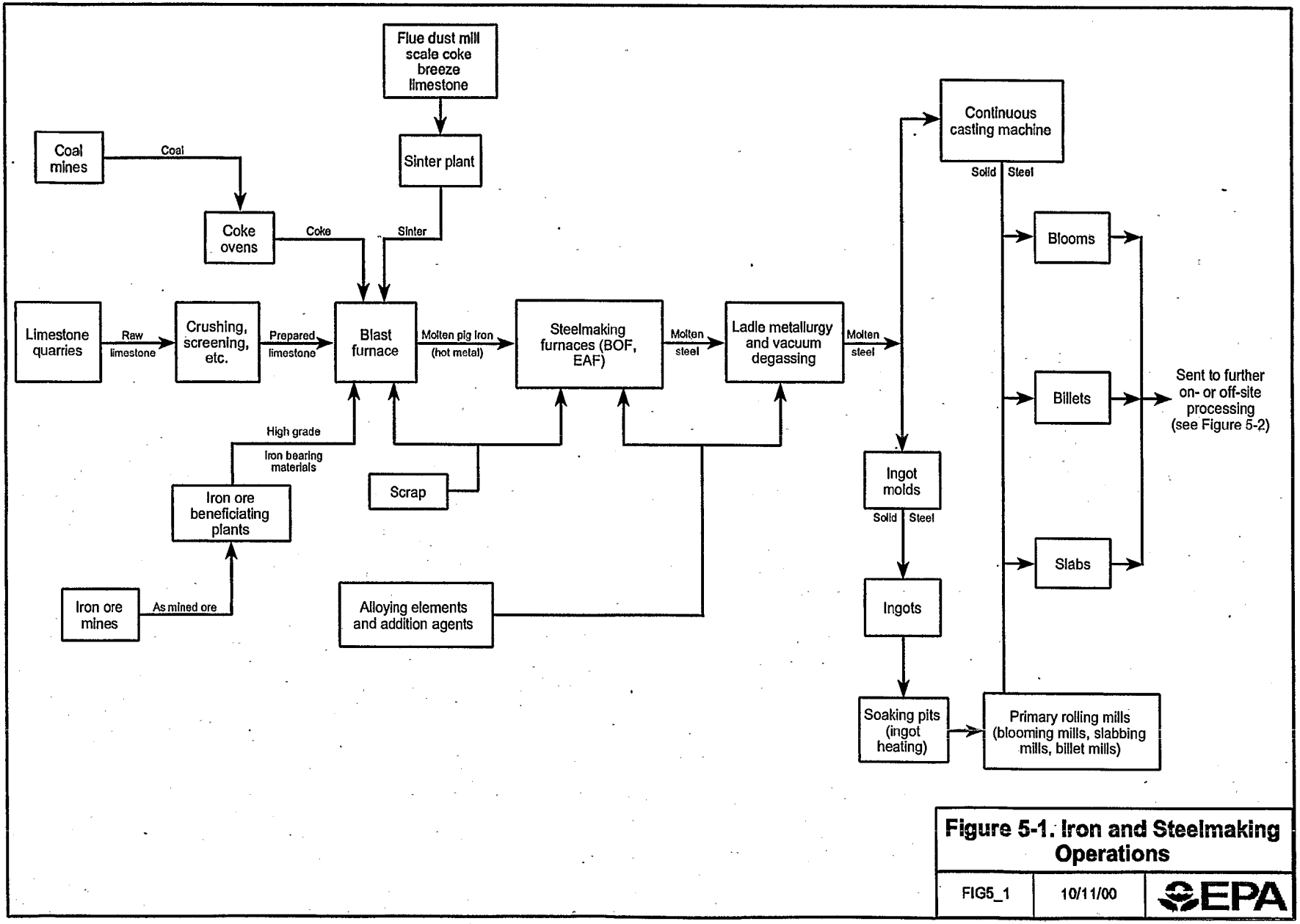


Figure 5-1. Iron and Steelmaking Operations

FIG5_1	10/11/00	EPA

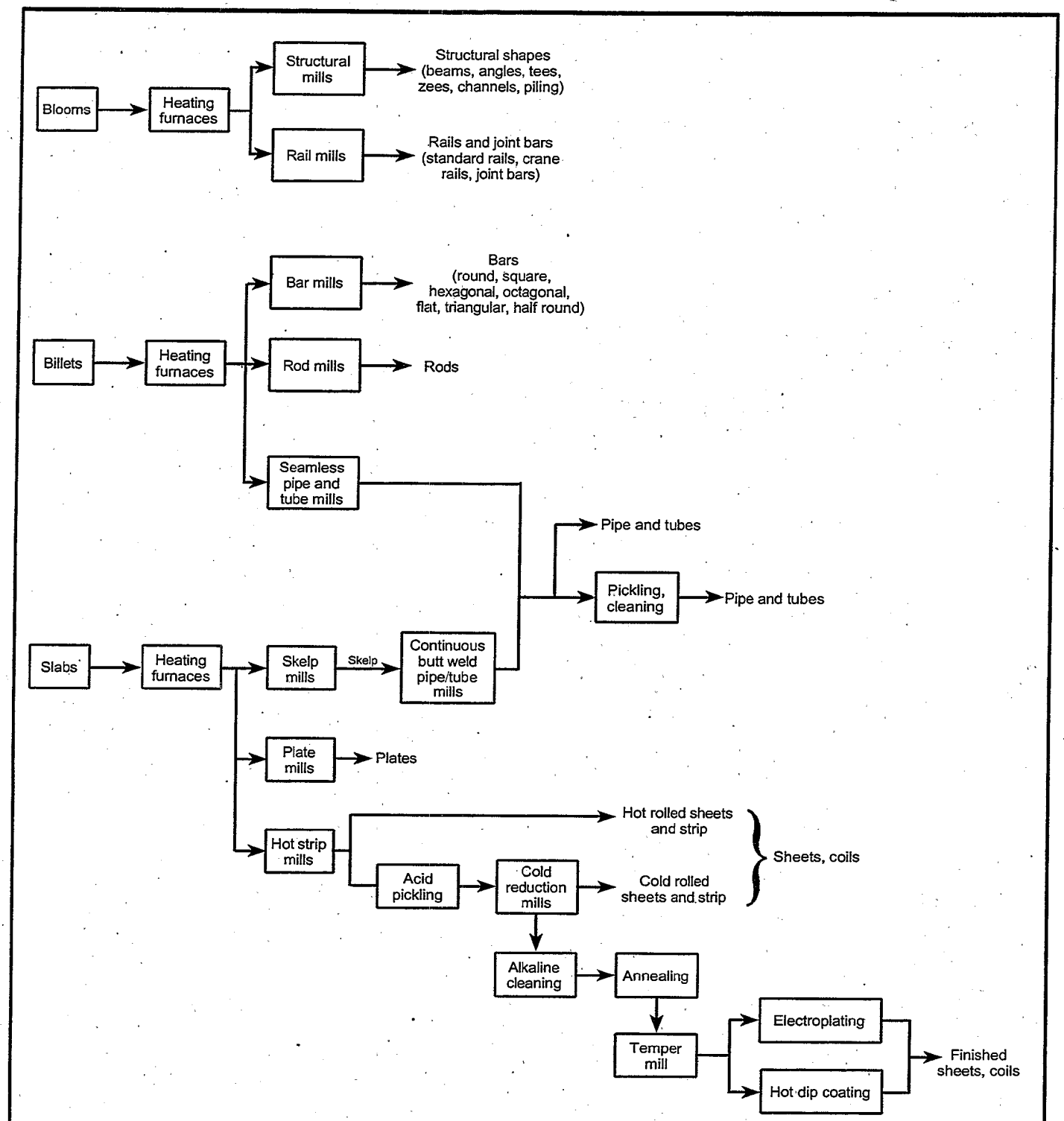
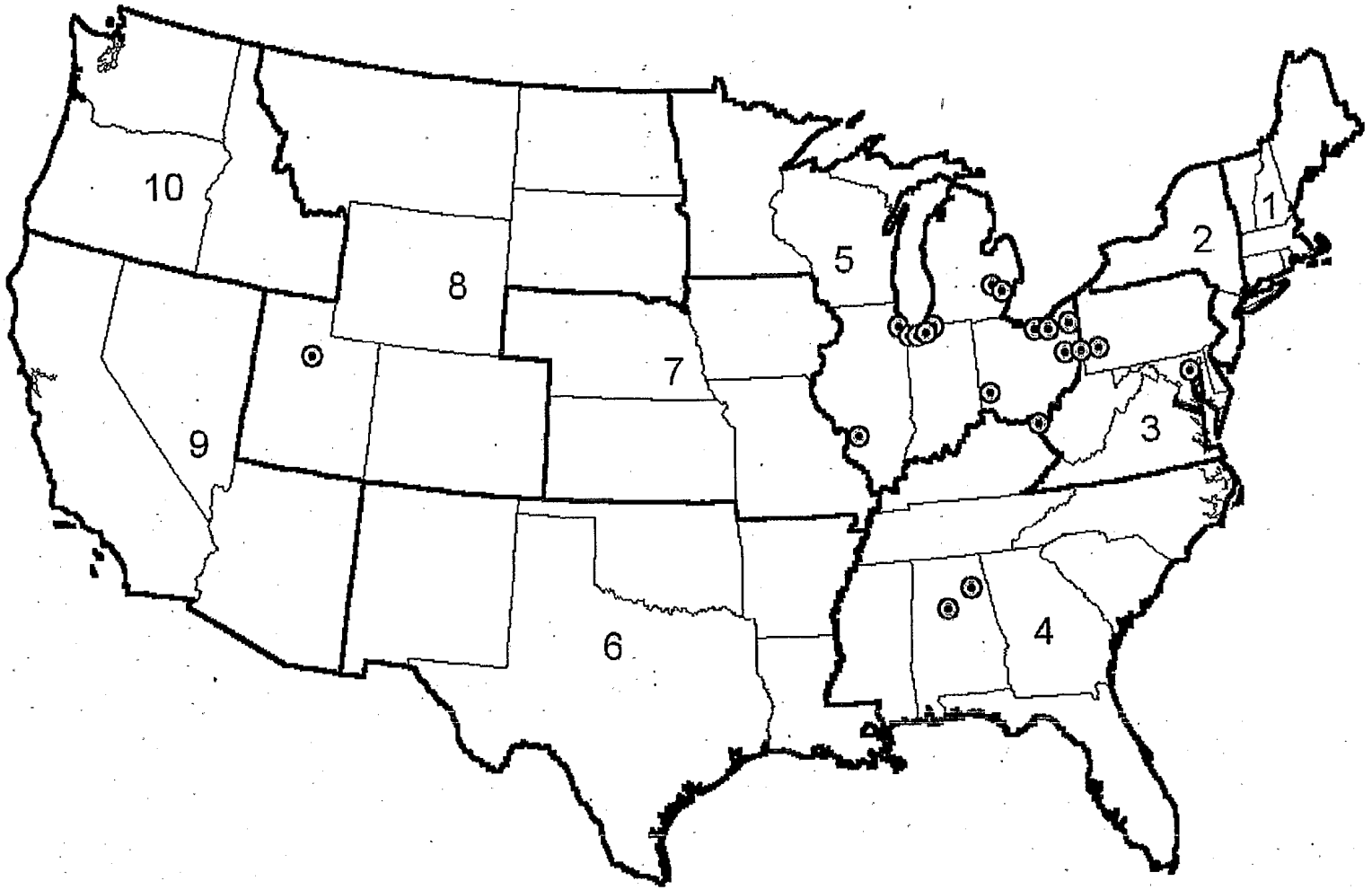


Figure 5-2. Forming and Finishing Operations

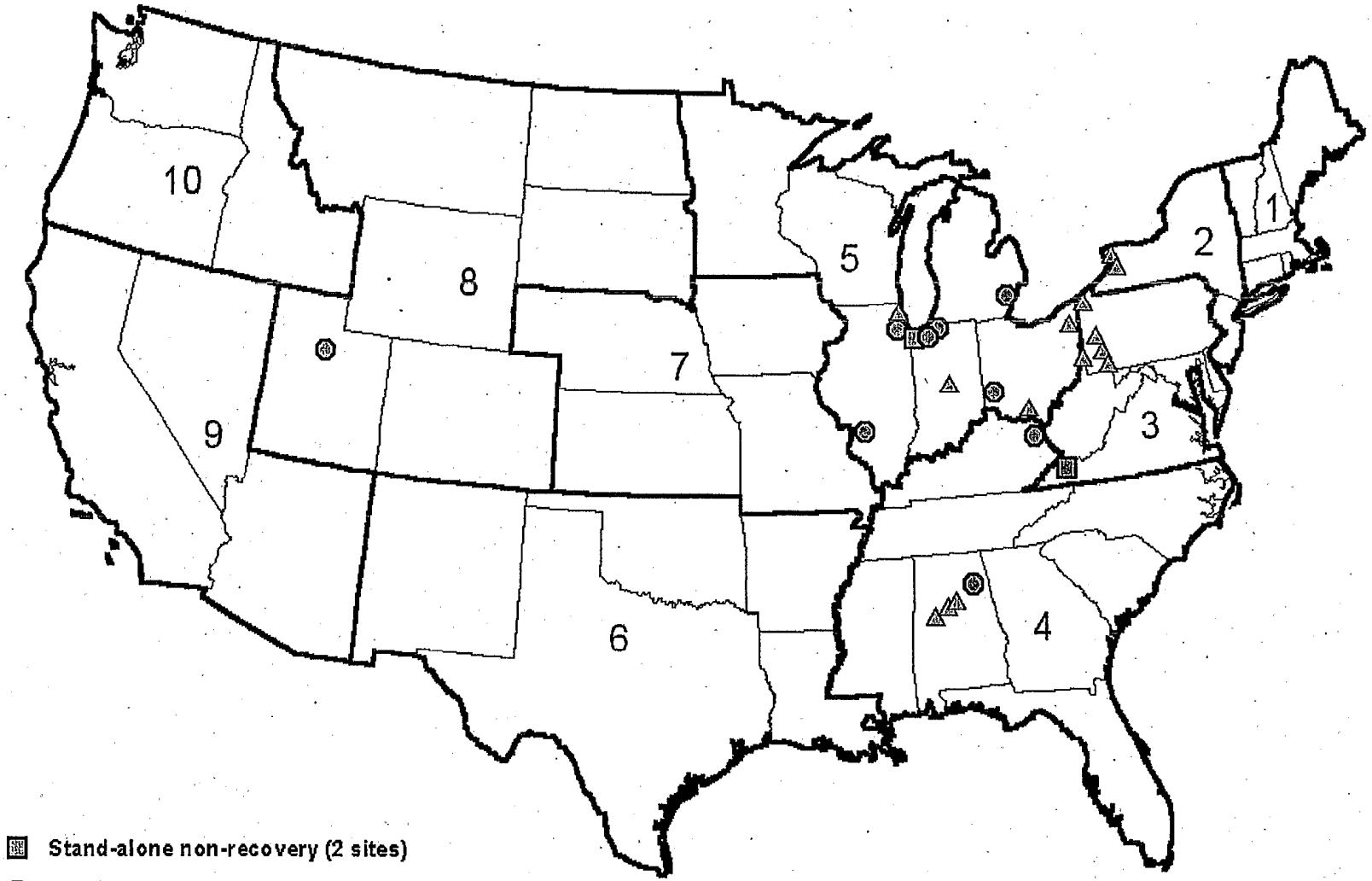
FIG5_2	10/11/00	EPA

Figure 5-3.
Integrated Steel Manufacturing Sites



Smaller stand-alone forming and finishing facilities are generally located near steel manufacturing sites.

Figure 5-4.
Cokemaking Sites



SECTION 6

SUBCATEGORIZATION

This section presents the proposed subcategorization for the Iron and Steel effluent limitations guidelines and standards. Section 6.1 presents EPA's subcategorization criteria and the proposed subcategories and discusses differences between the 1982 subcategorization and the proposed subcategorization. Sections 6.2 through 6.8 present each proposed subcategory in detail and review the segments and manufacturing operations within each subcategory.

6.1 Subcategorization Process

To develop the regulation, the Agency had to determine whether different effluent limitations and standards were appropriate for distinct subcategories within the industry. The Clean Water Act (Section 304(b)(2)(b), 33 U.S.C. § 1314 (b)(2)(B)) requires the Agency to consider certain factors for subcategorization, as well as process and engineering factors. These factors include:

- Age of equipment and facilities;
- Location;
- Size of site;
- Manufacturing processes employed;
- Wastewater characteristics;
- Economic impacts; and
- Non-water quality impacts.

In considering these factors, EPA analyzed industry survey data and EPA sampling data for trends in discharge flow rates, pollutant concentrations, and treatability to determine where subcategorization was warranted. Based on this analysis, the Agency has adopted a revised subcategorization of the industry for the proposed rule. The revised subcategorization not only reflects the production and wastewater treatment changes in the industry since the last rulemaking, but also simplifies the regulation and incorporates the experience that the Agency and other regulatory entities have gained from implementing the 1982 Iron and Steel effluent limitations guidelines and standards.

Of all the subcategorization criteria, EPA identified manufacturing processes as the most significant factor for subcategorization, and divided the industry into seven primary process subcategories on this basis. In addition, EPA used manufacturing operations, type of product, and wastewater characteristics, including flow rates with respect to production and type of pollutant present, to segment within certain subcategories. The Agency decided to further divide segments in some cases, based on different wastewater pollutant characteristics, wastewater flow rates, and/or process operations. Section 7 discusses in detail wastewater sources, production-normalized flow rates, and pollutants for each segment. Tables 6-1 and 6-2 present the 1982 and

proposed subcategorization, respectively. Table 6-3 compares the subcategorization for the 1982 and the proposed regulations.

Manufacturing process changes in the iron and steel industry have resulted in changes to the current subcategorization and the proposal of the new subcategorization. EPA removed three segments from the proposed subcategorization because the manufacturing operations are no longer practiced in the United States: the Beehive Cokemaking Segment of the Cokemaking Subcategory, the Ferromanganese Blast Furnace Segment of the Ironmaking Subcategory, and the Open Hearth Furnace Segment of the Integrated Steelmaking Subcategory. In addition, the Agency added one segment and one subcategory to include iron and steel manufacturing processes that are not covered under the 1982 regulation: the proposed Cokemaking Subcategory includes a segment for non-recovery cokemaking operations, and the Other Operations Subcategory has been created to regulate direct reduced ironmaking, briquetting, and forging.

Changes to the proposed subcategorization are also a result of applicability changes for iron and steel and other effluent limitations guidelines and standards. In contrast to the 1982 regulation, the proposed regulation covers cold forming only as it pertains to cold rolling of flat products. The Agency has determined that operations associated with cold forming of pipe and tube and cold drawing or extrusion operations are more appropriately regulated by the proposed Metal Products and Machinery regulation, because the products produced and wastewater characteristics generated by these operations more closely resemble those seen in the metal products and machinery industry. For similar reasons, electroplating of flat products at iron and steel facilities, currently regulated by the concentration-based Metal Finishing regulation (40 CFR Part 433), is more appropriately regulated by the iron and steel effluent limitations guidelines and standards. EPA has consequently added electroplating to the Steel Finishing Subcategory to simplify coverage of this manufacturing operation at iron and steel facilities.

Wastewater characteristics also had an impact on modifications to the subcategorization. The Agency determined that subcategorization and segmentation based on wastewater characteristics is warranted because wastewaters from the various processes contain different pollutants that generally require different wastewater control systems. However, EPA also designed the proposed regulation to facilitate co-treatment of compatible wastewaters, by including manufacturing operations that generate wastewaters amenable to co-treatment in the same subcategory. Sections 6.2 through 6.8 discuss these changes. Sections 7 and 10 discuss wastewater characteristics and pollutant loadings, respectively.

Another appropriate revision to the 1982 subcategorization is segmentation based on the type of steel processed. In the 1982 regulation, segments exist for carbon steel and specialty steel (stainless and alloy steels). For the proposed regulation, the Agency determined that, for three subcategories, it is appropriate to have separate segments for carbon and alloy steels and for stainless steels. EPA determined that this change better reflects pollutants found within each segment. For example, chromium and nickel are currently regulated in the stainless steel segment but not in the carbon and alloy steel segment.

EPA evaluated other factors and determined them to be insignificant to subcategorization. The Agency evaluated the age of facilities relative to production-normalized wastewater discharge rates (volume of water discharged with respect to production). The comparison between the age of the facilities and the respective process wastewater discharge rates showed no relationships between mill age and the volume of process wastewater discharged. Therefore, the Agency determined that the age of facilities and equipment did not have an impact on wastewater generation or discharge. The results of EPA's analysis of facility age versus wastewater discharge rate are located in the Iron and Steel Administrative Record for the proposed rule.

The Agency also evaluated facility age with respect to installing or upgrading wastewater treatment equipment and found that, while a site or a plant may have been operating for several decades, manufacturing and treatment systems are regularly upgraded. In certain cases, older sites actually have modern wastewater treatment systems and have demonstrated model BAT treatment. Consequently, the Agency has determined that subcategorization based on facility age was not warranted. In addition, since system upgrades frequently occur within the industry, the Agency included sufficient costs in its evaluation of technology options to account for treatment system modifications at all iron and steel facilities regardless of their age.

The Agency also evaluated location of sites with respect to the amount of process wastewater discharged. While the Agency realizes that facilities located in arid and semi-arid regions of the country may have lower discharge flow rates due to water loss from evaporation, EPA developed the flow allowances in the proposed regulation to be achievable in any region of the country. Therefore, the Agency determined that location was not a significant criteria for subcategorization. The results of EPA's analysis of location versus wastewater discharge rate are located in the Iron and Steel Administrative Record for the proposed rule.

While larger iron and steel sites discharge greater total volumes of wastewater, the size of a site (e.g., acreage, number of employees) did not have an impact on production-normalized wastewater discharge rates or pollutant concentrations. Consequently, the Agency determined that size was also not a significant factor for subcategorization. Similarly, EPA evaluated non-water quality impacts, such as solid waste and air emission effects, and determined that theses did not constitute a basis for subcategorization in the proposed rule. However, EPA did evaluate non-water quality impacts during EPA's rulemaking process, as discussed in detail in Section 13. With the exception of the Integrated and Stand-Alone Hot Forming Subcategory, economic impacts were determined not to have an impact on subcategorization. Section 9 presents a detailed discussion of economic impacts.

Since the elements to these factors have not changed since the 1982 rule, refer to Volume I of the Technical Development Document for the 1982 regulation (pages 155 to 163, EPA 440/1-82/024, May 1982) for a more detailed review of the above factors.

6.2 Subcategory A: Cokemaking

Cokemaking operations include foundry and blast furnace coke production at integrated and stand-alone facilities. The Cokemaking Subcategory has been segmented into by-product recovery and non-recovery cokemaking operations. The Non-recovery Cokemaking Segment includes non-recovery cokemaking processes that have either existed for many years or are currently emerging in the industry. Other than low-volume boiler blowdown and process area storm water, non-recovery cokemaking processes do not generate wastewater like the by-product recovery processes do. This major difference in wastewater flow necessitated the segmentation of this subcategory. Two stand-alone facilities in the United States practice non-recovery cokemaking.

By-product recovery coke plants comprise 23 of the 25 cokemaking facilities in the United States. All 9 integrated facilities with coke plants and 14 of the 16 stand-alone cokemaking facilities operate by-product ovens. By-product recovery cokemaking generates process wastewater from the release of moisture and volatile compounds from coal and from the by-product recovery operations.

To reflect slightly different wastewater generation rates, the 1982 regulation further segments by-product recovery cokemaking operations by those coke plants that manufacture coke for blast furnaces and merchant coke plants. Merchant coke plants provide more than 50 percent of the coke produced to operations, industries, or processes other than ironmaking blast furnaces associated with steel production. In 1982, EPA determined that the model flow rates for blast furnace and merchant coke plants, including control water, were 153 gallons per ton (gpt) and 170 gpt, respectively. Since EPA did not observe these differences in wastewater generation rates when analyzing the 1997 industry survey data, the Agency eliminated this segment.

6.3 Subcategory B: Ironmaking

Ironmaking operations include sintering and blast furnace ironmaking at integrated steel plants and stand-alone facilities. The 1982 regulation distinguishes sintering and blast furnace operations as two subcategories; EPA combined these operations into one subcategory in the proposed regulation because of similar wastewater pollutant characteristics and the potential for co-treatment of sintering and blast furnace wastewaters. However, the Agency divided the subcategory into two segments, sintering and blast furnace ironmaking, based on differences in flow rates and manufacturing processes. The Agency decided to further divide the sintering segment due to differences in wastewater generation, as discussed below.

Facilities use two types of air pollution control systems to treat air emissions from sinter plants: wet and dry. Sinter plants that operate dry air pollution controls do not generate process wastewater. In 1997, the period for which industry survey data were collected, eight sinter plants were in operation (a ninth plant providing data had been inactive since 1995), six at integrated facilities and two stand-alone facilities. Of the eight plants, six operated wet air pollution control systems and two operated dry air pollution control systems. Since the industry

survey data were collected, one plant operating a wet air pollution control system has converted to a dry system and another plant operating a wet air pollution control system has been deactivated indefinitely. The four remaining sinter plants with wet air pollution control systems are located at integrated steel plants; three of these sites co-treat sinter plant wastewater with blast furnace wastewater, and the fourth site co-treats sinter plant wastewaters with wastewaters from several other operations. Twenty integrated steel plants operated 40 blast furnaces in 1997. Every blast furnace in the United States operates a wet gas cleaning system to cool and clean the furnace off-gases prior to reuse.

6.4 Subcategory C: Integrated Steelmaking

Integrated steelmaking operations include basic oxygen furnace (BOF) steelmaking, ladle metallurgy, vacuum degassing, and continuous casting manufacturing processes at integrated steel plants. EPA combined these operations into one subcategory because of similar wastewater pollutant characteristics and the potential for co-treatment of compatible wastewaters. EPA decided to further subcategorize the subcategory to the manufacturing process level, because of differences in wastewater generation rates. These manufacturing processes are discussed below.

Facilities use three types of air pollution control systems to treat furnace off-gases from BOF steelmaking operations: semi-wet, wet-open combustion, and wet-suppressed combustion. Each type of air pollution control system operates differently and generates different wastewater flow rates. However, the wastewater characteristics are similar. Twenty integrated steel plants and one non-integrated steel plant operate a total of 24 BOF shops. Of the 24 BOF shops, eight use semi-wet air pollution control systems, eight use wet-open combustion air pollution control systems, seven use wet-suppressed combustion air pollution control systems, and one uses a combination wet-open/wet-suppressed combustion air pollution control system.

Twenty integrated steel mills operate a total of 30 continuous casters. Twenty-five of these continuous casters cast slabs for the production of flat-rolled products (e.g., strip and plate); the remaining five continuous casters cast blooms and billets. The Agency determined that the type of product cast did not have a significant impact on wastewater generation and that no further division of continuous casting is necessary.

The 1982 regulation distinguishes steelmaking, vacuum degassing, and continuous casting operations as three separate subcategories. The new subcategorization consolidates these operations into the Integrated Steelmaking Subcategory due to similarities in their wastewater. EPA proposes to regulate electric arc furnace (EAF) steelmaking (which was part of the 1982 Steelmaking Subcategory) under the Non-Integrated Steelmaking and Hot Forming Subcategory, as well as vacuum degassing, ladle metallurgy, and continuous casting operations at non-integrated plants. The Agency proposes segregating steelmaking operations at integrated plants and non-integrated plants to simplify the structure of the regulation and because different wastewater generation rates were observed between integrated and non-integrated plants.

6.5 Subcategory D: Integrated and Stand-Alone Hot Forming

Integrated and stand-alone hot forming operations include all hot forming processes at integrated steel plants and stand-alone hot forming mills. Four different types of hot forming mills are operated at integrated and stand-alone facilities: flat mills (hot strip and sheet mills and plate mills), primary mills (slabbing and blooming mills), section mills (bar and rod mills), and hot formed pipe and tube mills. The 1982 regulation segregates the Hot Forming Subcategory into four different segments based on differences in flow rates:

1. Primary mills
   - Carbon and specialty primary mills with scarfing,
   - Carbon and specialty primary mills without scarfing;

2. Section mills
   - Carbon section mills,
   - Specialty section mills;

3. Flat mills
   - Carbon and specialty hot strip and sheet mills,
   - Carbon plate mills,
   - Specialty plate mills; and

4. Pipe and tube mills.

In the proposed regulation, EPA proposes two segments, Carbon and Alloy Steel and Stainless Steel, for the Integrated and Stand-Alone Hot Forming Subcategory because of differences in pollutants present in the wastewater. EPA did not propose to segment this subcategory based on mill type because the Agency has determined that all hot forming mills can achieve the same wastewater discharge rate with the proper use of wastewater recycle. The 1982 Hot Forming Subcategory also regulates hot forming processes at non-integrated plants; however, EPA proposes to regulate non-integrated hot forming processes under the Non-Integrated Steelmaking and Hot Forming Subcategory to simplify the structure of the regulation.

6.6 Subcategory E: Non-Integrated Steelmaking and Hot Forming

Non-integrated steelmaking and hot forming operations include EAF steelmaking, ladle metallurgy, vacuum degassing, continuous casting, and hot forming operations performed at non-integrated mills. EPA has combined these operations into one subcategory because of similar wastewater pollutant characteristics and the potential for co-treatment of these wastewaters. EPA proposes two segments, Carbon and Alloy Steel and Stainless Steel, in this subcategory due to differences in wastewater pollutant characteristics. EPA decided to further divide these segments based on differences in manufacturing operations.

Departing from the structure of the 1982 regulation, EPA proposes the Non-Integrated Steelmaking and Hot Forming Subcategory to simplify the regulatory structure by

grouping the basic steelmaking and hot forming operations performed at non-integrated plants under one subcategory. In addition, the Agency proposes to separate the non-integrated and integrated steelmaking and hot forming operations because of major differences in the flow rates. Non-integrated facilities demonstrate substantially lower wastewater flow rates due to their lower water application rates, use of high-rate water recycle systems, and good water management practices.

6.7 Subcategory F: Steel Finishing

Since extensive co-treatment of steel finishing wastewaters is currently practiced by the industry, the Agency proposes a simplified regulatory structure for steel finishing operations because of the compatibility of wastewaters for treatment. In addition, EPA proposes that the proposed regulation no longer apply to several types of products (e.g., bars, billets, rods, and wire) that are currently regulated by the 1982 regulation. The Agency has determined that finishing operations for these products are more appropriately regulated by the proposed Metal Products and Machinery rule (see Section 1).

Steel finishing operations include salt bath and electrolytic sodium sulfate (ESS) descaling, acid pickling, cold forming, alkaline cleaning, continuous annealing, hot coating, and electroplating at integrated, non-integrated, and stand-alone facilities. EPA divided this subcategory into Carbon and Alloy Steel and Stainless Steel Segments due to variations in wastewater pollutant characteristics and flow rates.

Carbon and Alloy Steel Finishing

After reviewing the industry survey data, the Agency identified nine discrete manufacturing operations for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory:

1. Hydrochloric acid pickling;
2. Sulfuric acid pickling;
3. Acid regeneration;
4. Cold forming;
5. Alkaline cleaning;
6. Continuous annealing;
7. Hot coating;
8. Electroplating; and
9. Wet air pollution control devices.

EPA decided to further subcategorize to the manufacturing process operation level for this subcategory because of differences in wastewater flow rates. These operations are described below.

EPA has defined acid pickling lines as including annealing and other surface cleaning and surface preparation operations located on the same line. The Agency grouped three

acid pickling manufacturing operations in this segment: hydrochloric acid pickling, sulfuric acid pickling, and acid regeneration. Different acid types generate different wastewater flow rates. The following table shows the acid pickling manufacturing operations and the associated product types in the Carbon and Alloy Steel Segment.

Carbon and Alloy Steel Acid Pickling Operations and Product Types

Acid Pickling Operation	Product Type
Hydrochloric Acid Pickling	• Strip, sheet • Bar, billet, rod, coil • Pipe, tube • Plate
Sulfuric Acid Pickling	• Strip, sheet • Bar, billet, rod, coil • Pipe, tube • Plate
Acid Regeneration	• Fume Scrubbers

Cold forming operations in the proposed rule apply to only cold rolling of flat products. Other cold forming operations are to be regulated by the proposed Metal Products and Machinery effluent guidelines limitations and standards. Cold forming operations in this segment include single and multiple rolling stands on a given mill. Furthermore, three methods of rolling solution application are included: direct, recirculation, or combinations of direct and recirculation.

Alkaline cleaning operations in this segment include stand-alone alkaline cleaning lines and continuous annealing/alkaline cleaning lines (i.e., alkaline cleaning lines with continuous annealing located on the same continuous line). The two product types for carbon and alloy steel alkaline cleaning are: 1) strip and sheet; and 2) pipe and tube. Although the wastewater characteristics are similar, different product types generate different wastewater flow rates.

Stand-alone continuous annealing operations in this segment include lines with and without a water quench. Quench water is the only source of wastewater from these lines.

Hot coating operations in this segment include continuous process lines having surface cleaning and surface preparation operations located on the same line. The proposed regulation covers hot coating of flat steel product only (i.e., strip, sheet, and plate).

Electroplating operations in this segment include continuous process lines having surface cleaning and surface preparation operations located on the same line. Electroplating operations include tin/chrome electroplating of strip and sheet, other metal electroplating of strip and sheet, and electroplating of plate. Different operations generate different wastewater flow rates.

Although electroplating at iron and steel facilities is currently regulated by 40 CFR Part 433, Metal Finishing, the Agency has determined that it is appropriate to regulate electroplating of flat products in the proposed regulation because a large number of iron and steel facilities perform these operations. With pretreatment where appropriate, electroplating wastewaters are compatible with wastewaters from other steel finishing operations. Additionally, by covering electroplating in the iron and steel regulation, all operations at iron and steel mills will have production-based limitations. Currently, the electroplating limitations in the Metal Finishing effluent limitation guidelines and standards are concentration-based, requiring permit writers to combine production- and concentration-based limitations when permitting iron and steel facilities with electroplating operations. Therefore, the proposed regulation simplifies the current permitting process for flat product electroplating.

Stainless Steel Finishing

After reviewing the survey data, the Agency identified six discrete manufacturing operations for the Stainless Steel Finishing Segment of the Steel Finishing Subcategory:

1. Acid pickling and other descaling;
2. Acid regeneration;
3. Cold forming;
4. Alkaline cleaning;
5. Continuous annealing; and
6. Wet air pollution control devices.

Differences in wastewater flow rates and process operations were the basis for the divisions in the Stainless Steel Finishing Segment. Certain manufacturing operations have been further divided on the basis of product type to account for wastewater flow rate differences within a given operation. Although the wastewater characteristics are similar among the operations, different operations generate different wastewater flow rates.

After reviewing the industry survey data, the Agency did not identify any stand-alone salt bath or ESS descaling lines. The information in the industry survey responses indicated that salt bath and ESS descaling operations currently take place on stainless steel acid pickling lines. Therefore, salt bath and ESS descaling will be accounted for in stainless steel acid pickling operations. EPA has defined acid pickling operations as including annealing and other surface cleaning and surface preparation operations located on the acid pickling line. The Agency grouped two operations for stainless steel acid pickling: acid pickling and other descaling operations and acid regeneration. The following table shows acid pickling manufacturing operations and their associated product types in the Stainless Steel Segment.

Stainless Steel Acid Pickling Operations and Product Types

Acid Pickling Operation	Product Types
Acid Pickling and Other Descaling	• Strip, sheet • Bar, billet, rod, coil • Pipe, tube • Plate
Acid Regeneration	• Fume Scrubbers

Cold forming operations in the proposed rule apply to only cold rolling of flat products. Other cold forming operations are to be regulated by the proposed Metal Products and Machinery effluent guidelines limitations and standards. Cold forming operations in this segment include single and multiple rolling stands on a given mill. Furthermore, three methods of rolling solution application are included: direct, recirculation, or combinations of direct and recirculation.

Alkaline cleaning operations in this segment include stand-alone alkaline cleaning lines and continuous annealing/alkaline cleaning lines (i.e., alkaline cleaning lines with continuous annealing located on the same continuous line). Operations with different product types generate different wastewater flow rates. The two product types for stainless steel alkaline cleaning are: 1) strip and sheet; and 2) pipe and tube.

Stand-alone continuous annealing operations in this segment include lines with and without a water quench. Quench water is the only source of wastewater from these lines.

6.8 Subcategory G: Other Operations

The Other Operations Subcategory includes the following three segments: direct reduced ironmaking, forging, and briquetting operations. The Agency determined that it is necessary to segment this subcategory on the basis of manufacturing process differences and wastewater flow rate differences. These manufacturing operations are not covered by the 1982 regulation; however, because these manufacturing operations are directly related to iron and steel production and are performed at iron and steel sites, the Agency determined that it is appropriate to regulate them under the proposed regulation.

Table 6-1

1982 Subcategorization

Subcategory		Segment	Manufacturing Process
A	Cokemaking	By-Product	Iron and Steel
			Merchant
		Beehive	---
B	Sintering	---	---
C	Ironmaking	Iron Blast Furnace	---
		Ferromanganese Blast Furnace	---
D	Steelmaking	Basic Oxygen Furnace	Semi-Wet
			Wet-Suppressed Combustion
			Wet-Open Combustion
		Open Hearth Furnace	Wet
		Electric Arc Furnace	Semi-Wet
			Wet
E	Vacuum Degassing	---	---
F	Continuous Casting	---	---
G	Hot Forming	Primary	Carbon and Specialty Mills without Scarfers
			Carbon and Specialty Mills with Scarfers
		Section	Carbon Mills
			Specialty Mills
		Flat	Hot Strip and Sheet Mills
			Carbon Plate Mills
			Specialty Plate Mills
		Pipe and Tube Mills	---

Table 6-1 (Continued)

Subcategory		Segment	Manufacturing Process
H	Salt Bath Descaling	Oxidizing	Sheet, Plate - Batch
			Rod, Wire, Bar - Batch
			Pipe, Tube - Batch
			Continuous
		Reducing	Batch
			Continuous
I	Acid Pickling	Sulfuric Acid	Rod, Wire, Coil
			Bar, Billet, Bloom
			Strip, Sheet, Plate
			Pipe, Tube, Other
			Fume Scrubber
		Hydrochloric Acid	Rod, Wire, Coil
			Strip, Sheet, Plate
			Pipe, Tube, Other
			Fume Scrubber
			Acid Regeneration
		Combination Acid	Rod, Wire, Coil
			Bar, Billet, Bloom
			Strip, Sheet, Plate - Continuous
			Strip, Sheet, Plate - Batch
			Pipe, Tube, Other
			Fume Scrubber

Table 6-1 (Continued)

Subcategory		Segment	Manufacturing Process
J	Cold Forming	Cold Rolling	Recirculation: Single Stand
			Recirculation: Multiple Stand
			Combination
			Direct Application: Single Stand
			Direct Application: Multiple Stand
		Cold Worked Pipe and Tube	Water Solutions
			Oil Solutions
K	Alkaline Cleaning	Batch	---
		Continuous	---
L	Hot Coating	Galvanizing, Terne, and Other Metal Coatings	Strip, Sheet, and Miscellaneous Products
			Wire Products and Fasteners
		Fume Scrubbers	---

Table 6-2

Proposed Subcategorization

Subcategory		Segment	Manufacturing Process
A	Cokemaking	By-Product Recovery	---
		Non-Recovery	---
B	Ironmaking	Sintering	Wet Air Pollution Controls
			Dry Air Pollution Controls
		Blast Furnace	---
C	Integrated Steelmaking	---	Basic Oxygen Furnaces Semi-Wet Wet-Suppressed Combustion Wet-Open Combustion
			Ladle Metallurgy
			Vacuum Degassing
			Continuous Casting
D	Integrated and Stand-Alone Hot Forming	Carbon and Alloy Steel	---
		Stainless Steel	---
E	Non-Integrated Steelmaking and Hot Forming	Carbon and Alloy Steel	Electric Arc Furnaces
			Ladle Metallurgy
			Vacuum Degassing
			Continuous Casting
			Hot Forming
		Stainless Steel	Electric Arc Furnaces
			Ladle Metallurgy
			Vacuum Degassing
			Continuous Casting
			Hot Forming

Table 6-2 (Continued)

Subcategory		Segment	Manufacturing Process
F	Steel Finishing	Carbon and Alloy Steel	Hydrochloric Acid Pickling Strip, Sheet Bar, Billet, Rod, Coil Pipe, Tube Plate
			Sulfuric Acid Pickling Strip, Sheet Bar, Billet, Rod, Coil Pipe, Tube Plate
			Acid Regeneration Fume Scrubbers
			Cold Forming Single Stand - Once Through Single Stand - Recirculation Multiple Stand - Once Through Multiple Stand - Recirculation Multiple Stand - Combination
			Continuous Annealing With Water Quench Without Water Quench
			Alkaline Cleaning Sheet, Strip Pipe, Tube
			Hot Coating Galvanizing, Terne, and Other Metals
			Electroplating Sheet, Strip: Tin, Chromium Sheet, Strip: Zinc, Other Metals Plate
			Wet Air Pollution Control Devices Fume Scrubbers

Table 6-2 (Continued)

Subcategory		Segment	Manufacturing Process
F	Steel Finishing (cont.)	Stainless Steel	Acid Pickling and Other Descaling: Strip, Sheet Bar, Billet, Rod, Coil Pipe, Tube Plate
			Acid Regeneration Fume Scrubbers
			Cold Forming Single Stand - Once Through Single Stand - Recirculation Multi Stand - Once Through Multi Stand - Recirculation Multi Stand - Combination
			Continuous Annealing With Water Quench Without Water Quench
			Alkaline Cleaning Sheet, Strip Pipe, Tube
			Wet Air Pollution Control Devices Fume Scrubbers
G	Other Operations	Direct Iron Reduction	---
		Forging	---
		Briquetting	---

Table 6-3

Subcategory Comparison of the 1982 and Proposed Regulations

<table>
<tr><th>1982 Regulation</th><th colspan="2">Proposed Regulation</th></tr>
<tr><td>A. Cokemaking</td><td colspan="2">A. Cokemaking</td></tr>
<tr><td>B. Sintering</td><td colspan="2" rowspan="2">B. Ironmaking</td></tr>
<tr><td>C. Ironmaking</td></tr>
<tr><td>D. Steelmaking</td><td rowspan="3">C. Integrated Steelmaking</td><td rowspan="3">E. Non-Integrated Steelmaking and Hot Forming</td></tr>
<tr><td>E. Vacuum Degassing</td></tr>
<tr><td>F. Continuous Casting</td></tr>
<tr><td>G. Hot Forming</td><td>D. Integrated and Stand-Alone Hot Forming</td></tr>
<tr><td>H. Salt Bath Descaling</td><td colspan="2" rowspan="5">F. Steel Finishing</td></tr>
<tr><td>I. Acid Pickling</td></tr>
<tr><td>J. Cold Forming</td></tr>
<tr><td>K. Alkaline Cleaning</td></tr>
<tr><td>L. Hot Coating</td></tr>
<tr><td>-----</td><td colspan="2">G. Other Operations</td></tr>
</table>

SECTION 7

WASTEWATER CHARACTERIZATION

This section presents information on manufacturing process wastewater flow rates and the pollutants generated from iron and steel manufacturing operations. All estimates presented in this section are based on industry information collected for the 1997 calendar year. The selected pollutants of concern (POCs) for each subcategory and segment and the selected model treatment system flow rates for each technology option are also presented. Sections 7.1 and 7.2, respectively, discuss the methodologies for selecting POCs and model flow rates. Sections 7.3 through 7.9 present wastewater sources, pollutants of concern, and wastewater flow rates for each of the seven subcategories.

7.1 Identification of Pollutants of Concern

EPA selected POCs for each subcategory to screen for possible regulation and also to use them as the list of pollutants for which to perform the loading reduction calculations and the environmental assessment analysis. From the list of POCs for each subcategory, EPA determined the list of pollutants to regulate. Section 11 describes the selection of regulated pollutants. The Agency took the following approach in identifying POCs.

EPA used analytical data collected during the sampling episodes conducted at 16 iron and steel facilities as the dataset for the screening (see Section 3). EPA analyzed untreated wastewater samples from each manufacturing process characterized to identify pollutants present in wastewaters from each process. For each manufacturing process analyzed, EPA selected POCs using the following detection criteria:

- The pollutant was detected at greater than or equal to 10 times the minimum level (ML) concentration in at least 10 percent of all untreated process wastewater samples; and

- The mean detected concentration in untreated process wastewater samples was greater than the mean detected concentration in the source water samples.

In addition to the criteria outlined above, the Agency made the following considerations:

- EPA considered three pollutants as POCs for all manufacturing processes, independent of the above criteria: total suspended solids (TSS), oil and grease measured as hexane extractable material (HEM), and total petroleum hydrocarbons measured as silica gel treated hexane extractable material (SGT-HEM). These analytes are present to some degree in nearly

all steel industry process wastewater and are important indicators of overall wastewater treatment system performance.

- EPA did not evaluate pH as a candidate POC, since pH is not expressed in terms of quantity or concentration. However, the pH level is an important wastewater characteristic and an important indicator of wastewater treatment system performance in many applications in the steel industry, so EPA is proposing to regulate pH.

- Except where noted, EPA excluded the following pollutants from consideration as POCs for all manufacturing process divisions because they are either dissolved substances or common elements found in wastewater, and because some of them are not treatable: TSS, calcium, chloride, sodium, total sulfide, and sulfate.

Because the Agency generally considers wastewater from manufacturing processes within a segment of a subcategory to be compatible and co-treatable, EPA generated segment-level POC lists to use in subsequent analyses. See Section 6 for a discussion of subcategorization and segmentation. Below is the rationale for determining how each segment-level POC list was developed for each segmented subcategory:

- Cokemaking Subcategory. EPA selected POCs for the By-Product Segment of this subcategory. EPA did not select POCs for the Non-Recovery Segment, as non-recovery cokemaking operations do not generate process wastewater.

- Ironmaking Subcategory. Because the characteristics of wastewater in this subcategory's two segments are somewhat different, EPA selected two lists of POCs for this subcategory, one for the Blast Furnace Segment and one for the Sintering Segment.

- Integrated Steelmaking Subcategory. Because wastewater from each of the three manufacturing processes that generate process wastewater (basic oxygen furnaces, vacuum degassing, and continuous casting) in this subcategory are commonly co-treated, EPA selected POCs for each manufacturing process, and then compiled the list of POCs for the subcategory from those pollutants that were selected as POCs in at least one of the three manufacturing processes.

- Integrated and Stand-Alone Hot Forming Subcategory. Because the characteristics of wastewater from this subcategory are affected by the type of steel processed, EPA selected two lists of POCs for this subcategory, one for the Carbon and Alloy Steel Segment and one for the Stainless Steel Segment.

- Non-Integrated Steelmaking and Hot Forming Subcategory. For the same reason as stated above, EPA selected two lists of POCs for the Carbon and Alloy Steel Segment and the Stainless Steel Segment. Moreover, because wastewater streams from each of the three manufacturing processes that generate process wastewater (vacuum degassing, continuous casting, and hot forming) within each segment are compatible and are commonly co-treated, the list of POCs for each segment comprises those pollutants that were selected as POCs in at least one of the three manufacturing processes.

- Steel Finishing Subcategory. EPA selected two lists of POCs for the Carbon and Alloy Steel Segment and the Stainless Steel Segment. EPA compiled the lists of POCs for the two segments in the same way as for the Non-Integrated Steelmaking and Hot Forming Subcategory.

- Other Operations Subcategory. EPA selected POCs for the Direct Reduced Ironmaking Segment of this subcategory. EPA did not sample forging operations during the sampling program and, therefore, did not select POCs for the Forging Segment. EPA did not select POCs for the Briquetting Segment, as briquetting operations do not discharge process wastewater.

7.2 Calculation of Production-Normalized Flow Rates

EPA's selection of model treatment system flow rates has a large impact on development of the effluent limitations guidelines and standards. This section reviews the Agency's methodology for selecting the process wastewater flow rate for each manufacturing operation that is used in developing the proposed effluent limitations guidelines and standards. These flow rates are expressed as production-normalized flow rates (PNFs) in terms of gallons of water discharged per ton of production (gpt) for all operations except certain wet air pollution control devices associated with steel finishing operations, where the flow rates are expressed in gallons per minute (gpm), since they are independent of production.

Because the Agency considers good water management practices and decreased wastewater discharge volumes to be key components of effective pollution control, it has selected its model discharge flow rates based on the better performing mills within a given subcategory or segment. EPA also considered whether all facilities within any given segment can achieve the selected PNFs. The Agency has concluded that all of the selected model flow rates that are described in the subsequent subsections are both well demonstrated and achievable.

The Agency analyzed industry survey data for each manufacturing unit or process line within the subcategory or segment to determine model treatment system flow rates. EPA used the industry survey data to identify every source of process wastewater generated by a manufacturing operation. With each source of process wastewater identified, the Agency calculated the total process wastewater discharge flow rate for each manufacturing operation.

Table 7-1 provides EPA's estimates for the annual discharge rate by operation and discharge type (direct or indirect) and the number of zero or alternative dischargers for each operation. Most zero or alternative dischargers are non-integrated, stand-alone hot forming, or stand-alone finishing facilities.

To normalize flow rates across the industry and for a range of facility sizes, EPA then calculated PNFs for each manufacturing operation in a given segment. Calculating PNFs for the individual operations allowed EPA to develop a profile of PNFs across a given segment. The Agency analyzed these profiles for trends and similar characteristics to develop a well-demonstrated model flow rate for each segment.

EPA did not include nonprocess wastewater sources in the calculation of PNFs. The largest source of nonprocess wastewater is noncontact cooling water, but other sources include storm water and recovered ground water. Nonprocess wastewaters were not included in the calculation of PNFs because: 1) EPA calculated the amount of wastewater directly generated from manufacturing operations that displayed wastewater characteristics requiring treatment, and 2) nonprocess wastewater differs from process wastewater in that it does not directly contact processed or raw materials as part of the manufacturing operations, and often does not require treatment. EPA recognizes that storm water from iron and steel sites can become contaminated with a variety of pollutants from raw materials and finished products that are stored outdoors, and may require treatment before discharge. However, EPA determined that it was not appropriate to include weather-variable storm water flows in the PNFs.

For those manufacturing operations where high-rate recycle is a principal component of the model treatment technology, the Agency selected PNFs by analyzing recycle system recirculating water rates and blowdown flow rates. EPA selected a model flow rate from the best performing mills exclusive of those systems achieving zero discharge. The Agency justifies this approach because the owner or operator directly controls the volume of the discharge by controlling the process water treatment and recycle system. This is accomplished by managing the amounts of make-up water and storm water entering the system, removing and/or minimizing the potential for nonprocess wastewater entering the system, and by controlling recirculating water chemistry to prevent fouling and scaling, where necessary. EPA also included sufficient costs in the cost models to account for flow rate reductions. To identify the best performing mills, EPA looked at each segment independently to identify discriminating characteristics that influence the amount of wastewater generated and discharged.

For most manufacturing operations where high-rate recycle is not a principal component of the technology options, the Agency chose to use a PNF approximating the median PNF reported by the industry in those subcategories and segments. EPA determined that selecting median flow rates for once-through systems accurately represents well-demonstrated flow rates because 50 percent of the subcategory or segment is able to achieve the model flow rate. However, for a few segments (e.g., carbon and alloy hydrochloric acid pickling - strip and sheet, carbon and alloy sulfuric acid pickling - strip and sheet) where data clearly indicated a well-demonstrated flow rate below the median, the Agency selected a model flow rate less than the

median. For those manufacturing operations where the selected model flow rate is greater than the median, the Agency determined that the costs associated with meeting the median flow rate would preclude certain sites from being able to obtain the model flow rate. EPA looked at each segment independently to identify discriminating characteristics that influence the amount of wastewater generated and discharged. The Agency included sufficient costs in its models to account for flow rate reductions, and, in some cases, transferred flow rates from the 1982 regulation.

The following seven subsections present wastewater sources, pollutants of concern, and wastewater flow rates for each proposed subcategory.

7.3 Cokemaking Subcategory

Sources

The proposed Cokemaking Subcategory covers the by-product and non-recovery cokemaking segments. EPA analyzed industry survey responses for 16 stand-alone coke plants and nine coke plants at integrated mills to develop the model PNF; one stand-alone non-recovery coke plant began operations after 1997 but was still used in the flow rate analysis. Three sites are zero discharge sites: two do not generate process wastewater (non-recovery cokemaking sites) and one disposes of its wastewater by a combination of coke quenching and deep-well injection. The Agency evaluated the 23 sites that generate process wastewater to develop a profile of the wastewater generated at cokemaking facilities.

By-product cokemaking operations generate wastewater from a number of sources. The greatest volume of wastewater generated at by-product sites is waste ammonia liquor, which is the condensed combination of coal moisture and volatile compounds released from the coal during the coking process. Nearly all sites reported other sources of wastewater, including the following:

- Coke oven gas desulfurization;
- Crude light oil recovery;
- Ammonia still operation;
- Final gas coolers;
- National emission standards for hazardous air pollutants (NESHAP) controls for benzene;
- Barometric condensers;
- Coke oven gas condensates;

- Equipment cleaning;
- Excess coke quenching water; and
- Wet air pollution control devices used to control emissions from coal charging and coke pushing.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the analytical and production survey (see Section 3), EPA determined that by-product cokemaking wastewater contains O&G, ammonia-N, cyanides, thiocyanates, phenolics, benzene, toluene, xylene, benzo(a)pyrene, and numerous other volatile organic compounds and polynuclear aromatic compounds. From the sampling data, EPA selected 71 POCs for the By-Product Segment of the Cokemaking Subcategory, presented in Table 7-2. EPA included total Kjeldahl nitrogen (TKN), weak acid dissociable (WAD) cyanide, and thiocyanate as POCs because they are widely present in cokemaking wastewater (each was detected at significant concentrations in all 16 untreated cokemaking wastewater samples collected) and are important indicators of biological treatment effectiveness. However, since no method minimum levels (MLs) were specified at the time of this analysis, they could not be evaluated with the POC selection criteria. Even though nitrate/nitrite failed the screening criteria, EPA selected it as a POC because of its importance as an indicator of biological treatment effectiveness.

Wastewater Flow Rates

After identifying the wastewater sources identified by the industry survey respondents, the Agency determined representative flow rates for each of the sources. The total model flow rate for by-product cokemaking was the sum of each of these sources. The waste ammonia liquor, crude light oil recovery, final gas cooler condensate, barometric condenser blowdown, and control water PNFs are unchanged from the model PNFs in the 1982 regulation. Review of the industry survey data determined that the current flow rates are still applicable and achievable. EPA did not consider a flow allowance for coke oven gas condensates when developing the model PNF for the 1982 regulation. However, in the industry survey, 14 sites reported collecting and treating coke oven gas condensates; reported flow rates ranged from less than 1 gpt to approximately 4 gpt. Therefore, the Agency determined that a flow allowance of 3 gpt was appropriate for coke oven gas condensates. EPA decreased the flow allowance for ammonia still steam from 13 gpt in the 1982 regulation to 10 gpt in the proposed regulation, because six of the 11 sites that reported a flow rate for ammonia still steam indicated flow rates below 10 gpt.

EPA proposed that the miscellaneous flow rate be increased from 20 gpt in the 1982 regulation to 25 gpt. This increase accounts for additional wastewater treated at coke plant treatment systems, primarily collected storm water and other miscellaneous waters collected from the site. Many sites have improved their collection of miscellaneous waters since the

promulgation of the 1982 regulation. The Agency believes that collecting and treating these waters prior to discharge is a good operating practice and thus proposes an increased flow allowance for these miscellaneous wastewaters.

Excess coke quenching water is another potential source of wastewater reported in the industry surveys. Water used for coke quenching is typically plant service water or treated coke plant wastewater. The Agency does not advocate the practice of coke quenching with untreated wastewater because of the potential for air pollution and ground water contamination associated with this practice. To the Agency's knowledge, coke quenching with untreated process wastewaters is no longer practiced at any of the coke plants that responded to the industry survey. Standard industry practice is to recycle coke quenching water to extinction; therefore, the Agency did not give an allowance for excess coke quenching water. Similarly, it is also standard industry practice to dispose of wastewater from wet air pollution control (WAPC) systems from coke pushing by coke quenching. The Agency supports this practice because this type of WAPC wastewater does not contain volatile pollutants found in waste ammonia liquor and other untreated wastewaters. Because coke quenching has been designated as a zero discharge operation, EPA gave no additional flow allowance for WAPC wastewater from coke pushing.

EPA also proposes supplemental allowances for those sites that operate wet coke oven gas desulfurization systems or NESHAP control systems that generate process wastewater. Since these operations are not practiced by a large percentage of the industry, the Agency found it inappropriate to use these operations to develop the model by-product cokemaking PNF. However, the Agency does realize that these operations generate process wastewater and has developed additional allowances for those sites that operate wet desulfurization systems or NESHAP control systems. An additional 15 gpt would be allowed for wet desulfurization, while an additional 10 gpt would be allowed for NESHAP controls. Approximately 50 percent of the sites reporting these wastewater sources achieve both of these flow rates; therefore, the Agency has determined that these flow rates are well demonstrated and appropriate for the industry. The proposed regulation also contains provisions that would allow National Pollutant Discharge Elimination System (NPDES) and pretreatment permitting authorities to develop, on a site-specific basis, supplemental mass effluent limitations and standards for wastewater resulting from coke plant ground water remediation systems and air pollution control systems not considered in the proposed rulemaking.

EPA determined that biological wastewater treatment systems used to treat cokemaking wastewaters often use control water for toxicity control. To determine an appropriate flow rate, EPA analyzed control water flow rates from the industry survey and the 1982 development document (Reference 7-1). After comparing these data, the Agency determined that the 50-gpt flow allowance from the 1982 development document was still appropriate because of the number of sites currently using that approximate volume of control water to effectively operate their treatment system. Moreover, one coke plant demonstrating best available technology economically achievable (BAT) treatment is using control water at a rate of approximately 50 gpt to achieve its treatment effectiveness.

The following table presents the model PNFs for each source and the overall by-product cokemaking model PNF.

By-Product Cokemaking Wastewater Flow Rates

Wastewater Source	PNF (gpt)
Waste ammonia liquor	32
Crude light oil recovery	25
Final gas cooler condensate	10
Coke oven gas condensate	3
Barometric condenser blowdown	3
Steam and caustic solution from ammonia still	10
Miscellaneous[a]	25
Total base flow	**108**
Control water (dilution water added to control toxicity prior to biological treatment)	50
Total base flow with control water	**158**

[a]Miscellaneous sources include such flows as equipment cleaning water, storm water, and other wastewater collected and treated from cokemaking or by-product recovery operations.

EPA determined that the selected cokemaking model flow rate is well demonstrated because each of the sites identified as operating a BAT treatment system is able to achieve the model flow rate. The Agency considers these sites to be the best performing in the subcategory and has concluded that the flow rates that they are achieving are obtainable for every site.

Non-recovery cokemaking has been designated as a zero discharge operation because it does not generate process wastewater other than boiler blowdown and process area storm water, which are disposed of by coke quenching.

7.4 Ironmaking Subcategory

Separate discussions are provided below for the Sintering and Blast Furnace Ironmaking Segments of the Ironmaking Subcategory.

7.4.1 Sintering

Sources

The Agency analyzed data from nine sites that provided industry survey information for sintering operations. Sinter plants generate wastewater from air pollution control systems designed to control emissions from the sinter strand wind box and material processing. Seven sites indicated that they used WAPC systems to control air emissions from the sintering process, while two sites used dry air pollution control (DAPC) systems. EPA analyzed wastewater flow rate data for the six sinter plants that provided data for WAPC systems in 1997 (one site operating a WAPC reported being inactive in 1996 and 1997). Currently, only four plants operate a WAPC system (see Section 6). All of the plants operated WAPC systems that recycle wastewater as part of the treatment system; blowdown from the recycle systems is the primary source of wastewater from sintering operations. All of the sinter plants generating process wastewater reported using wet scrubbers to control wind box emissions, and some sites also reported using scrubbers to control emissions at the discharge end of the sinter strand.

Facilities identified other sources of sintering wastewater in the industry surveys, including sinter cooling water, belt sprays, and equipment cleaning water. However, respondents did not provide flow rate data for these sources. The Agency believes the wastewaters would be discharged with the WAPC flow and would not have a significant impact on the model PNF.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that sintering wastewater contains the following principal pollutants: TSS, O&G, ammonia-N, cyanide, phenolic compounds, and metals (principally lead and zinc). EPA also found that sintering wastewater contains polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDDs and PCDFs, or dioxins and furans).

EPA selected 65 POCs for the Sintering Segment of the Ironmaking Subcategory, presented in Table 7-3. EPA selected TKN, WAD cyanide, and thiocyanate as POCs because they are widely present in sintering wastewater (each was detected in all 10 untreated sintering wastewater samples collected). However, since no method MLs were specified at the time of this analysis, these pollutants could not be evaluated with the POC selection criteria.

Wastewater Flow Rates

The Agency based its selection of the model PNF on WAPC systems that operated with greater than 95 percent wastewater recycle. The Agency considers plants with this recycle rate representative of the best plants in this segment. Two sites reported operating their WAPC systems at this selected recycle rate and were achieving discharge rates of 0 gpt and 73 gpt, respectively. Using the data from these sites, the Agency selected a model sintering PNF of 75 gpt.

The Agency determined that a 75-gpt model flow rate, coupled with a 95 percent recycle rate, is appropriate for the BAT model treatment systems, because it represents the best demonstrated sintering wastewater treatment system flow rate. The two sites used to develop the model flow rate are representative of other sinter operations in that they include wastewaters from the wind box and other sources. These sites are typical of sinter plants operating WAPC systems, are located in different regions of the country, and are owned by different companies. Furthermore, EPA determined that this model flow rate is achievable by sinter plants that treat sintering wastewaters in a dedicated treatment system or a combined treatment system, as the model sites represent each of these treatment options. EPA also determined that sites not achieving the model PNF will be able to achieve the model flow rate by increasing their wastewater recycle to the selected recycle rate.

The Agency found that sinter plants with dry air pollution controls discharge no process wastewater. Therefore, the Agency has designated sinter plants with dry air pollution controls as zero discharging operations.

7.4.2 Blast Furnace Ironmaking Segment

Sources

Twenty integrated mills indicated in their industry survey responses that they conducted blast furnace ironmaking, with 40 blast furnaces active in 1997. Wastewater from blast furnace ironmaking is primarily generated from wet gas cleaning and cooling systems designed to clean and cool the furnace off-gas prior to its use as a fuel in the blast furnace stoves. The gas cleaning systems use high-energy scrubbers and gas coolers that use water to treat the gas. The blowdown from the gas cleaning systems is the largest source of wastewater from blast furnace ironmaking. Blast furnace gas seals, blast furnace drip legs, equipment cleaning water, and excess slag quenching water comprise the other, relatively minor sources of process wastewater.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from blast furnaces are TSS, ammonia-N, cyanides, phenolic compounds, and metals (copper, lead, and zinc).

EPA selected 27 POCs for the Blast Furnace Segment of the Ironmaking Subcategory, presented in Table 7-4. EPA selected TKN, WAD cyanide, and thiocyanate as POCs because they are widely present in blast furnace wastewater (each was detected in at least 60 percent of the untreated blast furnace wastewater samples collected). However, since no method MLs were specified at the time of this analysis, these pollutants could not be evaluated with the POC selection criteria.

Wastewater Flow Rates

To analyze the wastewater discharge rates from blast furnace ironmaking, the Agency evaluated each of the wastewater treatment systems in operation. Depending on the site, these systems could potentially treat wastewater from one blast furnace or several blast furnaces. EPA calculated PNFs for each wastewater treatment system identified (24 systems were identified across the industry); therefore, a single site could have multiple PNFs.

Six water systems are achieving zero discharge and four water systems are achieving reduced discharge of blast furnace wastewater by using all or a portion of gas cleaning blowdown for slag quenching. One additional site achieves zero discharge by discharging gas cleaning blowdown to one unlined and one synthetically lined pond where the wastewater infiltrates and evaporates. The Agency does not advocate the practice of using untreated gas cleaning blowdown for slag quenching in unlined slag pits because of ground water contamination and the potential for air pollution associated with this practice. Therefore, the Agency has not selected zero discharge as its model PNF for this segment.

Because slag quenching and infiltration are not endorsed methods of wastewater disposal, EPA used the total amount of wastewater generated from blast furnace operations to develop PNFs. Consequently, EPA used the total gas cleaning blowdown rate from each site, even if it was used for slag quenching, to calculate the PNFs. With this in mind, the Agency evaluated the wastewater recycle at each of the gas cleaning systems. All but two systems recycle gas cleaning wastewater.

EPA based the selection of a blast furnace model flow rate on a recycle rate of 98 percent. Analysis of the data the Agency considers representative of the best plants in this segment showed eight systems recycling 98 percent or more of process wastewater. Each of these systems achieved a discharge rate of 25 gpt or less. The flow rate data for these systems are shown below.

Water System	Number of Furnaces	PNF (gpt)
A	3	4
B	3	6
C	1	6
D	2	10
E	2	17
F	2	23
G	2	24
H	2	25

The Agency determined that these sites were representative of this segment because they include furnaces of various production capacities, are located in different geographic

locations, and are owned by different companies. Additionally, these sites demonstrate that water systems with a single or multiple blast furnaces can achieve the selected model flow rate. EPA also has concluded that operating blast furnace wastewater treatment system with a 98 percent recycle rate is representative of BAT treatment.

7.5 Integrated Steelmaking Subcategory

The Agency did not find any reason to further segment the Integrated Steelmaking Subcategory. However, EPA identified several manufacturing process divisions within the subcategory. This subsection provides separate discussions for basic oxygen furnace (BOF) steelmaking, ladle metallurgy, vacuum degassing, and continuous casting.

7.5.1 Basic Oxygen Furnace (BOF) Steelmaking

Sources

Twenty integrated sites and one non-integrated site indicated in their survey responses that they conducted BOF steelmaking operations; 24 BOF shops were identified as active in 1997. The primary source of wastewater from BOF steelmaking is air pollution control systems designed to treat furnace off-gases prior to release into the atmosphere. Each active BOF shop uses one of three types of WAPC systems: semi-wet, wet-open combustion, or wet-suppressed combustion. These WAPC systems operate differently. Semi-wet systems apply water to the furnace off-gases to condition the off-gases prior to treatment in an electrostatic precipitator (ESP). A wet-suppressed system is a high-energy wet scrubbing system that limits excess air entering the furnace mouth, minimizing carbon monoxide combustion and thus minimizing the volume of gas requiring treatment. A wet-open system is a gas cleaning system that admits excess air to allow the combustion of carbon monoxide prior to high-energy scrubbing. EPA separated and analyzed the flow rate data for BOF steelmaking based on the type of WAPC system used at the BOF shop because of differences in water application rates, discharge rates, and industry-demonstrated recycle rates. Other wastewater sources include slag quenching water, hood cooling water losses, cooling tower blowdown, and equipment cleaning water.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from BOFs are TSS and metals (lead and zinc). EPA selected 28 POCs for BOF steelmaking, presented in Table 7-5.

Wastewater Flow Rates

During the analysis, EPA identified eight BOF shops operating semi-wet air pollution control systems. Two sites reported zero discharge of process wastewater, while one site reported a discharge of 1 gpt. One other site reported a discharge of less than 10 gpt. Sites achieve zero or relatively low discharges from their semi-wet systems by balancing the applied water with water that evaporates in the conditioning process. Although the 1982 regulation designates semi-wet air pollution control as zero discharge, currently not all of the sites are able to achieve this discharge status because of safety considerations. Some sites operate their semi-wet systems with excess water, which is subsequently discharged, to flush the air pollution control ductwork and prevent the buildup of debris within the ductwork. If this wet debris accumulates, it has the potential to fall back into the BOF, causing explosions and process upsets. The Agency recognizes the benefit of using excess water in these systems and has selected a semi-wet air pollution control model PNF of 10 gpt. The Agency justifies the increased allowance in this case because of the safety and manufacturing considerations impacted by the operation of the air pollution control system. The Agency determined that all sites can achieve this proposed model flow rate.

EPA also identified seven BOF shops operating wet-suppressed combustion air pollution control systems. All of the shops operate their treatment systems with wastewater recycle. The Agency based the model flow rate selection on those BOF shops that operate recycle systems with 97.5 percent recycle or more; EPA considers these shops to be the best performing for this manufacturing operation. After analyzing the data from these shops, the Agency selected a wet-suppressed combustion air pollution control model PNF of 20 gpt. Three shops operating with this recycle rate report flow rates below or slightly above the selected model flow rate. Two shops reported discharge rates of 17 gpt and 22 gpt; one shop achieved a discharge rate of 14 gpt by using carbon dioxide injection in the high-rate recycle system. Carbon dioxide injection allows carbonates to precipitate in the treatment system clarifiers (in effect water softening), thus minimizing the need for blowdown from the system. The BOF shops used to select the model flow rate are typical of all wet-suppressed shops: they generate wastewater from the WAPC system and other miscellaneous sources, they are located in different geographic regions, and they are owned by different companies. EPA determined that shops operating with 97.5 percent recycle and 20-gpt flow rates are representative of BAT operations. The model flow rate is also consistent with the proposed model treatment for wet-suppressed air pollution control systems that utilizes carbon dioxide injection as part of the treatment process.

EPA identified eight BOF shops operating wet-open combustion air pollution control systems. All of the shops operate their treatment systems with wastewater recycle. One shop is able to achieve zero discharge of process wastewater by using carbon dioxide injection, which eliminates the need for system blowdown. As with wet-suppressed systems, the Agency has selected a model PNF of 20 gpt for wet-open combustion air pollution control, based on the use of carbon dioxide injection. The Agency concluded that all sites with proper wastewater recycle and carbon dioxide injection can achieve the proposed model flow. EPA determined that the one wet-open shop currently achieving the model flow rate is representative of all of the wet-

open shops in the United States for the same reasons provided above for wet-suppressed shops. The only difference between this shop and the others is its use of carbon dioxide in the treatment system. Furthermore, the Agency did not propose zero discharge of process wastewaters for wet-open systems because the cost was prohibitive, and EPA did not conclude that zero flow could be achieved by all wet-open combustion sites.

7.5.2 Ladle Metallurgy

The Agency found that, other than for vacuum degassing, no process wastewater is generated or discharged in ladle metallurgy operations. Therefore, the Agency has designated ladle metallurgy as a zero discharge operation.

7.5.3 Vacuum Degassing

Sources

Thirteen integrated sites indicated in their industry survey responses that they conducted vacuum degassing operations in 1997. Wastewater is generated in vacuum degassing operations from vacuum systems (e.g., barometric condensers, steam ejectors) that are used to refine the molten steel. These systems use water to create the vacuum necessary to draw the molten steel from the ladle to remove the impurities; the water becomes contaminated with dissolved off-gases from the steel. No other sources of wastewater were reported.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from vacuum degassing are TSS and metals (lead and zinc), which volatilize from the steel. EPA selected 15 POCs for vacuum degassing, presented in Table 7-5.

Wastewater Flow Rates

EPA calculated PNFs for 12 integrated sites that provided flow rate information. All of the sites operate wastewater treatment systems with wastewater recycle. After analyzing the data, the Agency based the selection of a model flow rate on recycle systems with 99 percent recycle or greater and selected a model vacuum degassing PNF of 15 gpt. EPA considers sites operating with this recycle rate to be the best performing for this manufacturing operation. Four sites operating with the selected recycle rate reported flow rates less than 15 gpt. The Agency concludes that the selected flow rate is well demonstrated because the better performing sites in the segment are able to achieve it and is achievable by those sites currently discharging at a rate greater than the model PNF.

7.5.4 Continuous Casting

Sources

Twenty integrated sites indicated in their industry survey responses that they conducted continuous casting operations; EPA identified 30 continuous casters at integrated mills that were active in 1997. The largest amount of wastewater is generated in continuous casting from the contact spray cooling of the steel product as it passes through the molds and from flume flushing for the removal of scale. The only other source of process wastewater identified in industry survey responses was equipment cleaning water.

The Agency did not include nonprocess wastewater sources in determining the model PNF, as discussed in Section 7.2. Nonprocess wastewater sources often treated with process wastewater include low-volume losses from closed caster mold and machine cooling water systems.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from continuous casting are TSS, O&G, and low levels of particulate metals. EPA selected 13 POCs for continuous casting, presented in Table 7-5. Although EPA found lead at relatively low concentrations in sampled continuous casting wastewater, the Agency considers lead a POC for this operation because industry-supplied effluent data indicate that lead was detected in 129 of the 262 samples (49 percent) from integrated continuous casting operations.

Wastewater Flow Rates

During the analysis, the Agency identified that six of the 20 sites operate combined wastewater treatment and/or recycle systems for vacuum degassing, continuous casting, and/or hot forming operations. The common characteristics of the process wastewater from each of these operations allows the sites to commingle and treat the wastewater simultaneously. When determining the PNF for a particular manufacturing operation that shares a combined treatment and/or recycle system with one or more other manufacturing operations, the Agency developed a PNF based on the percentage of wastewater entering the treatment and/or recycle system from each operation.

EPA calculated PNFs for 29 casters for which flow rate data were provided. The Agency selected the model flow rate based on six continuous casters operating with 97 percent recycle or greater; EPA considers these casters to be the best performing for this manufacturing operation. Based on the performance of these casters, EPA selected a model PNF of 20 gpt for continuous casting at integrated sites. The flow rate data for these casters are provided below.

Continuous Caster	Recycle Rate (%)	PNF (gpt)
A	98.7	14
B	99.2	14
C	97.2	17
D	97.5	20
E	98.1	20
F	98.3	20

EPA concluded that these continuous casters are typical of all the casters in the United States because they all generate wastewater from contact cooling and flume flushing, they are located in different geographic regions, and they are owned by different companies.

7.6 Integrated and Stand-Alone Hot Forming Subcategory

Sources

Fifty-seven integrated and stand-alone sites indicated in their industry survey responses that they conducted hot forming operations; EPA identified 71 hot forming operations at integrated and stand-alone mills that were active in 1997. The Agency was unable to analyze data from three processes due to incomplete industry survey responses.

The Agency identified spray water, used for cooling and descaling of the steel during the hot forming process, as the primary wastewater source. For the purposes of this subcategory, EPA uses spray water as a generic term because there are many different sources of spray water within a hot forming mill. Spray water includes the following: high-pressure descaling sprays, roll and/or roll table spray cooling, die spray cooling, scarfer emissions control, hot shear spray cooling, flume flushing, low-pressure/laminar flow cooling, and product cooling on runout tables. Other sources of wastewater included in the development of the model PNFs were roll shop wastewater, wastewater collected in basement sumps, scarfer water, and equipment cleaning water.

The Agency did not include nonprocess wastewater sources in determining the model PNF, as discussed in Section 7.2. Nonprocess wastewater from hot forming operations often treated with process wastewater includes noncontact cooling water from reheat furnaces.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from carbon steel integrated and stand-alone hot forming facilities are TSS, O&G, and particulate metals. EPA

selected 11 POCs for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory, presented in Table 7-6. Although EPA found lead at relatively low concentrations in sampled hot forming wastewater, the Agency considers lead a POC for this segment because industry-supplied effluent data indicate that lead was detected in 246 of the 331 samples (74 percent) from integrated and stand-alone hot forming operations.

Based on an analysis of industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from stainless steel integrated and stand-alone hot forming facilities are TSS, O&G, and low levels of particulate metals. EPA did not sample any stainless steel integrated or stand-alone hot forming facilities. However, EPA did sample stainless steel non-integrated hot forming operations. Therefore, EPA chose the same POCs selected for the hot forming manufacturing operation of the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory, since the hot forming processes performed and type of steel formed are identical. Fifteen POCs were selected for each of these manufacturing operations, presented in Table 7-7.

Wastewater Flow Rates

During the analysis, the Agency determined that 12 of the 57 sites operate combined wastewater treatment and/or recycle systems for their hot forming operations. When determining the PNF for a particular manufacturing operation that shares a combined treatment and/or recycle system with one or more other manufacturing operations, the Agency developed a PNF based on the percentage of wastewater entering the treatment and/or recycle system from each operation.

EPA selected the model flow rate based on wastewater treatment systems operating with 96 percent recycle. The Agency determined that systems operating with this level of recycle were the best performing mills in the subcategory. EPA selected 100 gpt as the model PNF for integrated and stand-alone hot forming. Twenty-one of the 68 operations reported PNFs less than or equal to 100 gpt, including seven operations that reported zero discharge. All of the operations currently meeting the model PNF operate high-rate recycle systems with recycle rates of at least 95 percent. The mills used to develop the model flow rate are representative of integrated and stand-alone hot forming mills across the industry: they generate wastewater from a variety of sources, including contact water, rolls shops, and basement sumps; they hot form a range of products (e.g., strip, plate, pipe, tube, bar); and they are located in different geographic locations. For those operations with recycle systems that are not achieving the model flow rate, the Agency included sufficient costs to upgrade all of the systems to achieve this rate. For those operations with once-through treatment systems, the Agency included sufficient costs to install and operate high-rate recycle systems that would be able to achieve the model flow rate.

The Agency did not select zero discharge as the model PNF for integrated and stand-alone hot forming sites due to the costs. The Agency determined that the capital costs

involved with retrofitting existing recycle systems to operate at a 100 percent recycle rate would be cost-prohibitive.

7.7 Non-Integrated Steelmaking and Hot Forming Subcategory

The Agency designated Carbon and Alloy Steel and Stainless Steel Segments for the Non-Integrated Steelmaking and Hot Forming Subcategory because of differences in pollutants present in the wastewater. However, EPA also identified several manufacturing process divisions for both segments. Below are separate discussions for electric arc furnace (EAF) steelmaking, ladle metallurgy, vacuum degassing, continuous casting, and hot forming.

7.7.1 Electric Arc Furnace (EAF) Steelmaking

The Agency evaluated data from 69 facilities that indicated in their industry survey response that they performed non-integrated steelmaking. The analysis included a total of 76 EAF shops and 132 EAFs. All EAFs in the United States are equipped with dry or semi-wet air pollution controls, and none discharge process wastewater. One EAF shop has a wet scrubber system that functions as a backup. Accordingly, the Agency is proposing to designate all EAFs as zero discharge operations.

7.7.2 Ladle Metallurgy

The Agency found that no ladle metallurgy operations other than vacuum degassing generate or discharge process wastewater. Therefore, the Agency has designated ladle metallurgy as a zero discharge operation.

7.7.3 Vacuum Degassing

Sources

The Agency evaluated data from the 22 non-integrated sites that indicated in their industry survey response that they performed vacuum degassing. Because some plants operate more than one vacuum degassing operation, the total number of processes evaluated was 30. The Agency was unable to analyze data from five operations due to incomplete survey responses.

The primary source of wastewater from vacuum degassing operations is blowdown from the vacuum system. Other sources of wastewater reported include boiler blowdown and WAPC wastewater.

Pollutants of Concern

From industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants for vacuum degassing operations are TSS and metals. EPA did not perform a POC analysis for this segment because the Agency did not sample non-

integrated vacuum degassing operations during its sampling program. However, based on process chemistry and the steel material processed, EPA determined that it is unlikely that wastewater associated with this operation would contain pollutants not already selected as POCs in the other manufacturing processes in the Non-Integrated Steelmaking and Hot Forming Subcategory.

Wastewater Flow Rates

During the analysis, the Agency determined that 15 of the 22 sites operate recycle systems for their vacuum degassing operations. Seven of the 15 sites operate combined wastewater treatment and/or recycle systems. When determining the PNF for a particular vacuum degassing operation whose wastewater treatment and/or recycle system is combined with others systems within the plant, the Agency developed a vacuum degassing PNF based on the relative percentage of process wastewater conveyed to the treatment or recycle system from vacuum degassing operations. EPA assigned vacuum degassing operations that discharge process wastewater to evaporation ponds a PNF of zero. The Agency designated sites that attained zero discharge by using process wastewater as makeup water for other processes zero dischargers, but used the volume of blowdown water from the these operations in determining the model flow rate.

EPA selected 10 gpt as the model PNF for non-integrated vacuum degassing operations. Ten of the 30 vacuum degassing operations reported PNFs equal to or less than 10 gpt, including two operations that reported zero discharge. Of the 10 operations currently operating with a PNF of less than or equal to 10, five have once-through systems, while five have recycle systems. All of the recycle systems currently achieving the model PNF have recycle rates of at least 99.5 percent. The Agency concluded that 10 gpt is a flow rate that well-operated high-rate recycle vacuum degassing systems can achieve.

The Agency did not select zero discharge as the model PNF for non-integrated vacuum degassing operations because of the feasibility of achieving zero discharge on an industry-wide basis. Three of five operations report attaining zero discharge through either evaporation or discharge to another process. The Agency concluded natural evaporation or discharge to another process are not viable treatment options at all facilities. The Agency also does not feel that contract hauling of wastewater from non-integrated operations is a cost-effective option, due to the potentially large volumes of wastewater generated by these operations. Finally, the Agency does not believe it is feasible for all existing non-integrated mills to manage process area storm water such that they can continuously achieve zero discharge.

7.7.4 Continuous Casting

Sources

The Agency analyzed data from the 59 non-integrated sites that indicated in their industry survey responses that they performed continuous casting operations. Because some sites

operate more than one caster, the total number of operations analyzed was 76. The Agency was unable to analyze data from one continuous casting operation due to an incomplete industry survey response.

During the analysis, the Agency identified spray water, used to cool and descale the steel during the casting process, as the primary wastewater source from casting operations. The only other source of process wastewater identified in industry survey responses and included in the development of the model PNF was equipment cleaning water.

The Agency did not include nonprocess wastewater sources in determining the model PNF, as discussed in Section 7.2. Nonprocess wastewater sources treated with process wastewater include low volume losses from closed caster mold and machine cooling water systems.

Pollutants of Concern

From an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants in continuous casting wastewater are TSS, metals, and O&G. EPA selected eight POCs for the Carbon and Alloy Steel Continuous Casting segment of the Non-Integrated Steelmaking and Hot Forming Subcategory, presented in Table 7-8. EPA also selected 21 POCs for the Stainless Steel Continuous Casting segment of the Non-Integrated Steelmaking and Hot Forming Subcategory, presented in Table 7-9. EPA selected lead and zinc as POCs for continuous casting operations for both segments because both pollutants are regulated under the 1982 regulation (no distinction was made between steel type in the 1982 regulation), and data collected in support of the 1982 regulation indicated that these pollutants were present in wastewater discharged from continuous casting operations. Although EPA did not detect lead, and only detected zinc at relatively low concentrations, in the limited sampling data collected from continuous casting wastewater, the Agency considers lead and zinc POCs for the following reason: industry-supplied data indicate that, in effluent samples submitted from carbon and alloy steel non-integrated continuous casting operations, lead was detected in 65 of the 70 samples (93 percent) and zinc was detected in 69 of the 70 samples (99 percent), and, in samples submitted from stainless steel operations, lead was detected in 12 of the 15 samples (80 percent) and zinc was detected in 14 of the 15 samples (93 percent).

Wastewater Flow Rates

During the analysis, the Agency determined that 22 sites operate combined wastewater treatment and/or recycle systems for vacuum degassing, continuous casting, and/or hot forming operations. The common characteristics of the process wastewater from these three operations allows facilities to commingle and treat these wastewaters simultaneously. When determining the PNF for a particular operation associated with a combined treatment and/or recycle system, the Agency developed a PNF based on the percentage of wastewater entering the treatment and/or recycle system from each operation.

EPA selected 10 gpt as the model PNF for non-integrated continuous casting. Twenty-eight of the 76 non-integrated continuous casting operations reported PNFs equal to or less than 10 gpt. The Agency identified 16 caster water systems that operated without wastewater discharge. An additional nine sites discharged from their caster water system, but used the discharge as makeup water for other processes. EPA designated sites that reported having no process wastewater discharge from their entire site as having no discharge from their continuous caster(s). EPA considers 10 gpt to be well demonstrated not only because the better performing non-integrated continuous casters are demonstrating this flow rate, but also because of the large percentage (37 percent) of the total casters achieving this flow rate.

The Agency did not select zero discharge as the model PNF for non-integrated continuous casting operations for the same reasons cited in Section 7.3.3 for vacuum degassing.

7.7.5 Hot Forming

Sources

The Agency analyzed data from the 64 non-integrated sites that indicated in their industry survey response that they performed hot forming. Because some plants operate more than one hot forming operation, the total number of operations analyzed was 96. The Agency was unable to analyze data from two operations due to incomplete survey responses.

During the analysis, the Agency identified spray water used to cool and descale the steel during the hot forming process as the primary source of wastewater. For the purposes of this manufacturing operation, spray water is a generic term that includes many different sources of spray water within a hot forming mill. Spray water includes the following: high-pressure descaling sprays, roll and/or roll table spray cooling, die spray cooling, scarfer emissions control, hot shear spray cooling, flume flushing, low-pressure/laminar flow cooling, and product cooling on runout tables. Other sources of wastewater included in the development of the model PNFs were blowdown from roll shop wastewater, wastewater collected in basement sumps, scarfer water, and equipment cleaning and wash down water.

The Agency did not include nonprocess wastewater sources in determining the model PNF, as discussed in Section 7.2. Nonprocess wastewater from hot forming operations that is treated with process wastewater includes noncontact cooling water from reheat furnaces, which is sometimes included in the process water recycle loop or recycled separately with a blowdown to the process water loop.

Pollutants of Concern

From an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants for hot forming mills are TSS, metals, and O&G. EPA selected eight POCs for carbon and alloy steel hot forming operations in the Non-Integrated Steelmaking and Hot Forming Subcategory, presented in Table

7-8. The Agency considers lead and zinc POCs because, even though EPA did not detect lead and detected zinc at relatively low concentrations in the limited sampling data, industry-supplied effluent data indicate that lead was detected in 17 of the 23 samples (74 percent) and zinc was detected in 22 of the 23 samples (96 percent) from carbon and steel non-integrated hot forming operations. EPA selected 15 POCs for stainless steel hot forming operations in the Non-Integrated Steelmaking and Hot Forming Subcategory, presented in Table 7-9.

Wastewater Flow Rates

During the analysis, the Agency identified 41 sites that operate combined wastewater treatment and/or recycle systems for vacuum degassing, continuous casting, and/or hot forming operations. The common characteristics of the process wastewater from these three operations allows facilities to commingle and treat the wastewater simultaneously. When determining the PNF for a particular hot forming operation associated with a combined treatment and/or recycle system, the Agency developed a PNF based on the percentage of wastewater entering the treatment and/or recycle system from the hot forming operation.

EPA selected 50 gpt as the model PNF for non-integrated hot forming mills. Forty-two of the 94 non-integrated hot forming operations reported PNFs equal to or less than 50 gpt. During the analysis, the Agency identified eight operations that operate without discharging wastewater. An additional 16 sites listed discharges from their hot forming water system, but used the discharge as makeup water for other processes or allowed the excess wastewater to evaporate. EPA used the volume of blowdown water from the these hot forming operations in determining the model flow rate. EPA designated sites that reported no process wastewater discharge from their entire site as having no discharge from their hot forming mill(s). EPA considers 50 gpt to be well demonstrated not only because the better performing non-integrated hot forming mills are demonstrating this flow rate, but also because of the large percentage (45 percent) of the total hot forming mills achieving this flow rate.

The Agency did not select zero discharge as the model PNF for non-integrated hot forming mills for the same reasons cited in Section 7.7.3 for vacuum degassing.

7.8 Steel Finishing Subcategory

The Agency established the Carbon and Alloy Steel and Stainless Steel Segments for the Steel Finishing Subcategory because of differences in pollutants present in the wastewater. EPA also identified several manufacturing process divisions between the segments. Below are separate discussions for acid pickling, cold forming, alkaline cleaning, stand-alone continuous annealing, hot coating, and electroplating.

7.8.1 Acid Pickling

Sources

The Agency analyzed data from the 61 sites (integrated, non-integrated, and stand-alone) that indicated in their industry survey responses that they performed acid pickling. Because some plants operate more than one acid pickling line, the number of process lines analyzed was 130. The Agency was unable to analyze data from three lines due to incomplete industry survey responses.

For the proposed rulemaking, EPA defined acid pickling lines to include alkaline cleaning and salt bath and electrolytic sodium sulfate (ESS) descaling operations that occur on the line that includes acid pickling. In a small number of instances, continuous annealing operations with an associated water quench take place on acid pickling lines. In these instances, EPA included discharge from the annealing rinse as a wastewater source from acid pickling lines. The Agency also evaluated acid regeneration operations to determine the volume of wastewater generated and discharged during these operations.

During the analysis, the Agency identified three major sources of wastewater from acid pickling lines. The first is rinse water used to clean the acid solution from the steel. Rinse water comprises the largest volume of wastewater from acid pickling lines to wastewater treatment operations. The second is spent pickle liquor, a solution composed primarily of acid that is no longer an effective pickling agent. The third major source of wastewater is generated by the WAPC devices located above the pickling tanks. Other minor sources of wastewater included in the development of model PNFs were process wastewater from other operations (e.g., salt bath descaling) on the acid pickling lines (spent process baths and rinses); raw material handling, preparation, and storage; tank clean-outs; and equipment cleaning water. Except for blowdown from surface cleaning tanks, these wastewater sources are noncontinuous sources of wastewater that minimally contribute to the total wastewater flow.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from carbon and alloy steel acid pickling are TSS, lead, and zinc. EPA selected 19 POCs for acid pickling operations in the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory, presented in Table 7-10. EPA selected sulfate as a POC because it is present in sulfuric acid pickling wastewater, which the Agency did not sample.

Using the same analysis, EPA also determined that the principal pollutants from stainless steel acid pickling, ESS descaling, and salt bath descaling operations are TSS, chromium, hexavalent chromium, and nickel. EPA selected 30 POCs for stainless steel acid pickling and descaling operations in the Stainless Steel Segment of the Steel Finishing Subcategory (as selected in at least one of the three pickling or descaling operations listed), presented in Table 7-11. EPA

selected total cyanide as a POC because it can be present in reducing salt bath descaling wastewater, which the Agency did not sample.

Wastewater Flow Rates

When responding to the industry survey, sites had the option of indicating several different discharge destinations for process wastewater. These destinations included the following: on-site regeneration and reuse, discharge to another process or rinse, discharge to treatment, discharge without treatment to publicly owned treatment works (POTWs), discharge to privately owned treatment works (PrOTWs), recycle and reuse, and several zero discharge methods including contract hauling. If a discharge was listed as recycle and reuse, discharge to another process or rinse, or zero discharge or alternative disposal method, such as contract hauling, EPA did not use the discharge in developing the model PNF. Several sites often responded that discharges were split between discharge to treatment and zero discharge methods of disposal such as contract hauling, but did not provide the portion of flow going to each. In these cases, EPA accounted for all of the flow in model PNF development.

The Agency analyzed data from 219 WAPC devices that were reported as being operated on acid pickling lines. After reviewing the 1997 industry survey data and comparing it to the data used to develop the 1982 rule, the Agency determined that the model flow rate of 15 gpm in the 1982 rule is still applicable.

The following tables list the model PNFs for carbon and alloy and stainless steel pickling operations. The Agency did not identify any sites that performed plate pickling operations on carbon and alloy steels. Consequently, the Agency transferred the model plate pickling flow rate from the Stainless Steel Segment to the carbon and alloy steel hydrochloric and sulfuric acid plate pickling manufacturing operations. Similarly, the Agency did not identify any sites that performed pipe and tube pickling operations on stainless steels, and, transferred the model specialty steel pipe and tube flow rate from the 1982 development document.

Carbon and Alloy Steel Hydrochloric Acid Pickling Model Flow Rates

Carbon and Alloy Hydrochloric Acid Pickling	Model PNF (gpt)	Operations Currently Operating at or Below the Model PNF	Number of Operations Analyzed
Strip, sheet	50	18	48
Bar, billet, rod, coil	490[a]	1	1
Pipe, tube	1,020[a]	2	3
Plate	35[b]	N/A	0
Fume scrubber (gal/min)	15[a]	8	14

[a]Value transferred from the 1982 development document.
[b]Value transferred from Stainless Steel Segment.

Carbon and Alloy Steel Sulfuric Acid Pickling Model Flow Rates

Carbon and Alloy Sulfuric Acid Pickling	Model PNF (gpt)	Operations Currently Operating at or Below the Model PNF	Number of Operations Analyzed
Strip, sheet	230	4	10
Bar, billet, rod, coil	280[a]	2	7
Pipe, tube	500[a]	1	1
Plate	35[b]	N/A	0
Fume scrubber (gal/min)	15[a]	34	60

[a]Value transferred from the 1982 development document.
[b]Value transferred from Stainless Steel Segment.

Stainless Steel Pickling Model Flow Rates

Stainless Steel Acid Pickling	Model PNF (gpt)	Operations Currently Operating at or Below the Model PNF	Number of Operations Analyzed
Strip, sheet	700	19	50
Bar, billet, rod, coil	230[a]	1	2
Pipe, tube	770[a]	0	0
Plate	35	3	3
Fume scrubber (gal/min)	15[a]	36	54

[a]Value transferred from 1982 development document.

EPA selected a model flow rate of 50 gpt for hydrochloric acid pickling of strip or sheet because 18 of the 48 process lines were demonstrating this model flow rate. The Agency selected a model flow rate below the median value of 79 gpt for hydrochloric acid pickling of strip and sheet, because the better performing mills were achieving this discharge rate. EPA selected 230 gpt as the model flow rate for sulfuric acid pickling of strip and sheet instead of the median PNF of 265 gpt. The Agency concluded that the selected flow rate roughly approximating, but slightly lower than, the median PNF is well demonstrated and achievable for all operations in the segment. The remaining model flow rates for hydrochloric acid pickling and sulfuric acid pickling were either transferred from the 1982 development document or from the Stainless Steel Segment (pickling).

EPA selected 700 gpt as the model flow rate for stainless steel acid pickling of strip and sheet instead of the median PNF of 874 gpt. The Agency considers the sites achieving the model flow rate (38 percent of the total) to be the better performing operations in this segment. EPA selected 35 gpt for stainless steel acid pickling of plate instead of the median of 33 gpt. Each of the sites that pickles plate was already achieving this flow rate and the Agency

determined that it would be cost-prohibitive to reduce the flow rate further. EPA transferred the remaining model flow rates for stainless steel acid pickling from the 1982 development document.

The Agency identified six zero discharge acid pickling lines during its analysis of the acid pickling subcategory. The Agency did not select zero discharge as the model flow for any of the acid pickling operations because sites would have to use options such as contract hauling of waste to achieve zero discharge. In addition, the Agency concluded that it was not feasible to achieve zero discharge on an industry-wide basis.

The Agency analyzed data from WAPC devices (e.g., absorber vent scrubbers) that acid regeneration operations reported operating. After reviewing the 1997 industry survey data and comparing it to the data used for the 1982 regulation, the Agency determined that the model flow rate of 100 gpm contained in the 1982 rule is still applicable.

7.8.2 Cold Forming

Sources

The Agency considered data from the 64 sites (integrated, non-integrated, stand-alone) that reported performing cold forming in their industry survey responses. Because some plants operate more than one cold forming operation, the total number of operations analyzed was 234. The Agency was unable to analyze data from two operations due to incomplete industry survey responses.

During the analysis, the Agency identified blowdown from the contact water and rolling solution systems as the primary source of wastewater. For the purposes of this manufacturing operation, the Agency made no distinction between contact spray water systems and rolling solution systems, which can include blowdown from roll and/or roll table spray cooling and product cooling. Other sources of wastewater included in the development of model PNFs were equipment cleaning water, wastewater from roll shops, and basement sumps.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from cold forming wastewater are TSS, O&G, and metals (lead and zinc for carbon and alloy steels and chromium and nickel for stainless steels; chromium may also be a contaminant from cold rolling of carbon steels resulting from wear on chromium-plated work rolls). EPA also found priority organic pollutants including naphthalene, other polynuclear aromatic compounds, and chlorinated solvents in cold rolling wastewater. EPA selected 26 POCs for cold forming operations in the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory, presented in Table 7-10, and 40 POCs for cold forming operations in the Stainless Steel Segment of the Steel Finishing Subcategory, presented in Table 7-11.

Wastewater Flow Rates

The following table presents the selected model PNF, number of operations currently operating at the model PNF, and number of lines analyzed for carbon and alloy cold forming operations. Each of the selected model flow rates for carbon and alloy cold forming, except for single stand, recirculation, is slightly above the median PNF for each operation. EPA determined that it would be cost-prohibitive for all sites to achieve the median flow rate. For single stand, recirculation, EPA selected a flow rate below the median of 7 gpt. The Agency concluded that it was appropriate for single stand, recirculation, to have a lower flow rate than single stand, direct application. Therefore, EPA selected the model flow rate based on the three best performing mills in the category. The Agency did not select zero discharge as the model PNF for carbon and alloy cold forming operations because sites with a discharge from their recycle system(s) achieved zero discharge through either contract hauling or discharge to another process. The Agency concluded that contract hauling of waste is a not a universally applicable wastewater management approach and also recognizes that discharge to another process is not a viable option at all sites.

Carbon and Alloy Steel Cold Forming Model Flow Rates

Carbon and Alloy Cold Forming	Model PNF (gpt)	Operations Currently Operating at the Model PNF	Number of Operations Analyzed
Single stand, recirculation	1	3	18
Single stand, direct application	3	15	26
Multiple stand, recirculation	25	16	28
Multiple stand, direct application	275	11	19
Multiple stand, combination	143	5	8

The following table presents the selected model PNF, number of operations currently operating at the model PNF, and number of operations analyzed for stainless cold forming. The selected model flow rates for stainless cold forming are slightly above the median flow rates. EPA determined that it would be cost-prohibitive for all sites to achieve the median flow rate. The Agency did not select zero discharge as the model PNF for stainless steel cold forming operations for the reasons cited above. After reviewing the industry survey data, the Agency did not identify any sites operating multiple stand, direct application, or multiple stand, combination, rolling mills for stainless steels. The Agency transferred the model flow rates for these operations from the Carbon and Alloy Steel Segment, because of similarities in the manufacturing processes.

Stainless Steel Cold Forming Model Flow Rates

Stainless Steel Cold Forming	Model PNF (gpt)	Operations Currently Operating at the Model PNF	Number of Sites Reporting
Single stand, recirculation	3	7	13
Single stand, direct application	35	1	1
Multiple stand, recirculation	16	6	7
Multiple stand, direct application	275[a]	N/A	0
Multiple stand, combination	143[a]	N/A	0

[a]Value transferred from the Carbon and Alloy Steel Segment.
N/A = Not applicable.

7.8.3 Alkaline Cleaning

Sources

The Agency considered data from the 32 sites (integrated, non-integrated, and stand-alone) that indicated in their industry survey response that they performed alkaline cleaning operations on stand-alone process lines that do not have other processes such as pickling or coating. Because some plants operate more than one stand-alone alkaline cleaning operation, the total number of operations analyzed was 49. The Agency was unable to analyze data from one operation due to an incomplete survey response.

EPA has defined alkaline cleaning operations to include annealing operations on the same line; as a result, this segment includes both stand-alone alkaline cleaning lines and continuous annealing/alkaline cleaning lines. The Agency included annealing rinses, when present, in determining PNFs for the alkaline cleaning lines.

The primary sources of wastewater identified for alkaline cleaning operations were blowdown from the alkaline cleaning solution tanks and rinse water used to clean the alkaline cleaning solution from the steel. Other minor sources of wastewater included the following: rinse water from annealing operations (when operated with a water quench); runoff from raw material handling, preparation, and storage; tank clean-outs; and equipment cleaning and wash down water.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutant from alkaline cleaning operations is O&G removed from the steel. Because alkaline cleaning baths do not aggressively attack or dissolve the surface of the steel processed, metals are not as prevalent as in acid pickling wastewater. EPA selected 12 POCs for alkaline cleaning operations in the Carbon

and Alloy Steel Segment of the Steel Finishing Subcategory, presented in Table 7-10. EPA selected 10 POCs for alkaline cleaning operations in the Stainless Steel Segment of the Steel Finishing Subcategory, presented in Table 7-11.

Wastewater Flow Rates

When developing the model PNF for alkaline cleaning, the Agency included all process wastewater flows that were conveyed to treatment. If a wastewater discharge was contract hauled or recycled and reused, the Agency did not include the flow in the development of the model PNF. If a site's industry survey response indicated that a flow was both contract hauled and discharged to treatment, but did not specify the portion of flow going to each, the Agency used the combined flow to develop the PNF. Each of the selected model flow rates for alkaline cleaning approximates the median flow rate.

EPA selected 320 gpt as the model PNF for alkaline cleaning of carbon and alloy steel strip and sheet. Twelve of the 24 lines reported PNFs of less than 320 gpt. None of these sites reported lines operating without a discharge.

EPA selected 20 gpt as the model PNF for alkaline cleaning of carbon and alloy steel pipe and tube. Four of the six sites reported lines with PNFs of less than or equal to 20 gpt. One site reported operating without a discharge by contract hauling its wastewater. The Agency did not select zero discharge as the model flow for alkaline cleaning of pipe and tube because sites would have to use disposal methods such as contract hauling to achieve zero discharge.

EPA selected 2,500 gpt as the model PNF for alkaline cleaning of stainless strip. Nine of the 15 sites reported lines with PNFs of less than or equal to 2,500 gpt. None of the sites reported operating without a discharge. The Agency did not identify any sites that practiced alkaline cleaning of stainless steel pipe and tube. EPA transferred the model pipe and tube flow rate of 20 gpt from the Carbon and Alloy Steel Segment.

7.8.4 Continuous Annealing

Sources

The Agency considered data from the 11 sites that indicated in their industry survey responses that they performed stand-alone continuous annealing operations (i.e., not on the same process line with operations such as alkaline cleaning or acid pickling). Because some sites operate more than one stand-alone continuous annealing operation, the total number of operations analyzed was 28. The Agency was unable to analyze data from two operations due to incomplete survey responses.

Stand-alone continuous annealing operations only include annealing operations that are not considered to be part of any other finishing line operated by the site. Annealing operations with a water quench that generate a discharge on acid pickling, cold forming, hot

coating, alkaline cleaning, and electroplating lines are included in the model flow rate for these operations. Both the Carbon and Alloy Steel and Stainless Steel Segments have stand-alone continuous annealing operations that are divided into two categories: lines that do and lines that do not use water to quench the steel after the annealing process.

Pollutants of Concern

EPA did not identify any POCs for this manufacturing process because EPA did not sample any annealing quenching operations. However, because quenching is simply a direct-contact water cooling process with no chemicals involved, the Agency determined that wastewater associated with this operation is unlikely to contain pollutants not already selected as POCs in other finishing manufacturing process divisions.

Wastewater Flow Rates

EPA selected 20 gpt (the median flow rate) as the model PNF for stand-alone continuous annealing with a water quench. Seven of the 14 lines with a water quench reported PNFs of less than or equal to 20 gpt. None of the sites reported operating without a discharge. Stand-alone continuous annealing lines that operate without a water quench do not generate process wastewater and have been designated as a zero-discharge operation.

7.8.5 Hot Coating

Sources

The Agency considered data from the 26 sites (integrated, non-integrated, and stand-alone) that indicated in their industry survey responses that they performed hot coating. Because some plants operate more than one hot coating line, the total number of lines analyzed was 40. The Agency was unable to analyze data from five lines due to incomplete survey responses. Hot coating operations are performed on carbon and alloy steels only. EPA has defined hot coating lines as including acid cleaning, annealing, alkaline cleaning, and other surface cleaning and preparation operations on the same line.

The primary source of wastewater from hot coating operations is the surface preparation operations, such as acid and alkaline cleaning, that the steel undergoes before hot coating. Four of the operations reported a discharge from their hot coating tanks. Thirty-two of the operations reported having a rinse following the coating operation. Tank clean-outs, fume scrubbers, and equipment cleaning are other sources of wastewater reported by a number of sites.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from hot coating wastewater are TSS, O&G, metals from the surface preparation operations, and hexavalent

chromium from lines with chromium brightening or passivation operations. EPA selected 23 POCs for hot coating operations in the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory, presented in Table 7-10.

Wastewater Flow Rates

The Agency analyzed data from WAPC devices that were reported as being operated on hot coating lines. After reviewing the 1997 industry survey data and comparing it to the data used for the 1982 rule, the Agency determined that the model flow rate of 15 gpm contained in the 1982 rule is still applicable.

In developing the model PNF, the Agency only considered flow rates that were conveyed to treatment systems. When responding to the industry survey, sites had the option of indicating if they discharged process wastewater to treatment and/or disposed of it via several different zero discharge methods. If a site listed a zero discharge disposal method for a discharge, EPA did not use that discharge in the development of the model PNF. If a site's industry survey response indicated that a flow was both discharged to treatment and disposed of using a zero discharge method, but did not specify the portion of flow rate going to each, the Agency used the combined flow to develop the PNF.

EPA selected 550 gpt as the model PNF for hot coating operations. Twenty-eight of the 40 lines reported having PNFs of less than or equal to 550 gpt. Two of the lines reported operating without a discharge by using contract hauling. EPA determined that it would be cost-prohibitive for all sites to achieve the median PNF of 182 gpt. The Agency did not select zero discharge as the model flow for hot coating because sites would have to use disposal methods such as contract hauling to achieve zero discharge.

7.8.6 Electroplating

Sources

The Agency considered data from the 23 sites (integrated, non-integrated, and stand-alone) that indicated in their industry survey responses that they performed electroplating. Because some plants operate more than one electroplating line, the total number of operations analyzed was 44. The Agency was unable to analyze data from two operations due to incomplete survey responses. EPA has defined electroplating lines as annealing, alkaline cleaning, acid cleaning, and other surface cleaning and surface preparation operations on the same line.

The primary sources of wastewater from electroplating operations are acid and alkaline cleaning operations performed on the same process line, plating solution losses, and fume scrubbers. Tank clean-outs and equipment cleaning are other sources of wastewater reported by a number of sites.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutants from electroplating wastewater are TSS and O&G generated from the precleaning operations and the metals from plating solution losses, rinsing, and fume scrubbers. EPA selected 19 POCs for electroplating operations in the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory (as selected in at least one of the following types of electroplating: tin, tin-chromium, zinc, or zinc-nickel), presented in Table 7-10.

Wastewater Flow Rates

The Agency analyzed data from WAPC devices that were reported as being operated on electroplating lines. After reviewing the 1997 industry survey data and comparing it to the data used for the 1982 regulation, the Agency determined that the model flow rate of 15 gpm contained in the 1982 effluent guidelines is still applicable.

In developing the model PNF, the Agency only considered flow rates that were conveyed to treatment systems. When responding to the industry survey, sites had the option of indicating whether they discharged their process wastewater to treatment and/or disposed of it via several different zero discharge disposal methods. If a site listed a zero discharge disposal method for discharge, EPA did not use that discharge in the development of the model PNF. If a site's industry survey response indicated that a flow was both discharged to treatment and disposed of using a zero discharge method, but did not specify the portion of flow going to each, the Agency used the combined flow to develop the PNF.

The model PNF for electroplating operations varies by the type of metal applied and the product type. The Agency chose a model PNF of 1,100 gpt for tin and chromium lines plating strip steel. Ten of the 20 lines reported PNFs equal to or less than 1,100 gpt. The Agency chose a model PNF of 550 gpt for lines plating strip steel with metals other than tin or chromium. Sixteen of the 20 lines reported PNFs equal to or less than 550 gpt. EPA determined that it would be cost-prohibitive for all sites to achieve the median PNF of 214 gpt. The Agency chose a model PNF of 35 gpt for electroplating of steel plate. Because the data for plate electroplating are confidential, they are not presented here. EPA concluded that the selected flow rates are achievable by well-operated electroplating operations.

7.9 Other Operations Subcategory

The subcategory the Agency proposes for other operations encompasses segments for direct reduced ironmaking, forging, and briquetting.

7.9.1 Directed Reduced Ironmaking (DRI) Segment

Sources

Three DRI plants provided industry survey data. One plant was operated at a non-integrated site and two were operated as stand-alone DRI sites. One plant began operations after 1997, but was considered for the development of the model flow rate. WAPC systems are the only reported process wastewater source for DRI operations. The WAPCs control furnace emissions and emissions from material handling and storage.

Pollutants of Concern

Based on an analysis of EPA sampling data and industry-provided data from the Analytical and Production Survey, EPA determined that the principal pollutant from DRI operations is TSS. EPA selected 10 POCs for the DRI Segment of the Other Operations Subcategory, presented in Table 7-12.

Wastewater Flow Rates

An evaluation of the three sites that conducted DRI operations found that they recycle scrubber wastewater. Based on the practice of wastewater recycle, the Agency selected a model PNF of 90 gpt; two of the three DRI plants are achieving this model flow rate.

7.9.2 Forging Segment

Sources

The Agency determined that forging operations are similar to other hot forming operations with respect to wastewater characteristics based on process considerations. Sixteen industry survey respondents indicated that they conducted forging operations in 1997 at eight non-integrated and four stand-alone sites. Contact water and hydraulic system wastewater comprise most of the process wastewater from forging operations. Contact water is used for flume flushing, descaling, die spray cooling, and product quenching. Some sites identified equipment cleaning water and basements sumps as other sources of wastewater from forging operations.

Pollutants of Concern

Based on an analysis of industry-provided data, EPA determined that the principal pollutants from forging are TSS, O&G, and metals. EPA did not identify any POCs for the Forging Segment because EPA did not sample any forging operations.

Wastewater Flow Rates

EPA calculated 15 PNFs based on available industry survey data. The Agency based its development of model treatment for forging operations on similar wastewater treatment for hot forming operations. As with hot forming, the Agency determined that wastewater treatment systems treating forging wastewaters demonstrate a recycle rate of 96 percent. High-rate recycle is a principle component of forging wastewater treatment and EPA used it to select a model flow rate. EPA selected a model PNF of 100 gpt for forging operations. This model flow rate is demonstrated at nine of the 16 forging operations that were analyzed.

7.9.3 Briquetting Segment

The Agency found that briquetting operations do not generate or discharge process wastewater. Therefore, the Agency has designated briquetting as a zero discharge operation.

7.10 References

7-1 U.S. Environmental Protection Agency. Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. Volume 1. EPA 440/1-82/024, Washington, D.C., May 1982.

Table 7-1

1997 National Estimate of Annual Discharge from Manufacturing Operations by Discharge Type

Manufacturing Operation	Total Number of Sites[a]	Total Annual Discharge Rate (1,000 gallons per year)	Number (%) of Direct Dischargers	Annual Discharge Rate for Direct Dischargers (1,000 gallons per year)	Number (%) of Indirect Dischargers	Annual Discharge Rate for Indirect Dischargers (1,000 gallons per year)	Number (%) of Zero Dischargers[b]
Cokemaking	24	3,031,000	14 (58%)	2,450,000	8 (33%)	581,000	2 (8%)
Sintering	9	2,110,000	4 (44%)	2,110,000	0[3] (0%)	0[c]	5 (56%)
Blast furnace ironmaking	20	7,914,000	13 (62%)	7,630,000	1 (5%)	284,000	7 (33%)
BOF steelmaking	20	6,371,110	17 (81%)	6,370,000	1 (5%)	1,110	3 (14%)
EAF steelmaking	96	0[c]	3 (3%)	0[c]	2 (2%)	0[c]	92 (96%)
Vacuum degassing	44	1,270,000	26 (59%)	1,250,000	4 (9%)	20,000	14 (32%)
Ladle metallurgy	103	0[c]	0[c] (0%)	0[c]	0[c] (0%)	0[c]	103 (100%)
Continuous Casting	113	10,573,000	53 (47%)	10,100,000	17 (15%)	473,000	43 (38%)
Hot forming	153	140,772,000	87 (57%)	140,000,000	29 (19%)	772,000	39 (25%)
Acid pickling and descaling	69	13,755,000	50 (72%)	13,400,000	14 (20%)	355,000	7 (10%)
Cold forming	103	9,479,600	39 (38%)	9,420,000	16 (16%)	59,600	52 (50%)
Surface cleaning and coating[d]	98	14,519,000	53 (54%)	13,800,000	33 (34%)	719,000	14 (14%)
Briquetting or other agglomeration process	4	0[c]	0[c] (0%)	0[c]	0[c] (0%)	0[c]	4 (100%)
Direct reduced ironmaking	2	119,000	1 (50%)	78,600	1 (50%)	40,500	0[d] (0%)

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).

[a]The sum of direct, indirect, and zero dischargers may not equal the total number of operations. Sites may discharge wastewater both directly and indirectly from their manufacturing operations.
[b]Zero dischargers include operations that do not discharge process wastewater as well as operations that are completely dry.
[c]Cells with a zero (0) indicate that none of the survey respondents have the characteristic; however, it is possible for nonsurveyed facilities to have the characteristic.
[d]Surface cleaning and coating operations include: alkaline cleaning, stand-alone continuous annealing, hot coating, and electroplating.

Table 7-2

Pollutants of Concern
Cokemaking Subcategory - By-Product Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Biochemical oxygen demand 5-day (BOD_5)
	Biochemical oxygen demand 5-day (BOD_5) - carbonaceous
	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Amenable cyanide
	Ammonia as nitrogen
	Chemical oxygen demand (COD)
	Nitrate/nitrite
	Total petroleum hydrocarbons (TPH)
	Thiocyanate
	Total Kjeldahl nitrogen (TKN)
	Total organic carbon (TOC)
	Total phenols
	Weak acid dissociable (WAD) cyanide
Priority metals	Arsenic
	Mercury
	Selenium
Nonconventional metals	Boron
Priority organic constituents	Acenaphthene
	Acenaphthylene
	Anthracene
	Benzidine
	Benzo(a)anthracene
	Benzo(b)fluoranthene
	Benzo(k)fluoranthene
	Benzo(ghi)perylene
	Benzo(a)pyrene
	Chrysene
	2,4-dimethylphenol

Table 7-2 (Continued)

Pollutant Group	Pollutant of Concern
Priority organic constituents (cont.)	Fluoranthene
	Fluorene
	Indeno(1,2,3-cd)pyrene
	Naphthalene
	Phenanthrene
	Phenol
	Pyrene
	Benzene
	1,2-Dichloroethane
	Ethylbenzene
	Toluene
Nonconventional organic constituents	Aniline
	2,3-Benzofluorene
	Biphenyl
	Carbazole
	o-Cresol
	p-Cresol
	Dibenzofuran
	Dibenzothiophene
	n-Eicosane
	n-Hexadecane
	4,5-Methylene phenanthrene
	2-Methylnaphthalene
	1-Methylphenanthrene
	1-Naphthylamine
	beta-Naphthylamine
	n-Octadecane
	Perylene
	2-Phenylnaphthalene
	2-Picoline
	Pyridine

Table 7-2 (Continued)

Pollutant Group	Pollutant of Concern
Nonconventional organic constituents (continued)	Styrene
	Thianaphthene
	o-Toluidine
	2-Propanone
	Carbon disulfide
	2-Butanone
	m-Xylene
	m- + p-Xylene
	o-Xylene
	o- + p-Xylene
Other priority pollutants	Total cyanide

Table 7-3

Pollutants of Concern
Ironmaking Subcategory - Sintering Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Amenable cyanide
	Ammonia as nitrogen
	Chemical oxygen demand (COD)
	Fluoride
	Nitrate/Nitrite
	Total petroleum hydrocarbons (TPH)
	Thiocyanate
	Total Kjeldahl nitrogen (TKN)
	Total organic carbon (TOC)
	Total phenols
	Weak acid dissociable (WAD) cyanide
Priority metals	Arsenic
	Cadmium
	Chromium
	Copper
	Lead
	Mercury
	Selenium
	Silver
	Thallium
	Zinc
Nonconventional metals	Aluminum
	Boron
	Iron
	Magnesium
	Manganese
	Titanium

Table 7-3 (Continued)

Pollutant Group	Pollutant of Concern
Priority organic constituents	Benzo(a)anthracene
	Benzo(b)fluoranthene
	Benzo(k)fluoranthene
	Benzo(a)pyrene
	Chrysene
	2,4-Dimethylphenol
	Fluoranthene
	4-Nitrophenol
	Phenanthrene
	Phenol
	Pyrene
Nonconventional organic constituents	n-Tetracosane
	n-Docosane
	n-Eicosane
	n-Hexadecane
	n-Octadecane
	o-Cresol
	p-Cresol
	Pyridine
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
	Octachlorodibenzo-p-dioxin
	2,3,7,8-Tetrachlorodibenzofuran
	1,2,3,7,8-Pentachlorodibenzofuran
	2,3,4,7,8-Pentachlorodibenzofuran
	1,2,3,4,7,8-Hexachlorodibenzofuran
	1,2,3,6,7,8-Hexachlorodibenzofuran
	1,2,3,7,8,9-Hexachlorodibenzofuran

Table 7-3 (Continued)

Pollutant Group	Pollutant of Concern
Nonconventional organic constituents (continued)	2,3,4,6,7,8-Hexachlorodibenzofuran
	1,2,3,4,6,7,8-Heptachlorodibenzofuran
	1,2,3,4,7,8,9-Heptachlorodibenzofuran
	Octachlorodibenzofuran
Other priority pollutants	Total cyanide

Table 7-4

Pollutants of Concern
Ironmaking Subcategory - Blast Furnace Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Amenable cyanide
	Ammonia as nitrogen
	Chemical oxygen demand (COD)
	Fluoride
	Nitrate/Nitrite
	Total petroleum hydrocarbons (TPH)
	Thiocyanate
	Total Kjeldahl nitrogen (TKN)
	Total organic carbon (TOC)
	Weak acid dissociable (WAD) cyanide
Priority metals	Chromium
	Copper
	Lead
	Nickel
	Selenium
	Zinc
Nonconventional metals	Aluminum
	Boron
	Iron
	Magnesium
	Manganese
	Molybdenum
	Titanium
Nonconventional organic constituents	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
Other priority pollutants	Total cyanide

Table 7-5

Pollutants of Concern
Integrated Steelmaking Subcategory

Pollutant Group	Pollutant of Concern	BOF Furnaces	Vacuum Degassing	Continuous Casting
Conventional pollutants	Oil and grease (O&G)	✔	✔	✔
	Total suspended solids (TSS)	✔	✔	✔
Nonconventional pollutants	Ammonia as nitrogen	✔	✔	
	Chemical oxygen demand (COD)	✔	✔	✔
	Fluoride	✔	✔	✔
	Nitrate/Nitrite	✔		
	Total petroleum hydrocarbons (TPH)	✔	✔	✔
	Total organic carbon (TOC)	✔		✔
Priority metals	Antimony	✔		✔
	Beryllium	✔		
	Cadmium	✔		
	Chromium	✔		
	Copper	✔	✔	
	Lead	✔	✔	✔
	Mercury	✔		
	Nickel	✔		
	Silver	✔		
	Zinc	✔	✔	✔
Nonconventional metals	Aluminum	✔	✔	✔
	Cobalt	✔		
	Iron	✔	✔	✔
	Magnesium	✔		
	Manganese	✔	✔	✔
	Molybdenum	✔	✔	✔
	Tin	✔	✔	
	Titanium	✔	✔	
	Vanadium	✔		
Priority organic constituents	Phenol	✔		

Table 7-6

Pollutants of Concern
Integrated and Stand-Alone Hot Forming Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Ammonia as nitrogen
	Chemical oxygen demand (COD)
	Fluoride
	Total petroleum hydrocarbons (TPH)
Priority metals	Lead
	Zinc
Nonconventional metals	Iron
	Manganese
	Molybdenum

Table 7-7

Pollutants of Concern
Integrated and Stand-Alone Hot Forming Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Chemical oxygen demand (COD)
	Fluoride
	Total petroleum hydrocarbons (TPH)
	Total organic carbon (TOC)
Priority metals	Antimony
	Chromium
	Copper
	Nickel
	Zinc
Nonconventional metals	Iron
	Manganese
	Molybdenum
	Titanium

Table 7-8

Pollutants of Concern
Non-Integrated Steelmaking and Hot Forming Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Continuous Casting	Hot Forming
Conventional pollutants	Oil and grease (O&G)	✔	✔
	Total suspended solids (TSS)	✔	✔
Nonconventional pollutants	Ammonia as nitrogen	✔	
	Chemical oxygen demand (COD)	✔	
	Total petroleum hydrocarbons (TPH)	✔	✔
	Total organic carbon (TOC)	✔	✔
Priority metals	Lead	✔	✔
	Zinc	✔	✔
Nonconventional metals	Iron		✔
	Manganese		✔

Table 7-9

Pollutants of Concern
Non-Integrated Steelmaking and Hot Forming Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern	Continuous Casting	Hot Forming
Conventional pollutants	Oil and grease (O&G)	✔	✔
	Total suspended solids (TSS)	✔	✔
Nonconventional pollutants	Ammonia as nitrogen	✔	
	Chemical oxygen demand (COD)	✔	✔
	Fluoride	✔	✔
	Nitrate/Nitrite	✔	
	Total petroleum hydrocarbons (TPH)	✔	✔
	Total organic carbon (TOC)	✔	✔
Priority metals	Antimony		✔
	Chromium	✔	✔
	Copper	✔	✔
	Lead	✔	
	Nickel	✔	✔
	Zinc	✔	✔
Nonconventional metals	Aluminum	✔	
	Boron	✔	
	Hexavalent chromium	✔	
	Iron	✔	✔
	Manganese	✔	✔
	Molybdenum	✔	✔
	Titanium	✔	✔
Priority organic constituents	Tribromomethane	✔	

Table 7-10

Pollutants of Concern
Steel Finishing Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Acid Pickling	Cold Forming	Alkaline Cleaning	Hot Coating	Electro-plating
Conventional pollutants	Oil and grease (O&G)	✔	✔	✔	✔	✔
	Total suspended solids (TSS)	✔	✔	✔	✔	✔
Nonconventional pollutants	Ammonia as nitrogen	✔	✔	✔	✔	✔
	Chemical oxygen demand (COD)	✔	✔	✔	✔	✔
	Fluoride	✔	✔	✔	✔	✔
	Nitrate/Nitrite	✔			✔	✔
	Total petroleum hydrocarbons (TPH)	✔	✔	✔	✔	✔
	Total organic carbon (TOC)	✔	✔	✔	✔	✔
	Total phenols		✔			
	Sulfate	✔				
Priority metals	Antimony				✔	
	Arsenic	✔	✔		✔	
	Chromium	✔	✔		✔	✔
	Copper	✔	✔	✔	✔	✔
	Lead				✔	✔
	Nickel	✔	✔		✔	✔
	Selenium					✔
	Zinc	✔	✔	✔	✔	✔
Nonconventional metals	Aluminum		✔		✔	
	Boron				✔	
	Hexavalent chromium				✔	✔
	Iron	✔	✔	✔	✔	✔
	Manganese	✔	✔	✔	✔	✔
	Molybdenum				✔	✔
	Tin			✔	✔	
	Titanium	✔	✔		✔	✔
Priority organic constituents	Bis(2-ethylhexyl) phthalate		✔			
	1,1,1-Trichloroethane		✔			

Table 7-10 (Continued)

Pollutant Group	Pollutant of Concern	Acid Pickling	Cold Forming	Alkaline Cleaning	Hot Coating	Electro-plating
Nonconventional organic constituents	alpha-Terpineol		✔			
	Benzoic acid		✔			
	n,n-Dimethylformamide	✔				
	n-Dodecane		✔			
	n-Eicosane		✔			
	n-Hexadecane		✔			
	n-Octadecane		✔			
	n-Tetradecane		✔			
	2-Propanone	✔				

Note: Pollutants of concern were not selected for the annealing manufacturing process.

Table 7-11

Pollutants of Concern
Stainless Finishing Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern	Acid Pickling	Alkaline Cleaning	Cold Forming
Conventional pollutants	Oil and grease (O&G)	✔	✔	✔
	Total suspended solids (TSS)	✔	✔	✔
Nonconventional pollutants	Ammonia as nitrogen	✔	✔	✔
	Chemical oxygen demand (COD)	✔	✔	✔
	Fluoride	✔	✔	✔
	Nitrate/Nitrite	✔		
	Total petroleum hydrocarbons (TPH)	✔	✔	✔
	Total cyanide	✔		
	Total organic carbon (TOC)	✔		✔
	Total phenols			✔
Priority metals	Antimony	✔		✔
	Arsenic	✔		✔
	Cadmium	✔		✔
	Chromium	✔		✔
	Copper	✔		✔
	Lead	✔		
	Nickel	✔		✔
	Selenium	✔		
	Zinc	✔		✔
Nonconventional metals	Aluminum	✔		✔
	Barium	✔		
	Boron	✔		
	Cobalt	✔		
	Hexavalent chromium	✔		✔
	Iron	✔	✔	✔
	Magnesium	✔	✔	
	Manganese	✔	✔	✔

Table 7-11 (Continued)

Pollutant Group	Pollutant of Concern	Acid Pickling	Alkaline Cleaning	Cold Forming
Nonconventional metals (continued)	Molybdenum	✔		✔
	Tin	✔		✔
	Titanium	✔	✔	✔
	Vanadium	✔		
Priority organic constituents	Naphthalene			✔
	Phenol			✔
	Ethylbenzene			✔
	Toluene			✔
Nonconventional organic constituents	2,6-Di-tert-butyl-p-benzoquinone			✔
	2-Methylnaphthalene			✔
	Benzoic acid			✔
	Hexanoic acid			✔
	n-Docosane			✔
	n-Dodecane			✔
	n-Eicosane			✔
	n-Hexadecane			✔
	n-Octadecane			✔
	n-Tetracosane			✔
	n-Tetradecane			✔
	2-Propanone			✔
	m-Xylene			✔
	o- + p-Xylene			✔

Note: Pollutants of concern were not selected for the annealing manufacturing process.

Table 7-12

Pollutants of Concern
Other Operations Subcategory - Direct Reduced Ironmaking Segment

Pollutant Group	Pollutant of Concern
Conventional pollutants	Oil and grease (O&G)
	Total suspended solids (TSS)
Nonconventional pollutants	Ammonia as nitrogen
	Chemical oxygen demand (COD)
	Fluoride
	Total petroleum hydrocarbons (TPH)
Nonconventional metals	Aluminum
	Iron
	Manganese
	Titanium

SECTION 8

TECHNOLOGY OPTIONS

This section describes the technology options that EPA evaluated in developing the effluent limitations guidelines and standards proposed for the iron and steel industry. To determine the model treatment technologies, model discharge flow rate, and effluent quality for the proposed regulation, EPA developed a database of the following:

- In-process technologies and process modifications;
- Process water recycle technologies;
- End-of-pipe wastewater treatment technologies;
- Process wastewater discharge flow rates; and
- Treated process wastewater effluent quality.

EPA collected most data were collected from the analytical and production survey and the EPA wastewater sampling programs. As described in Section 3, the Agency also used other data sources.

Although EPA has wide discretion to establish BAT effluent limitations guidelines on a range of technologies, including transfer of technologies from other industries and in-process controls, even when not common industry practice, the technology options considered for this proposed regulation are generally well demonstrated in the iron and steel industry. The Clean Water Act does not require that dischargers achieve technology-based effluent limitations and categorical pretreatment standards by using the technologies considered by EPA when promulgating the effluent limitations guidelines and standards regulations. Rather, the Clean Water Act requires compliance with numerical NPDES permit and pretreatment limits derived from the effluent limitations guidelines and standards. Direct and indirect dischargers can use any combination of process modifications, in-process technologies, and wastewater treatment technologies.

Section 8.1 summarizes the in-process and end-of-pipe treatment technologies considered by EPA, and Section 8.2 summarizes the technology options (model treatment systems) EPA evaluated for the proposed effluent limitations guidelines and standards.

8.1 Technology Overview

This section discusses the types of technologies in place at iron and steel sites and other industrial wastewater treatment. Many wastewater treatment technologies apply to multiple subcategories; therefore, this section presents technologies in general order by manufacturing process and then by the typical treatment train for each technology. Section 8.1.1 discusses in-process technologies, and Section 8.1.2 discusses end-of-pipe technologies.

8.1.1 In-Process Technologies

Wastewater management practices for wet air pollution controls (WAPCs) for blast furnaces, sintering operations, and wet-open or wet-suppressed basic oxygen furnaces (BOFs) focus on the treatment and recycle of large volumes of contaminated gas cleaning wastewater. The use of high-rate recycle can reduce annual discharges by 95 percent or greater.

Common pollutants in blast furnace gas cleaning wastewater include total suspended solids (TSS), ammonia, cyanides, phenolic compounds, and metals. Wastewater from sintering operations also contains these pollutants, along with oil and grease (O&G) and dioxins and furans. Wastewater from gas cooling and cleaning systems associated with BOFs is contaminated with TSS and metals. To limit the pollutant loadings and volume of water discharge associated with the WAPC from the above-mentioned operations, high-rate recycle systems consisting of solids removal devices such as classifiers and clarifiers for removal of suspended solids are used to treat wastewater before reuse for gas cooling and cleaning. Blast furnace recycle systems also use cooling towers prior to reuse in gas cleaning systems. Carbon dioxide injection prior to clarification can be used for wet-open combustion and wet-suppressed combustion BOF recycle systems to remove scale-forming metal ions from wastewater before reuse. Solids recovered from classifiers, clarifiers, and scale pits have a significant iron content and may be processed at sintering or briquetting operations and then charged to a blast furnace. To prevent the accumulation of other contaminants in the high-rate recycle system, a small portion of the high-rate recycle stream is continuously discharged (blowdown), and makeup water is added. Blowdown is then treated at an end-of-pipe treatment system before discharge.

High-rate recycle systems are also used for vacuum degassing, continuous casting, and hot forming operations. Typical vacuum degassing high-rate recycle systems consist of clarifiers and cooling towers, with blowdown treated individually or with blowdown from continuous caster recycle systems. Typical components of high-rate recycle systems are scale pits with oil skimming, additional O&G and solids removal through clarification or filtration, and cooling towers. Principal pollutants from vacuum degassing wastewater are TSS and metals. Common pollutants from continuous casting and hot forming operations are TSS, O&G, and metals. Scale recovered from scale pits has a significant iron content and may be processed at sintering or briquetting operations and then charged to a blast furnace.

The following paragraphs provide additional information regarding equipment associated with the high-rate recycle systems discussed. Section 8.1.2 provides information on clarifiers, multimedia filtration, solids-handling equipment, and cooling towers, all of which are also common end-of-pipe treatment technologies.

- ***Scale Pits with Oil Skimming.*** Scale pits provide primary sedimentation and oil separation for untreated process wastewater generated by continuous casting and hot forming operations. Scale pits remove large, easily settleable iron scale. Pits are scraped or dredged and the iron scale is recovered for reuse or landfilled on or off site. Skimmed oil is typically collected on site and shipped off site for reclamation.

- ***Classifiers.*** Classifiers provide primary sedimentation of high-volume untreated wastewater from wet-suppressed and wet-open BOF WAPC systems. Solids can be removed using screw or rake systems.

- ***Carbon Dioxide Injection.*** Carbon dioxide injection is one method to remove scale-forming metal ions (hardness) from BOF recycle water in wet-open and wet-suppressed combustion systems. Carbonate precipitation occurs in the recycle system through injection of carbon dioxide (CO_2) prior to clarification. Carbon dioxide is injected through a very fine bubble diffusion assembly which is located in a basin with a minimum water depth of 10 feet. Liquid CO_2 can be stored on site and preheated prior to injection to create CO_2 gas. A series of baffles or a mixer directly above the CO_2 injection point help keep the bubbles submerged as long as possible. This action forms carbonic acid and bicarbonate alkalinity as illustrated by Equation 8-1 below:

  $$H_2O + CO_2 \text{ -------> } H_2CO_3 \text{ --------> } H^+ + HCO_3^- \qquad (8\text{-}1)$$

  Carbonate reacts with magnesium and calcium ions to form insoluble precipitate, which is removed in the clarifier, by Equation 8-2 below:

  $$Ca^{2+} + Mg^{2+} + 2HCO_3 + \text{heat} \text{ -----> } CaCO_3\downarrow + CO_2 + H_2O \qquad (8\text{-}2)$$

  Carbon dioxide injection can potentially reduce effluent hardness levels to 10 - 15 mg/L as $CaCO_3$.

Stainless, alloy, or carbon steel finishing mills process hot rolled steel through a combination of acid pickling, cold rolling, alkaline cleaning, hot coating, and electroplating operations. Based on responses to the industry survey, hot coating and electroplating are only performed on carbon and alloy steel. Pollutants include oils from cold rolling operations and alkaline cleaning, hexavalent chromium from hot dip coating and electroplating of carbon steel or acid pickling of stainless steel, and metals from acid pickling and electroplating. In-process alternatives for finishing mills include countercurrent rinsing to limit water usage, ion exchange, and evaporation to recover acids and metals before end-of-pipe treatment. Training, housekeeping, and record-keeping can also be effective management alternatives for steel finishing operations. Below are additional details on each of these in-process practices.

- ***Countercurrent Rinsing.*** Countercurrent cascade rinsing refers to a series of consecutive rinse tanks that are plumbed to cause water to flow from one tank to another in the direction opposite of the product flow. Fresh water flows into the rinse tank located farthest from the process tank and overflows, in turn, to the rinse tanks closer to the process tank. This technique is called countercurrent rinsing, because the product and the rinse water move in opposite directions. Over time, the first rinse becomes contaminated with drag-out solution and reaches a stable concentration

that is lower than the process solution. The second rinse stabilizes at a lower concentration, which enables less rinse water to be used than if only one rinse tank were in place. The more countercurrent cascade rinse tanks (three-stage, four-stage, etc.), the less water is needed to adequately remove the process solution.

The rinse rate needed to adequately dilute drag-out solution depends on the concentration of process chemicals in the initial process bath, the concentration of chemicals that can be tolerated in the final rinse tank to meet product specifications, the amount of drag-out carried into each rinse stage, and the number of countercurrent cascade rinse tanks. These factors are expressed in Equation 8-3 below:

$$V_r = \left(\frac{C_o}{C_f}\right)^{1/n} \times V_D \qquad (8\text{-}3)$$

where:

V_r	=	Flow through each rinse stage, gal/min
C_o	=	Concentration of the contaminant(s) in the initial process bath, mg/L
C_f	=	Tolerable concentration of the contaminant(s) in the final rinse to give acceptable product cleanliness, mg/L
n	=	Number of rinse stages used
V_D	=	Drag-out carried into each rinse stage, expressed as a flow, gal/min.

This mathematical rinsing model is based on complete rinsing (i.e., removal of all contaminants from the product) and complete mixing (i.e., homogeneous rinse water). Under these conditions, each additional rinse stage can reduce rinse water use by 90 percent. These conditions are not achieved unless there is sufficient residence time and agitation in the rinse tank. For less efficient rinse systems, each added rinse stage reduces rinse water use by 50 to 75 percent.

Countercurrent cascade rinsing systems have a higher capital cost than an overflow rinse and require more space due to the additional rinse tanks. Also, when countercurrent cascade rinsing is used, the low flow rate through the rinse tanks may not provide the needed agitation for drag-out removal. In such cases, air or mechanical agitation is added to increase rinsing efficiency.

- ***Recycle of Fume Scrubber Water.*** The steel finishing industry commonly uses fume scrubbers to capture acid gases. Scrubber water, which may

contain a dilute caustic solution, is neutralized and continuously recycled to adsorb acid. Makeup water is added to replace water lost through evaporation and water which is blown down to treatment. Blowdown is discharged to end-of-pipe treatment to prevent salts buildup.

- ***Hydrochloric Acid Regeneration.*** This process consists of thermal decomposition of spent pickle liquor, which contains free hydrochloric acid, ferrous chloride, and water. The liquor is heated to remove some of the water through evaporation and to concentrate the solution. The concentrated solution is then further heated to 925°C to 1,050°C. At this temperature, water is completely evaporated and the ferrous chloride decomposes into iron oxide (ferric oxide, Fe_2O_3) and hydrogen chloride (HCl) gas. Equation 8-4 below shows the decomposition process:

$$4\ FeCl_2 + 4\ H_2O + O_2 \text{-----> } 8\ HCl + 2\ Fe_2O_3 \qquad (8\text{-}4)$$

The iron oxide is separated and removed from the system. The hydrogen chloride gas is reabsorbed in water (sometimes rinse water or scrubber water is used), to produce hydrochloric acid solution (generally from 15 percent to 21 percent HCl) which is reused in the pickling operation. There are several types of "roaster" types of process in operation. The basic differences among the processes are the design and operation of the roaster/reactor and the recovery equipment (Reference 8-3).

- ***Effluent-Free Pickling Process with Fluid Bed Hydrochloric Acid Regeneration.*** This pickling process can be operated such that no wastewater is discharged from spent pickle liquor, rinse wastewater, and scrubber water from a hydrochloric acid pickling line. The process is configured as a closed system that uses a fluidized bed reactor "roaster" configuration (hydrochloric acid regeneration is explained in detail above) to thermally decompose spent pickle liquor to hydrochloric acid and iron oxide (Reference 8-4).

Spent pickle liquor is fed via a settling tank and venturi loop into the fluidized bed inside the reactor. The thermal energy from the fluidized bed off-gases is used to concentrate the pickling liquor by evaporation before it is fed to the reactor. The fluidized bed consists of granulated iron oxide. Residual acid and water are evaporated at 850°C and the iron chloride is converted to hydrochloric acid gas. Growth and new formation of iron oxide grains in the fluidized bed are controlled so that a dust-free granulated product is obtained. The iron oxide grains can be used as a raw material to manufacture other products (e.g., as an additive for the production of magnetic tapes, abrasives, tiles, glass, cosmetics and pigments).

Since the fluidized bed process operates at approximately 850°C, rinse and scrubber water from the pickle line can be used at the regeneration plant to cool fluidized bed off-gases, which contain hydrochloric acid vapor and a small amount of iron oxide dust. The off-gases are cooled to approximately 100°C in a venturi scrubber. The thermal energy of the off-gases is used to concentrate the pickling liquor by evaporation before it is fed to the reactor. From the venturi scrubber, the cooled gas stream goes to the absorber, where hydrogen chloride is absorbed with rinse water from the pickling line and fresh water to produce hydrochloric acid. The acid can be recycled directly to the pickling process or placed in a storage tank for later use. Once the fluidized bed off-gases have passed through the scrubbing stages and mist collector, the off-gases are virtually free of hydrochloric acid and are released to the atmosphere.

- ***Sulfuric Acid Recovery.*** To recover sulfuric acid, spent pickle liquor high in iron content is pumped into a crystallizer, where the iron is precipitated (under refrigeration or vacuum) as ferrous sulfate heptahydrate crystals. As the crystals are formed, water is removed with the crystals, and the free acid content of the solution increases to a level that is useable in the pickling operation. The crystals are separated from solution, and the recovered acid is pumped back into the pickling tank. The by-product ferrous sulfate heptahydrate is commercially marketable. The crystals are dried, bagged, and marketed, or sold in bulk quantities. Ferrous sulfate, commonly referred to as "copperas," is used in appreciable quantities in numerous industries, including the manufacture of inks, dyes, paints, fertilizers, and magnetic tapes. It is also used as a coagulant in water and wastewater treatment (Reference 8-3).

- ***Acid Purification and Recycle.*** Acid purification technology is applicable to various acid pickling solutions, such as sulfuric acid, and nitric/hydrofluoric acids used in stainless steel finishing mills. Acid is purified by adsorption on a bed of alkaline anion exchange resin that separates the acid from the metal ions. Acid is desorbed from the resin using water. The process begins by passing spent acid upward through the resin. A metal-rich, mildly acidic solution passes through the resin and is collected at the top of the bed. Water is then pumped downward through the bed and desorbs the acid from the resin. The purified acid solution is collected at the bottom of the bed. This technology can recover approximately 80 percent of the free acid remaining in a spent acid treatment solution.

- ***Nitric-Acid-Free Pickling.*** Nitrates were identified as a pollutant of concern for stainless steel acid pickling operations where nitric acids and combinations of nitric and hydrofluoric acids are used for surface treatments for various grades of stainless steels. When consumed in

drinking water, nitrates may cause health problems in humans, particularly infants. The Agency is considering regulating nitrates/nitrites and is investigating in-process treatment alternatives to eliminate nitrate discharges. The Agency is aware of a proprietary commercial technology that uses a nitric acid free solution that contains an inorganic mineral acid base, hydrogen peroxide, stabilizing agents, wetting agents, brighteners, and inhibitors. This process requires the same equipment as conventional acid pickling processes, with the addition of agitation to the bath to circulate fresh acid to the metal surface. The process is also compatible with acid regeneration. Acid purification and recycle, discussed above, is also an in-process treatment technology that can reduce nitrate discharges significantly.

- ***Effluent-Free Exhaust Cleaning for Stainless Steel Pickling.*** Stainless steel pickling operations using mixed acid, nitric acid, or hydrofluoric acid produce exhaust gases that contain nitrogen oxide and hydrogen fluoride. WAPCs are typically used to treat these exhaust gases, thereby generating wastewater. The Agency is aware of a commercially available technology that uses selective catalytic reduction (SCR) technology to treat exhaust gases from stainless steel pickling operations in lieu of WAPCs (Reference 8-5).

- ***In-Tank Filtration.*** Paper, cloth, or plastic filters are used to extend process bath life through removal of accumulated suspended solids or precipitant. Dissolved contaminants, such as organic constituents, are removed through devices such as granular activated carbon filters.

- ***Magnetic Separation of Fines in Cold Rolling Solution.*** Magnetic separators are sometimes used in the iron and steel industry to extend the life of cold rolling solutions. Magnetic separators are either installed in rolling solution collection tanks or in a side-stream system connected to these tanks. The most effective systems use vertical or horizontal configurations of magnetic rods to remove fines. Well-designed magnetic separators can control the iron content in the rolling solutions to below 100 parts per million (Reference 8-6).

- ***Ion Exchange.*** Ion exchange is a reversible chemical reaction that exchanges ions in a feed stream for ions of like charge on the surface of an ion-exchange resin. Resins are broadly divided into cationic or anionic types. Typical cation resins exchange H^+ for other cations, while anion resins exchange OH^- for other anions. Many types of process wastewater are excellent candidates for ion exchange, including the rinse water from plating processes of lead, nickel, tin, tin-lead, chromium, and zinc.

Ion exchange can be used for both water recycling and/or metal recovery. For water recycling, cation and anion columns are placed in series. The feed stream is deionized and the product water is reused for rinsing. The regenerant from the cation column typically contains metal species (with the exception of chromium, which is captured in the anion column), which can be recovered in elemental form via recovery. The anion regenerant is typically discharged to wastewater treatment. When metal recovery is the only objective, a single or double cation column unit containing selective resin is used. These resins attract divalent cations while allowing monovalent cations to pass, a process usually referred to as metal scavenging. Water cannot be recycled because contaminants other than the target cations remain in the stream exiting the column.

Ion exchange equipment ranges from small, manual, single-column units to multi-column, highly automated units. For continuous service, two sets of columns are necessary. One set handles the service flow, and the other set is regenerated. Thus, two-column metal scavenging and four-column deionizing systems are common. Automatic systems direct the wastewater flow and initiate regeneration with little or no operator interaction. Equipment size is based on flow volume and concentration. Resin capacity varies but often ranges from 1 to 2 pounds per cubed feet. Columns are typically sized to handle wastewater flow for at least a period of time equal to the time required for regeneration. Automatic systems are sized to provide continuous service. Regeneration volume typically ranges from 2 to 4 resin bed volumes of dilute acid or caustic.

- ***Evaporation with Condensate Recovery.*** Evaporation is a common chemical recovery technology. There are two basic types of evaporators: atmospheric and vacuum. Atmospheric evaporators, the more prevalent type, are relatively inexpensive to purchase and easy to operate. Vacuum evaporators are mechanically more sophisticated and are more energy-efficient. Vacuum evaporators are typically used when evaporation rates greater than 50 to 70 gallons per hour are required. Additionally, with vacuum evaporators, evaporated water can be recovered as a condensate and reused on site.

  A disadvantage of evaporation-based recovery is that all drag-out, including unwanted contaminants, are returned and accumulate in the process bath. For this reason, deionized water is preferred as rinse water to prevent the introduction of water contaminants in the process bath.

- ***Best Management Practices.*** There are many plant maintenance and good housekeeping management practices that can be applied at all iron and steel facilities: training and supervision, production planning and sequencing, process or equipment modification, raw material and product substitution

or elimination, and loss prevention and housekeeping (Reference 8-7). These alternatives are discussed below:

— Training and Supervision. Training and supervision ensures that employees are aware of, understand, and support the company's waste minimization goals. These goals are translated into practical information that will enable employees to minimize waste generation through the proper and efficient use of tools, supplies, equipment, and materials.

— Production Planning and Sequencing. Production can be planned to minimize the number of steps and eliminate unnecessary procedures (e.g., plan production to eliminate additional cleaning steps between incompatible operations).

— Process or Equipment Modification. Processes and equipment can be modified to minimize the amount of waste generated (e.g., reducing drag-out by slowing the withdrawal speed of part, installing electrolytic recovery units).

— Raw Material and Product Substitution or Elimination. Where possible, raw materials or products should be replaced with other materials that produce either less waste and/or less toxic waste (e.g., replacing chromium-bearing solutions with non-chromium-bearing and less toxic solutions, consolidating types of cleaning solutions and machining coolants).

— Oil Management and Preventive Maintenance. Where possible, sites should remove oil in recycle treatment, recycle used oil, and ensure integrity of process area containment systems.

— Loss Prevention and Housekeeping. Loss prevention and housekeeping includes performing preventive maintenance and managing equipment and materials to minimize leaks, spills, evaporative losses, and other releases (e.g., inspecting the integrity of tanks on a regular basis, using chemical analyses instead of elapsed time or amount of product processed as the basis for disposal of a solution). Solution testing is one important loss prevention alternative. The chemical make-up of cleaning solutions changes over time due to evaporative losses, additions of water, drag-out of cleaning chemicals, consumption of bath chemistry, chemical reactions, and drag-in of impurities. Because of these factors, cleaning baths lose strength, performance declines, and solutions require disposal. Many sites operate cleaning baths with a schedule consisting of three steps: formulate, use, and discard.

This procedure can be expensive and inefficient from a production standpoint, and creates large volumes of waste. For this reason, sites should frequently determine the strength of the cleaning solution and appropriate chemical additions needed to continue solution use. By implementing a program of testing and record keeping, sites can reduce the disposal frequency of cleaning baths.

— Waste Segregation and Separation. Mixing different types of wastes or mixing hazardous wastes with nonhazardous wastes should be avoided. Recyclable materials should not be mixed with incompatible materials or wastes. For example, hexavalent-chromium-bearing wastewater can be separated for preliminary treatment.

Other in-process treatment technologies that could be applied to pickling and electroplating wastewater generated by the steel finishing industry include electrowinning and reverse osmosis. Electrowinning can recover metals from ion exchange regenerants and return the metals to the plating bath. Reverse osmosis is a membrane technology that can be used to recover metal salts and generate a treated water stream that can be recycled for use as a rinse water. Neither of these technologies were reported in industry survey responses as a metals recovery technology; however, these technologies are commonly used in similar electroplating operations and are therefore applicable to the iron and steel finishing industry (Reference 8-8). For more information on these processes and other potentially applicable in-process treatment technologies, refer to the Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Metals Products and Machinery Point Source Category (Reference 8-8).

8.1.2 End-of-Pipe Treatment Technologies

The following subsections discuss the various end-of-pipe wastewater treatment technologies applicable to iron and steel facilities.

- Flow equalization;
- Cooling technologies;
- Coke plant treatment technologies;
- Cyanide treatment technologies;
- Oily wastewater treatment technologies;
- Metals treatment technologies;
- Solids handling technologies; and
- Polishing technologies.

Table 8-2 summarizes the end-of-pipe wastewater treatment and disposal technologies for all of these subsections.

Flow Equalization

Flow equalization is a critical treatment component to achieve consistent wastewater treatment performance for end-of-pipe treatment systems at all iron and steel facilities. Flow equalization before ammonia distillation and biological treatment at by-product recovery cokemaking facilities, and before chemical precipitation and clarification systems at integrated, non-integrated, and stand-alone facilities dampen fluctuations (reduce variability) in flow and influent wastewater quality. For by-product recovery cokemaking, flow equalization can also eliminate shock loadings of inhibitory substances to the biological treatment system. The effluent quality and thickening performance of secondary clarifiers following biological treatment is also improved as a result of constant solids loadings. Flow equalization improves the performance of chemical precipitation systems as a result of improved chemical feed control and process reliability. Eliminating rapid flow increases to gravity clarification equipment lessens the chance of disrupting the sludge bed. For multimedia filtration systems, flow equalization results in a constant media filtration surface area requirement and more uniform filter-backwash cycles.

The key design parameter for flow equalization is the required tank volume. Another key component of the equalization tank system is mixing. Two types of mixing are typically observed in equalization systems: conventional top or side-mount impeller mixers and a pump system that continuously removes a portion of the wastewater from the tank and reintroduces it into the untreated wastewater flow.

Cooling Technologies

Cooling technologies are used to attain water temperatures appropriate to facilitate end-of-pipe treatment and for reuse in high-rate recycle systems. Cooling is used in recirculation systems for blast furnace, vacuum degassing, continuous casting, and hot forming operations. Cooling is also commonly used prior to biological treatment systems at by-product recovery cokemaking plants to prevent water temperatures detrimental to biomass.

- ***Cooling Towers.*** Counterflow induced draft cooling towers are common in the iron and steel industry. The counterflow arrangement is superior to the cross-flow tower for greater cooling ranges (Reference 8-9). Performance of a given cooling tower is governed by the ratio of the weights of air to water and the time of contact between water and air. The time of contact between water and air is governed largely by the time required for the water to discharge from the nozzles and fall through the tower to the basin. The time of contact is therefore obtained in a given type of unit by varying the height of the tower.

- ***Shell-and-Tube Heat Exchangers.*** This is an indirect contact device that facilitates the transfer of heat from one fluid stream to another. Counterflow, shell-and-tube heat exchangers are common in the iron and steel industry. Liquid to be cooled or heated is pumped through tubes that run the length of the shell of the heat exchanger while another liquid to be

cooled or heated is pumped through the shell and passes over the tubes. Baffles placed along the shell direct the flow in the shell over the tubes to promote turbulence and support tubes in horizontal units.

Coke Plant Treatment Technologies

By-product recovery cokemaking operations produce wastewater containing nutrients such as ammonia and dissolved organic matter, including phenols, volatile organic compounds (VOCs), and polyaromatic hydrocarbons (PAHs), which if discharged untreated can result in growth of microbial populations and vegetation that deplete the oxygen concentration of the receiving stream to levels which can not support aquatic organisms. In the cokemaking industry, tar filtration, ammonia distillation, and biological treatment systems can be used to remove nutrients and dissolved organic matter from wastewater. Each of these types of treatment systems is described below.

- ***Tar Removal.*** Tar decanters are used to recover oil and tar from excess ammonia liquor generated during cokemaking. A mechanical filter can be placed on the tar decanter effluent to prevent residual tar and oil from entering the ammonia distillation system. The multiple tube filter uses a filter element made from porous aluminum oxide ceramic that can remove particulate as fine as 0.3 microns with flow rates of approximately 2 gallons per minute per square foot ($gal/min/ft^2$). At the end of each filtration cycle, collected solids are removed from the filter by backwashing. Removing the large-chained organic compounds present in tar significantly reduces the carbonaceous biochemical oxygen demand ($CBOD_5$) of cokemaking wastewater.

- ***Free and Fixed Ammonia Distillation (Stripping).*** Ammonia stripping is the transfer of gas (ammonia) dissolved in a liquid (waste ammonia liquor) into a gas stream (steam). In the cokemaking industry, flushing liquor is pumped to the top of a tray-type distillation tower and steam is injected into the base. As the rising steam passes through the boiling ammonia liquor moving down the tray tower, ammonia is transferred from the liquid to the gas phase, eventually passing out the top of the tower. The hot, ammonia-rich steam is collected, cooled, and typically treated with sulfuric acid to form ammonium sulfate, a by-product that can be shipped off site for use as a fertilizer. Liquid collected from the bottom of the stripping tower is cooled and transferred to a holding tank prior to further on-site treatment to remove any residual ammonia, or before discharge to the publicly owned treatment works (POTW).

  The efficiency of the stripping tower is a related to the number of trays (transfer units) that the liquid must pass over before reaching the bottom. Therefore, the higher the tower, the more trays and greater ammonia removal efficiency. The tower diameter is a function of the flow rate to the

system. Ammonia stripping towers in the cokemaking industry typically range in height from 30 feet to over 100 feet, with diameters ranging between 4 and 8 feet.

- ***Biological Nitrification.*** Biological nitrification is the aerobic process of converting ammonia to nitrate in a conventional activated sludge system configured with an aeration tank, a clarifier, and return sludge equipment. Figure 8-1 presents a process flow diagram of a typical biological nitrification system. Diffused or mechanical aeration achieve the aerobic environment in the reactor and also serves to maintain the mixed liquor in a completely mixed regime. After a specified period of time, the mixture of new bacterial cells and old bacterial cells passes into a settling tank where the cells are separated from the treated wastewater. A portion of the settled cells is recycled to maintain the desired concentration of organisms in the reactor, and a portion is wasted. In the activated sludge nitrification process, the ammonium ion is converted to nitrate in two steps by autotrophic bacteria, as summarized by the following reactions (Reference 8-10):

$$NH_4^+ + 3/2\ O_2 \text{ ----> } NO_2^- + 2H^+ + H_2O \qquad (8\text{-}5)$$

$$NO_2^- + 1/2\ O_2 \text{ ----> } NO_3^- \qquad (8\text{-}6)$$

In addition to obtaining energy from the reaction shown above, the bacteria assimilates a portion of the nitrogen into the cell tissue as shown by the following reaction:

$$4CO_2 + HCO_3^- + NH_4^+ + H_2O \text{ ----> } C_5H_7NO_2 + 5O_2 \qquad (8\text{-}7)$$

As shown in Equation 8-7, the nitrifying autotrophic bacteria use carbon dioxide and bicarbonate as a carbon source. The most important factor in controlling the nitrification system is the sludge retention time (SRT). Other significant factors on affecting nitrification include hydraulic retention time (HRT), ammonia and nitrite concentrations, the BOD_5/TKN ratio, dissolved oxygen concentration, temperature, and pH.

- ***Biological Denitrification.*** Biological denitrification (anaerobic) is applicable to the treatment of cokemaking wastewater following biological nitrification. Denitrification is a metabolic process in which nitrate is converted to nitrogen gas in the presence of a combined hydrogen source and a lack of free oxygen. The bacteria that are able to reduce nitrate are facultative heterotrophs of the genera Pseudomonas, Micrococcus, Achromobacter, and Bacillus (Reference 8-11). The reaction involves the transfer of electrons from organic carbon (oxidation) to nitrate (reduction) promoting its conversion to nitrogen gas. The biochemical pathway in

which nitrate is substituted for oxygen as the final electron acceptor in the electron transport chain is thermodynamically less favorable than if oxygen were the final electron acceptor. In the presence of free oxygen, denitrification ceases and typical aerobic oxidation predominates. Denitrification is typically referred to as anoxic respiration since it is an aerobic process in the absence of free oxygen.

The anoxic process, like the aerobic process, utilizes organic carbon to maintain cellular respiration and synthesis of biomass. The carbon can be derived from either the endogenous decay of biomass or from an external source, such as added methanol or organic materials already in the waste. The majority of denitrification systems operating in the United States use methanol as their carbon source. The equations below show the balanced stoichiometric reactions for the conversion of nitrate to nitrogen gas with either methanol (Equation 8-8) or acetic acid (Equation 8-9) as the carbon source (Reference 8-10).

$$NO_3^- + 1.08\ CH_3OH + H^+ \text{----}> 0.065\ C_5H_7O_2N + 0.47\ N_2 + 0.76\ CO_2 + 2.44\ H_2O \quad (8\text{-}8)$$

$$NO_3^- + 0.65\ CH_3COOH \text{----}> 0.5\ N_2 + 1.3\ CO_2 + 0.9\ H_2O + 0.8\ OH^- \quad (8\text{-}9)$$

For denitrification of cokemaking wastewater, two treatment options are applicable: 1) a unit in which all the flow from the biological nitrification system enters the denitrification system; or 2) a recycle system in which a portion of the effluent from the biological nitrification system is returned to the beginning of the treatment system and mixed with fresh wastewater. Figure 8-2 presents denitrification systems. For the end-of-pipe denitrification system, a supplemental carbon source such as methanol would be required to convert nitrate to nitrogen gas. For the recycle system, recycle equipment and tanks would be required to handle recycle volumes approximately 3 to 4 times the original wastewater flow.

Cyanide Treatment Technologies

Cyanide is present in process wastewater from by-product recovery cokemaking, blast furnace, and sintering operations. In biological treatment, many microorganisms can acclimate to relatively high concentrations of cyanides and have been documented to successfully treat wastewaters with concentrations up to 30 mg/L (Reference 8-12). The following treatment options are applicable to by-product recovery cokemaking (as add-ons to biological treatment), blast furnace ironmaking, and sintering wastewater for cyanide removal.

- ***Cyanide Precipitation.*** Cyanide precipitation combines cyanide in the waste ammonia liquor from cokemaking with iron to form an insoluble

iron-cyanide complex that can be precipitated and removed by gravity settling. The process can be illustrated by the following chemical reaction:

$$3CN^- + Fe^{+3} \text{ ----> } FeCN_3 \qquad (8\text{-}10)$$

Excess iron is typically added in the form of ferric sulfate ($Fe_2(SO_4)_3$) and the pH is adjusted to approximately 4.5 using sulfuric acid. Following complex formation, polymer is added to flocculate the iron-cyanide particulates, allowing them to settle in a gravity clarifier. Effluent from the gravity clarifier can be pH adjusted to neutral prior to discharge, or the pH can be raised to approximately 9 to precipitate any residual metals.

- ***Alkaline Chlorination.*** Alkaline chlorination can be applied to both cokemaking and blast furnace ironmaking wastewater for the destruction of cyanide, phenolics, and ammonia. An alkaline chlorination unit uses sodium hypochlorite or chlorine gas in a carefully controlled pH environment to remove cyanide and ammonia. The process oxidizes cyanide to bicarbonate and nitrogen gas, and ammonia to nitrogen gas and water, as illustrated by the following chemical reactions (Reference 8-12):

  Cyanide:

  $$CN^- + OCl^- \text{ ----> } CNO^- + Cl^- \qquad (8\text{-}11)$$

  $$CNO^- + 1.5OCl^- \text{ ----> } HCO_3^- + 1/2N_2 + 1.5Cl^- + 1/2H^+ \qquad (8\text{-}12)$$

  Ammonia:

  $$2NH_4^+ + 3HOCl \text{ ----> } N_2 + 3H_2O + 3HCl + 2H^+ \qquad (8\text{-}13)$$

  The alkaline chlorination process oxidizes cyanides to carbon dioxide and nitrogen, and ammonia to nitrogen and hydrochloric acid. The equipment consists of two reaction tanks, each with an agitator and a pH and oxidation-reduction potential (ORP) controller. The first step (tank 1) of the reaction oxidizes cyanides to cyanate. To affect the reaction, sodium hypochlorite is metered into the reaction tank as necessary to maintain the ORP at 350 to 400 millivolts, and aqueous sodium hydroxide is added to maintain a pH of 10 to 11. In the second step (tank 2), the ORP and the pH level are maintained at 600 millivolts and 8 to 9, respectively, to oxidize cyanate to carbon dioxide and nitrogen. Each step has an agitator designed to provide approximately one turnover per minute.

  Alkaline chlorination can be performed at ambient temperature and automatically controlled and is capable of achieving effluent levels of cyanide that are below detection. However, the reaction must occur at

carefully controlled pH levels and has the possibility of chemical interferences when treating mixed wastes. The effectiveness of the unit depends on the pretreatment and segregation of cyanide waste streams and the careful control of the pH. The size and type of system is solely dependent on the cyanide waste stream flow volume. Another disadvantage is that oxidation of organic compounds using chlorine has the potential to form trihalomethanes.

- ***Ozone Oxidation.*** Another less common cyanide treatment method is ozone oxidation. Ozone gas is bubbled through a wastewater solution containing cyanide. A portion of the ozone in the gas phase is transferred to the liquid where it reacts with cyanide, converting it to cyanate. Additional ozone reacts with the cyanate for complete conversion to nitrogen gas, ammonia, and bicarbonate as shown by the reaction below:

$$CN^- + O_3 \text{ ----> } CNO^- + O_2 \qquad (8\text{-}14)$$

$$3CNO^- + 2O_3 + 2OH^- + 2H_2O \text{ ----> } 3HCO_3^- + NH_3 + N_2 + 2O_2 \qquad (8\text{-}15)$$

The reaction rate is limited by mass-transfer of ozone to the liquid, the cyanide concentration, and temperature (Reference 8-13). Ozone is not effective in treating metallocyanide complexes, such as ferrocyanide, unless ultraviolet light is added to the reaction vessel.

One advantage of ozone over chlorine is the type of residuals formed. Oxidation of organic compounds using chlorine has the potential to form trihalomethanes, which are suspected carcinogens. Ozone oxidation of organic compounds forms short chained organic acids, ketones, and aldehydes instead. Equipment required for ozone oxidation of cyanides includes an ozone generator, gas diffusion system, a mixed reaction tank, and off-gas controls to prevent the release of unreacted ozone. The major disadvantages of the ozone oxidation process are the operating costs and the capital costs of the ozone generating and transfer equipment and off-gas control system.

Oily Wastewater Treatment Technologies

Hot forming and cold rolling operation wastewaters contain high levels of O&G. For hot forming operations, scale pits and roughing clarifiers fitted with oil skimmers remove nonemulsified O&G from high-rate recycle systems. Section 8.1.1 discusses these technologies. Oily wastewater generated by cold rolling operations contain some emulsified oils that require chemical treatment prior to removal. The following describes technologies that can be used to remove both emulsified and nonemulsified oils.

- ***Oil Removal by Gravity Flotation.*** O&G present in iron and steel wastewater can either be emulsified or nonemulsified. The characteristics of emulsified oils vary widely, depending on the types of oils used in the process. If wastewater contains emulsified oils, chemical treatment is required to separate the oils from solution prior to other treatment steps. Oil skimming can be used for nonemulsified oil treatment. The wastewater is discharged through a tank or basin of sufficient size and design to allow the oil to separate and rise to the surface. At the surface, the oil is contained by the underflow baffles and skimmed. Common separation devices that can be used for separation of nonemulsified oils include American Petroleum Institute (API) separators, disk, belt, and rotating drum oil skimmers, and coalescers.

  Skimming is a simple method for separating floating oil from cleaning solutions. Skimming devices are typically mounted onto the side of a tank and operate on a continuous basis. The disk skimmer consists of a vertically rotating disk (typically 12 to 24 inches in diameter) that is partially submerged into the liquid of a tank (typically to a depth of 4 to 12 inches below the liquid surface). The disk continuously revolves between spring loaded wiper blades that are located above the liquid surface. The adhesive characteristics of the floating oil cause the oil to adhere to the disk. The oil is removed from the disk as the disk surface passes through the wiper blades and is diverted to a run-off spout for collection. Maximum skimming rates are typically in the range of 2 to 10 gallons per hour of oil. Belt and drum skimmers operate in a similar manner, with either a continuous belt or drum rotating partially submerged in a tank. As the surface of the belt or drum emerge from the liquid, the oil that adheres to its surface is scraped (drum) or squeezed (belt) off and diverted to a collection vessel.

  Coalescers are typically designed as tanks containing a coalescing media that accelerates phase separation. Cleaning solution and oil are removed from the process tank by a suction skimmer and pumped to the coalescer. The media in the coalescers is a material such as polypropylene, ceramic, or glass which attracts oil in preference to water (i.e., oleophilic). The oil/cleaner mixture passes through the unit and the oil adheres to the coalescing media. The oil forms droplets that conglomerate and rise to the surface of the tank where the oil is removed by a skimming device or weir (Reference 8-14).

- ***API Oil/Water Separators.*** The API oil/water separator is typically a rectangular basin, designed with baffles to trap sediments and retain floating oils, that can achieve 150-micron droplet oil removal as per API standards. This separator is used for wastewater containing oil with heavy solids content or when long retention times are required. Standard

configurations of these systems include surface oil skimmers, sloped bottoms, and augers to remove collected sludge.

- ***Oil Removal by Emulsion Breaking and Dissolved Air Flotation.*** If wastewater contains emulsified oils, chemical treatment is required to separate the oils from solution prior to other treatment steps. Chemical treatment is used to break stable oil/water emulsions (oil dispersed in water, stabilized by electrical charges and emulsifying agents). A stable emulsion will not separate without chemical treatment. Chemical emulsion breaking is applicable to wastewater streams containing emulsified coolants and lubricants. This technology is also applicable to cleaning solutions that contain emulsified oils.

  The major equipment required for chemical emulsion breaking includes reaction chambers with agitators, chemical storage tanks, chemical feed systems, pumps, and piping. Factors to be considered for destroying emulsions are type of chemicals, dosage and sequence of addition, pH, mixing, heating requirements, and retention time. Chemicals (e.g., polymers, alum, ferric chloride, and organic emulsion breakers) destroy emulsions by neutralizing repulsive charges between particles, precipitating or salting out emulsifying agents, or weakening the interfacial film between the oil and water so it is readily broken. Reactive cations (e.g., H^{+}, Al^{+3}, Fe^{+3}) and cationic polymers are particularly effective in destroying dilute oil/water emulsions. Once the charges have been neutralized or the interfacial film broken, the small oil droplets and suspended solids either adsorb on the surface of the floc that is formed or break out and float to the top. Different types of emulsion-breaking chemicals are used for different types of oils. If more than one chemical is required, the sequence of addition can affect both breaking efficiency and chemical dosages.

  Solid wastes generated by chemical emulsion breaking include surface oil and oily sludge, which are usually contract hauled for disposal by a licensed contractor. If the recovered oil has a sufficiently low percentage of water, the oil may be burned for its fuel value or processed and reused.

  Dissolved air flotation combined with chemical emulsion breaking is an effective method of oil removal. With dissolved air flotation, air is injected into a fluid under pressure. The amount of air that can dissolve in a fluid increases with increasing pressure. When the pressure is released, the air comes out of solution as bubbles that attach to O&G particles, thus "floating" the O&G to the surface. There are two types of operational modes for dissolved air flotation systems, full flow pressurization and recycle pressurization. In full flow pressurization, all influent wastewater is pressurized and injected with air. The wastewater then enters the flotation unit where the pressure is relieved and bubbles form causing the O&G to

rise to the surface. In a recycle pressurization system, part of the clarified effluent is recycled back to the influent of the dissolved air flotation unit, then pressurized and supersaturated with air. The recycled effluent then flows through a pressure release valve to the flotation unit.

- ***Oil Removal by Ultrafiltration.*** Ultrafiltration is a pressure-driven membrane process that separates emulsified oils without the need for chemical emulsion breaking. Using an applied pressure difference across a membrane, solvent and small solute species pass through the membrane and are collected as permeate while larger compounds are retained by the membrane and are recovered as concentrate.

  Ultrafiltration is used to remove materials ranging from 0.002 to 0.2-microns or molecular-weights from 500 to 1,000,000 (e.g. oil emulsion and colloidal silica) (Reference 8-15). Prefiltration of the ultrafiltration influent is advisable to remove large particles and free oil to prevent membrane damage and membrane fouling. Many ultrafiltration membranes are typically made of homogeneous polymer or copolymer material. The transmembrane pressure required for ultrafiltration typically ranges between 15 to 200 pounds per square inch and is dependant on membrane pore size.

  Ultrafiltration results in a concentrated oil phase that is 2 to 5 percent of the influent volume (Reference 8-8). Oily concentrates are typically contract hauled or incinerated and the permeate (water phase) can either be treated further to remove water soluble metals and organic constituents or be directly discharged, depending on local and state requirements.

  The ultrafiltration system includes a number of components such as pumps and feed vessels, piping or tubing, monitoring and control units for temperature, pressure and flow rate, process and cleaning tanks, and membranes. Membranes are specifically designed to handle various waste stream parameters, including temperature, pH, and chemical compatibility. Membranes can be purchased in several different configurations, including hollow fiber, tubular, flat plate, and spiral wound (Reference 8-15). The configuration selected for each application is dependent on the type of application. For example, tubular membranes are commonly used to separate suspended solids, whereas spiral wound membranes are used to separate oil from water. The spiral wound design ultrafiltration membranes have a high membrane packing density and effective mass transfer characteristics.

Metals Treatment Technologies

Dissolved and total metals are present in high-rate recycle system blowdown wastewater from blast furnace, sintering, basic oxygen furnace (BOF), vacuum degassing, and continuous casting operations at levels that require treatment before discharge. Pickling, electroplating, and other steel finishing processes also generate wastewater containing dissolved and total metals. If left untreated, metals can accumulate in the environment to levels which become toxic to humans, terrestrial and aquatic organisms, and plants.

Chemical precipitation followed by gravity sedimentation is the treatment technology most commonly used by the industry to remove dissolved and total metals from wastewater. Hexavalent chromium reduction is used as a pretreatment step prior to hydroxide precipitation for hexavalent-chromium-bearing wastewater generated in steel finishing. The following discusses hexavalent chromium reduction, chemical precipitation, and solids removal technologies, including gravity clarification and membrane separation.

- ***Hexavalent Chromium Reduction.*** Reduction is a chemical reaction in which electrons are transferred from one chemical (the reducing agent) to the chemical being reduced. Sulfur dioxide, sodium bisulfite, sodium metabisulfite, and ferrous sulfate form strong reducing agents in water. They are used at iron and steel finishing sites to reduce hexavalent chromium to the trivalent form, which allows the metal to be removed from solution by chemical precipitation. The reaction in these processes is illustrated for the following sulfur dioxide reaction (reduction using other reagents is chemically similar):

  $$2H_2CrO_4 + 3SO_2 \text{ ----> } Cr_2(SO_4)_3 + 2H_2O \qquad (8\text{-}16)$$

  An operating pH level between 2 and 3 is normal. At pH levels above 5, the reduction rate is slow and oxidizing agents such as dissolved oxygen and ferric iron interfere with the reduction process by consuming the reducing agent.

  A typical treatment involves retention in a reaction tank for 45 minutes. The reaction tank is equipped with pH and ORP controls. Sulfuric acid is added to maintain a pH of approximately 2.0, and a reducing agent is metered to the reaction tank to maintain the ORP at 250 to 300 millivolts. The reaction tank is equipped with an impeller designed to provide approximately one bath volume per minute.

  Chemical reduction of hexavalent chromium is a proven technology that is widely used at iron and steel finishing sites. Operation at ambient conditions requires little energy and the process is well suited to automatic control.

- ***Chemical Precipitation.*** Chemical precipitation involves the removal of metallic contaminants from aqueous solutions by converting soluble, heavy metals to insoluble salts. The precipitated solids are then removed from solution by flocculation followed by sedimentation and/or filtration. Precipitation is caused by the addition of chemical reagents that adjust the pH of the water to the minimum solubility of the metal. The standard reagents include the following:

  — Lime (calcium hydroxide);
  — Caustic (sodium hydroxide);
  — Magnesium hydroxide;
  — Soda ash (sodium carbonate);
  — Trisodium phosphate;
  — Sodium sulfide; and
  — Ferrous sulfide.

  These reagents precipitate metals as hydroxides, carbonates, phosphates, and sulfides. Metals commonly removed from solution by precipitation include arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

  Figure 8-3 presents a flow diagram of the typical precipitation process for metals removal. A chemical precipitant is added to the metal containing water in a stirred reaction vessel. The dissolved metals are converted to an insoluble form by a chemical reaction between the soluble metal and the precipitant. The suspended particles are then flocculated and either settled in the batch tank or passed to a membrane filter. Granular media filtration can be used to polish any suspended metal precipitates that do not settle in the reaction tank.

  Hydroxide precipitation is the prevalent type of chemical precipitation. Hydroxide precipitation normally involves the use of calcium hydroxide (lime), sodium hydroxide (caustic), or magnesium hydroxide as a precipitant to remove metals as insoluble metal hydroxides. The reaction is illustrated by the following equation for precipitation of a divalent metal using sodium hydroxide:

  $$M^{++} + 2NaOH \text{ ----> } M(OH)_2 + 2Na^{+} \qquad (8\text{-}17)$$

  The effluent metals concentration attained by hydroxide precipitation is dependent on the metals present, precipitant used, the reaction conditions, especially pH, and the presence of other materials that may inhibit precipitation. Effluent metals concentrations of less than 1 mg/L, and sometimes less than 0.1 mg/L, are achievable by hydroxide precipitation.

The solubility of the metal is directly related to the pH of its environment. Many metals can form low solubility hydroxides in the pH range of 8.5 to 11.5. However, several metallic compounds are amphoteric and exhibit a rigid point of minimum solubility. Any further addition of alkali can drastically increase the solubility of the compound. Different metals have various minimum solubility points, which can pose a challenge when aqueous waste streams have highly variable metal compositions. Figure 8-4 shows the minimum solubilities of some common metals at various pH values.

The solubility curves in Figure 8-4 indicate achieving the minimum solubility of all metals at a single operating pH would be difficult. At a pH at which the solubility of one metal hydroxide may be minimized, the solubility of another may be relatively high. In the majority of cases, a pH between 9 and 11, selected on the basis of jar tests or operating experience with the water, produces an acceptable effluent quality. For a waste containing several metals, however, more than one precipitation stage with different pH control points may be required to remove all the metals of concern to the desired level.

Removal of precipitated metals typically involves the addition of flocculating agents or polymers to destabilize the hydrodynamic forces that hold the particle in suspension. For a continuous system, polymer is normally added in-line between the reaction tank and the flocculation tank. In the flocculation tank, the mixer is slowed to promote agglomeration of the particles until their density is greater than water and they settle from solution in the clarifier.

- ***Clarification.*** Gravity sedimentation to remove solids is a common method of clarification used in recycle and end-of-pipe systems within the iron and steel industry. High-efficiency clarifiers are used for end-of-pipe treatment and ironmaking and integrated steelmaking recycle systems that do not require water quality equivalent to filtered effluent for reuse in manufacturing processes. In continuous casting and hot forming recycle systems, it is good practice to pump contact cooling waters that collect in scale pits to a roughing clarifier for coarse solids removal prior to filtration, cooling, and recirculation. To improve the performance of high-efficiency and roughing clarifiers, coagulants such as polymers are added. These coagulant aids enhance solids removal by aiding in the formation of larger, more readily settleable particles. Two important design parameters for roughing and high-efficiency clarifiers include both the surface area of the clarifier and the detention time. Like high-efficiency clarifiers, roughing clarifiers are normally designed on the basis of a surface-loading rate expressed as gallons per day per square foot of surface area (gal/day/ft^2) and provide 90 to 150 minutes of detention based on the average flow rate

(Reference 8-9). The surface-loading rate depends on the type of material to be separated. The table below shows the range of surface loading rates for high-efficiency clarifiers (Reference 8-11).

Suspension	Range gal/day/ft^2	Peak Flow gal/day/ft^2
Activated sludge solids	590 - 785	1,460
Alum floc	613 - 1,200	1,200
Iron floc	613 - 1,200	1,200
Lime floc	730 - 1,460	1,460
Untreated wastewater	613-1,200	1,200

However, unlike more efficient clarifiers, roughing clarifiers are designed to remove large solids that rapidly settle. Therefore, surface loading rates may be three to four times those observed for high-efficiency clarifiers presented in the table. When the area of the tank has been established, the detention period in the tank is governed by the water depth. Open-top circular or rectangular shaped clarifiers are typically used for sedimentation of biological treatment solids from nitrification in the cokemaking industry.

For sedimentation of iron-cyanide solids from the treatment of cokemaking wastewater, inclined tube or lamella clarifiers are commonly used. Depending on land availability and wastewater flow rates, open-top, inclined tube, or lamella clarifiers are used for sedimentation of metal hydroxides generated from treatment of ironmaking, steelmaking, and steel finishing wastewater. The inclined tubes in the clarifier are oriented at angles varying between 45 and 60 degrees from the horizontal plane. Although the tube may be shaped in many forms, rectangular or square shapes are more common. Water enters the tank and solids settle to the tank bottom. As the water continues upward through the tubes, additional solids settle on the lower side of the tube. The clarified effluent continues up through the tube and passes over the weir. The solids collect and agglomerate on the lower side of the tube and because of the tube inclination, slide downward through the tube. They then drop back into the settling tank, where they collect on the bottom, and are scraped away into a sludge hopper before discharge to the thickener. The area covered by the lamella plates is typically 65 to 80 percent of the clarifier area required for a circular clarifier. Their design promotes laminar flow within the tubes, even when the water throughput is relatively high.

- ***Microfiltration for Precipitated Metals Removal.*** Chemical precipitation converts soluble metals into insoluble solids. One alternative to conventional clarifiers for removal of the insoluble solids is microfiltration.

Microfiltration has been observed at facilities manufacturing metal products and machinery and could potentially be used to remove solids from chemical precipitation effluents at iron and steel facilities (Reference 8-8). Microfiltration is a pressure-driven membrane process used to separate solution components based on molecular size and shape. Using an applied pressure difference across a membrane, solvent and small solute species pass through the membrane and are collected as permeate while larger compounds are retained by the membrane and are recovered as concentrate.

Microfiltration is used to remove materials ranging from 0.1 to 1.0-microns (e.g., colloidal particles, heavy metal particulates and their hydroxides). Numerous microfiltration membranes are isotropic in morphology and are typically made of homogeneous polymer material. Prefiltration is advisable for suspended solids loads above 200 mg/l. The transmembrane pressure required for microfiltration typically ranges between 3 to 50 pounds per square inch (psi) and is dependant on membrane pore size.

Microfiltration results in a concentrated suspended solid slurry that is typically discharged to dewatering equipment, such as a sludge thickener and filter press. The permeate can either be treated further for pH adjustment or be directly discharged, depending on local and state requirements. The microfiltration system includes a number of components such as pumps and feed vessels, piping or tubing, monitoring and control units for temperature, pressure and flow rate, process and cleaning tanks, and membranes. Membranes are specifically designed to handle various waste stream parameters, including temperature, pH, and chemical compatibility. Membranes can be purchased in several different configurations, including hollow fiber, tubular, flat plate, and spiral wound. The configuration selected for each application depends on the type of application. For example, tubular membranes are commonly used to separate suspended solids, whereas spiral wound membranes are used to separate oils from water. The tubular design microfiltration membranes are the least likely to foul with heavy suspended solids loadings and are easy to clean.

Polishing Technologies

Polishing technologies are the final treatment steps designed to remove residual, low concentrations of target pollutants from iron and steel wastewaters prior to discharge. Examples of polishing technologies include multimedia filters following clarification to remove small concentrations (less than 20 mg/L) of entrained suspended solids or carbon adsorption to remove trace concentrations of organic pollutants remaining in cokemaking wastewater following biological treatment. The following paragraphs describe each of these polishing technologies observed at iron and steel facilities.

- ***Multimedia Filtration (mixed-media filtration).*** Multimedia filtration, one of the oldest and most widely applied types of filtration for the removal of suspended solids from aqueous liquid streams, utilizes a bed of granular particles as the filter medium. Granular media filters are used to remove suspended solids from cokemaking wastewater following biological treatment, from high-rate recycle cooling water and blowdown water from blast furnace ironmaking, sintering, continuous casting, and hot forming operations. The bed may consist of one type of medium (e.g., sand) of same particle size, or multiple particle size. Different types of media (e.g., sand and gravel, sand and anthracite) with differing densities and different particle sizes, comprise the bed of a multimedia filter (Reference 8-9). Multimedia filters can be more efficient but more expensive and complex than single-media filters. The filter bed is contained within a basin or tank and is supported by an underdrain system, which allows the filtered liquid to be drawn off while retaining the filter medium in place. As suspended particle-laden water passes through the bed of the filter medium, particles are trapped on top of and within the bed. Once the pressure drop across the filter is large enough to impede flow, the filter is backwashed and the backwash water is typically sent to clarifiers or gravity thickeners.

- ***Granular Activated Carbon.*** Activated carbon adsorption has been observed as a polishing treatment step to remove residual concentrations of phenol and PAHs from cokemaking wastewater following biological treatment. It removes dissolved organic compounds from wastewater streams via adsorption. Activated carbon can also be used as a final treatment step to remove dioxins and furans from sinter plant wastewater or phenols from blast furnace ironmaking wastewater. Adsorption is a natural process by which molecules of a dissolved compound collect on and adhere to the surface of an adsorbent solid. Adsorption occurs when the attractive forces at the carbon surface overcome the attractive forces of the liquid. Activated carbon is a well-suited medium for this process due to its large internal surface area, high attraction to adsorbates (pollutants to be removed), and hydrophobic nature (i.e., water will not occupy bonding sites and interfere with the adsorption of pollutants). Pollutants in the wastewater bond to the activated carbon grains until all the surface bonding sites are occupied. When all bonding sites are occupied, the carbon is considered to be "spent." Spent carbon requires regeneration, which reduces adsorption capacity. After several regenerations, the carbon is disposed of.

  A granular carbon system generally consist of vessels in which the carbon is placed, forming a "filter" bed. Vessels are usually circular for pressure systems or rectangular for gravity flow systems. For wastewater treatment, activated carbon is packed into one or more filter beds or columns. Typical treatment systems consist of multiple filter beds in series. Wastewater flows

through the filter beds and is allowed to come in contact with all portions of the activated carbon. The activated carbon in the upper portion of the column is spent first (assuming operation is downflow mode), and progressively lower regions of the column are spent as the adsorption zone moves down the unit. When pollutant concentrations at the bottom of the column begin to increase above acceptable levels, the entire column is considered spent and must be replaced.

All vessels must be equipped with carbon removal and loading mechanisms to allow for the removal of spent carbon and the addition of new material. Vessels are backwashed periodically to remove the accumulated suspended solids in the filter bed. Surface wash and air scour systems can also be used as part of backwash cycle. The activated carbon systems may include carbon storage vessels and thermal regeneration facilities.

Solids Handling Technologies

Solids are generated from a number of the proposed treatment technologies including 1) biological treatment and cyanide precipitation of cokemaking wastewater, 2) clarifiers for treatment of high-rate recycle water in the ironmaking and steelmaking processes, including backwash from multimedia filters, and 3) chemical precipitation and multimedia filtration of high-rate recycle blowdown and steel finishing process waters for metals removal, including backwash from multimedia filters. Dilute sludges from each of these processes are often concentrated by gravity thickening prior to dewatering by a variety of presses and filters. Filter cake collected from the dewatering equipment can be further processed by sludge dryers to removal additional moisture. The following paragraphs describe the solids handling technologies that are used to reduce the volume of treatment sludges generated by iron and steel facilities.

- ***Gravity Thickening.*** Gravity thickening is a physical liquid-solid separation technology used to dewater wastewater treatment sludge. Sludge is fed from a primary settling tank or clarifier to a thickening tank, where gravity separates the supernatant from the sludge, increasing the sludge density. The supernatant is returned to the primary settling tank. The thickened sludge that collects on the bottom of the tank is pumped to additional dewatering equipment or contract hauled for disposal.

  Gravity thickeners are generally used in facilities where the sludge is to be further dewatered by a mechanical device, such as a filter press. Increasing the solids content in the thickener substantially reduces capital and operating costs of the subsequent dewatering device and also reduces the hauling cost. Typically, gravity thickeners achieve sludge with 8 to 10 percent solids by weight (Reference 8-17).

- ***Rotary Vacuum Filtration of Sludge.*** The rotary vacuum precoat filter consists of a perforated plate steel drum deck covered with a filter cloth. A

diatomaceous earth precoat is used to prevent small suspended particles from passing through the filter and into the center of the drum where filtrate is removed. A knife blade is used to shave filter cake from the surface of the diatomaceous earth precoat filter, preventing the filter cake from reaching a thickness that would not adhere to the filter. Rotary drum filters typically rotate between 0.25 and 6.5 revolutions per minute (RPMs), depending on the concentration of suspended solids in the wastewater (Reference 8-11). Filtrate that passes through the filter cake and diatomaceous earth precoat enters the center of the vacuum drum and is collected in horizontal pipes connected to a center drain shaft. Solids collected from the rotary vacuum filter can be recycled to sintering operations to recover iron.

- ***Pressure Filtration of Sludge.*** The plate-and-frame filter press is commonly used for sludge dewatering in the iron and steel industry. A filter press consists of a series of parallel plates pressed together by a hydraulic ram (older models may have a hand crank), with cavities between the plates. The filter press plates are covered with a filter cloth and are concave on each side to form cavities. At the start of a cycle, a hydraulic pump clamps the plates tightly together and a feed pump forces a sludge slurry into the cavities of the plates. The liquid (filtrate) escapes through the filter cloth and grooves molded into the plates and is transported by the pressure of the feed pump (typically around 100 psi) to a discharge port. The solids are retained by the cloth and remain in the cavities. This process continues until the cavities are packed with sludge solids. An air blow-down manifold is used on some units at the end of the filtration cycle to drain remaining liquid from the system, thereby improving sludge dryness and aiding in the release of the cake. The pressure is then released and the plates are separated.

  The sludge solids or cake is loosened from the cavities and falls into a hopper or drum. A plate filter press can produce a sludge cake with a dryness of approximately 25 to 40 percent solids for metal hydroxides precipitated with sodium hydroxide (caustic), and 35 to 60 percent solids for metal hydroxides precipitated with calcium hydroxide (lime). The solids content attained depends on the length of the drying cycle. Filter presses are available in a wide range of capacities (0.6 ft^3 to 20 ft^3). A typical operating cycle is from 4 to 8 hours, depending on the dewatering characteristics of the sludge. Units are usually sized based on one or two cycles per day (Reference 8-11).

- ***Belt Filtration for Sludge Dewatering.*** The belt pressure filter consists of two continuous belts set one above the other. Conditioned sludge is fed in between the two belts. Three process zones exist. First, the sludge passes through the drainage zone where dewatering is effected by the force of

gravity. Then, the sludge passes into the pressure zone where pressure is applied to the sludge by means of rollers in contact with the top belt. Finally, the sludge is passed to the shear zone where shear forces are used to bring about the final dewatering. The dewatered sludge is then removed by a scraper. Belt filtration can produce a sludge cake with a dryness of approximately 25 to 30 percent solids (Reference 8-18).

- ***Centrifugation of Sludge.*** A sludge dewatering device collects wet sludge in a cone-shaped drum. The drum is rotated to generate centrifugal forces to concentrate solids to the walls of the drum. These solids are continually removed from the centrifuge by an auger, screw conveyor, or similar device. Centrifugation dewaters sludges, reducing the volume and creating a semi-solid cake. Centrifugation of sludge can typically achieve a sludge of 20 to 35 percent solids (Reference 8-11).

- ***Sludge Drying.*** Wastewater treatment sludges are often hauled off site to disposal sites. The transportation and disposal costs depend mostly on the volume of sludge. Therefore, sludge dehydration equipment following dewatering can further reduce the volume of the sludge and the overall disposal cost. The solids content of the sludge dewatered on a filter press is usually in the range of 25 to 60 percent. Dehydration equipment can produce a waste material with a solids content of approximately 90 percent (Reference 8-11).

  There are several design variations for sludge dehydration equipment. A commonly used type is a sludge drying unit that uses an auger or conveyor system to move a thin layer of sludge through a drying region and discharge it into a hopper. Various heat sources are used for sludge drying, including electric, electric infrared, steam, and gas. Some continuous units are designed such that the sludge cake discharge from a filter press drops into the feed hopper of the dehydration unit, making the overall dewatering process more automated. System capacities range from less than 1 ft^3/hr to more than 20 ft^3/hr of feed. Sludge dehydration equipment requires an air exhaust system due to the fumes generated during drying. Energy requirements depend mostly on the water content of the feed stock and the efficiency of a given unit.

8.2 Development of Technology Options

In developing the proposed regulation, EPA used a focused rulemaking approach, conducting several data gathering and analysis activities concurrently and assessing only a limited number of technology options. This is unlike the traditional approach where EPA conducts these efforts consecutively and considers a wider range of wastewater management and treatment technology options. This focused rulemaking approach is feasible for the Iron and Steel regulation because the Agency has acquired a good understanding of the industry, its associated pollutants, and the available control and treatment technologies from its prior rulemaking efforts. EPA evaluated responses to industry surveys, data collected from Agency site visits and sampling episodes, and technical literature to determine potential in-process and end-of-pipe treatment technologies to form the basis of the proposed regulation. Of these technologies, EPA developed options incorporating pollutant control technologies that demonstrate effective past or current use in the iron and steel industry, consistent effluent quality with a high degree of pollutant reduction for pollutants of concern (supported by analytical data), and minimal non-water quality environmental impacts. The Agency did not perform detailed analyses on pollution control technologies that, after preliminary analyses, were determined to require significant capital and operating and maintenance costs without substantial pollutant removals. Because of the focused rulemaking approach, generally only one option is presented for each subcategory.

Extensive stakeholder involvement was also an important element of the focused rulemaking process. EPA met with industry representatives, citizen and environmental groups, and other stakeholders at various stages of the rulemaking process to discuss the preferred technology options and to identify issues of concern. Input from stakeholders allowed EPA to refine its proposed technology options. Stakeholders generally supported the chosen options because they were in place and demonstrating satisfactory performance levels.

While EPA establishes effluent limitations guidelines and standards based on a particular set of in-process and end-of-pipe treatment technology options, EPA does not require a discharger to use these technologies. Rather, the technologies that may be used to treat wastewater are left entirely to the discretion of the individual treatment plant operator, as long as the numerical discharge limits are achieved, as required by Section §301(b) of the Clean Water Act.

8.2.1 Technology Options by Subcategory

To establish the proposed limitations and standards, EPA reviewed data corresponding to "state-of-the-art" pollution control technologies in the iron and steel industry. Below is a summary of the technology options for the proposed effluent limitations guidelines and standards in each subcategory. Tables 8-1 and 8-2 show the in-process and end-of-pipe treatment technologies, respectively, that are applicable to the subcategories. The tables also identify whether a technology was included in the development of technology options.

Non-Recovery Cokemaking

Non-recovery cokemaking manufactures metallurgical coke by indirectly heating (with combustible gases) high-grade bituminous coal in an enclosed oven chamber without oxygen. Volatile gases are immediately combusted within and around the oven to provide the heat required for coke production. Non-recovery cokemaking plants also maintain a slight negative pressure in the coke ovens at all times, thereby eliminating door, refractories, and charging lid leakages associated with by-product recovery ovens. Unlike by-product recovery cokemaking, no process wastewater is generated at non-recovery plants. Plant service water is used in coke quenching operations at non-recovery plants. However, runoff from quenching operations is collected and reused until evaporation. Accordingly, zero discharge of process wastewater pollutants was the only technology option considered for this segment.

Cokemaking (By-Product Cokemaking)

As with non-recovery cokemaking, by-product cokemaking manufactures coke by indirectly heating coal without oxygen; however, volatile gases are driven off and refined in a coal chemical plant to manufacture products such as clean coke oven gas, tar, sulfur, ammonium sulfate, and light oil. Waste ammonia liquor, wastewater generated from by-product recovery processes, along with wastewater from WAPCs on coal oven preheating and charging operations, are co-treated at an end-of-pipe wastewater treatment plant. Wastewater from WAPCs on pushing operations is typically blown down to a coke quench station, combined with plant service water or other sources, and used until evaporated on coke. Of the iron and steel subcategories, by-product recovery cokemaking comprises the widest range of treatment technologies used by the industry. Biological treatment, used by 13 of the 14 direct dischargers and 3 of the 8 indirect dischargers; is the most common treatment technology. One direct discharger uses physical-chemical treatment in lieu of biological treatment. Of the 16 sites using biological treatment, all but one uses ammonia distillation prior to biological treatment. All five indirect dischargers without biological treatment use an ammonia still. Other treatment technologies in use at mills in North America during 1997 include alkaline chlorination, cyanide precipitation, and sand filtration followed by granular activated carbon filtration. Table 8-3 lists the various wastewater treatment technologies reported by direct and indirect discharge by-product recovery cokemaking facilities in industry responses.

Figures 8-5 through 8-8 show the BAT technology options for the 14 direct discharging by-product recovery cokemaking facilities throughout the United States. Figures 8-9 through 8-12 show the PSES options for the eight indirect discharging by-product recovery cokemaking facilities. BAT-1 includes oil and tar removal, flow equalization prior to ammonia stripping, free and fixed ammonia stripping, indirect cooling, flow equalization before biological treatment, biological treatment, and sludge dewatering. BAT-2 equals BAT-1 with cyanide precipitation and sludge dewatering prior to biological treatment. BAT-3 equals BAT-1 with alkaline chlorination to remove residual cyanide and ammonia, following biological treatment. BAT-4 equals BAT-3 with both multimedia filtration and granular activated carbon after alkaline chlorination to remove any residual toxic organic compounds that may be present.

EPA evaluated four PSES options for the indirect discharging by-product recovery cokemaking facilities. For PSES, treatment is carried out to ensure that pollutants discharged by the industry do not "pass through" POTWs to waters of the United States or interfere with POTW operations or sludge disposal practices. PSES-1 includes tar removal, flow equalization, and free and fixed ammonia stripping. PSES-2 is equal to PSES-1 with cyanide precipitation, sludge dewatering, and multimedia filtration. PSES-3 is equivalent to BAT-1. PSES-4 is equivalent to BAT-3.

Ironmaking

The technology options evaluated for this subcategory represent treatment of wastewaters associated with blast furnace and sintering operations, whether treated individually or co-treated. All sites with sintering operations with dry air pollution controls reported zero discharge of process wastewater in industry survey responses. Accordingly, EPA used zero discharge based on dry air pollution controls as the only technology option for sintering operations with dry air pollution control. Industry survey responses indicated that all sites with both sintering operations with WAPCs and blast furnace operations on site co-treat wastewater. Table 8-4 lists the high-rate recycle equipment and wastewater treatment technologies used at 14 sites. (One site in the cost and loads analysis currently discharges to slag quench, as discussed in Section 9, and was not included in the count of 14 sites). According to industry survey responses, 9 of these sites operated dedicated blast furnace treatment systems, 3 operated combined sintering and blast furnace treatment systems, 1 site co-treated wastewaters from sintering, blast furnace, and other iron and steel manufacturing processes, and 1 site operated a dedicated sinter plant treatment system. Of the 14 sites with blast furnace ironmaking operations that discharge wastewater to surface water or a POTW, 12 sites had Clean Water Act Section 301(g) variances for ammonia and total phenol. Table 8-4 does not include the treatment technology used by five blast furnace ironmaking sites that achieve zero discharge through slag quenching and one blast furnace ironmaking site that achieves zero discharge through discharge to an evaporation pond.

Figures 8-13 and 8-14 present BAT and PSES technology options evaluated by the Agency, respectively. BAT-1 for blast furnace ironmaking and sintering consists of high-rate recycle using a clarifier for solids removal with sludge dewatering; a cooling tower to lower the water temperature to acceptable levels for reuse in blast furnace gas cleaning; blowdown treatment with chemical precipitation for metals removal, alkaline chlorination for removal of cyanide, ammonia, and phenol; and multimedia filtration as a polishing step.

EPA is proposing one PSES options for the indirect discharging blast furnace ironmaking and sintering facilities. The PSES-1 option is equivalent to BAT-1, but without alkaline chlorination and multimedia filtration.

Integrated Steelmaking

The technology options evaluated for this subcategory represent treatment of wastewaters associated with BOF steelmaking, vacuum degassing, and continuous casting operations at integrated steelmaking facilities, whether treated individually or co-treated. Industry survey responses indicate that co-treatment is a common practice, but depends largely on

proximity of manufacturing processes. All sites with ladle metallurgy operations reported zero discharge of process wastewater in industry survey responses. Accordingly, EPA used zero discharge as the only technology option for ladle metallurgy operations. Table 8-5 lists the high-rate recycle equipment and wastewater treatment technologies reported by the 20 integrated sites employing basic oxygen furnace steelmaking, vacuum degassing, and/or continuous casting and one non-integrated facility that operates a basic oxygen furnace.

Figure 8-15 presents the BAT and PSES technology options evaluated by the Agency. Wastewater from WAPCs for BOFs are treated in a high-volume classifier or equivalent primary solids removal device before discharge to a high-efficiency clarifier. Carbon dioxide injection prior to clarification can be used for wet-open combustion and wet-suppressed combustion BOF recycle systems to remove scale forming metal ions from wastewater before reuse. Vacuum degassing wastewater is typically treated by a clarifier and cooling tower before recirculation. Continuous casting wastewater from the spray water system is treated in a scale pit with oil skimming to recover mill scale and remove O&G, a roughing clarifier for coarse solids removal, filtered, and cooled before reuse. Blowdown from each of these high-rate recycle systems can be treated in a dedicated chemical precipitation system or co-treated. The PSES-1 option is equivalent to the BAT-1 option.

Integrated and Stand-Alone Hot Forming

Equivalent technology options were evaluated for each segment of this subcategory: Carbon and Alloy Steel and Stainless Steel. For both segments, high-rate recycle and treatment of wastewater from contact water systems used for scale removal, roll cooling, product cooling, flume flushing, and other miscellaneous sources (e.g., roll shops, basement sumps) is common. Thirty of 38 surveyed sites from both segments have high-rate recycle systems in place. Table 8-6 lists the high-rate recycle equipment and wastewater treatment technologies reported by 38 integrated and stand-alone hot forming sites.

Figure 8-16 presents the BAT and PSES technology options evaluated by the Agency for the Carbon and Alloy Steel and Stainless Steel Segments of this subcategory. BAT-1 includes high-rate recycle using a scale pit with oil skimming, a roughing clarifier with oil skimming, sludge dewatering, a multimedia filter for polishing, and a cooling tower to lower the water temperature to acceptable levels for reuse and treatment of blowdown with multimedia filtration. PSES-1 is identical to BAT-1.

Non-Integrated Steelmaking and Hot Forming

Equivalent technology options were evaluated for each segment of this subcategory: Carbon and Alloy Steel and Stainless Steel. For both segments, high-rate recycle and treatment of wastewater from vacuum degassing, continuous casting, and hot forming operations at non-integrated facilities are common. Forty four of 46 surveyed sites from both segments reported having high-rate recycle systems in place for these operations. All sites with electric arc furnaces (EAFs) and ladle metallurgy stations reported zero discharge of process wastewater in industry survey responses. Accordingly, EPA used zero discharge as the only technology option for EAF and ladle metallurgy operations. Table 8-7 lists the high-rate recycle

equipment and wastewater treatment technologies reported used by the 46 non-integrated steelmaking and hot forming sites.

Figure 8-17 shows the BAT and PSES options evaluated by the Agency for non-integrated steelmaking and hot forming sites. This figure applies for both stainless and carbon steel products. BAT-1 and PSES-1 for both segments include high-rate recycle of vacuum degassing, continuous casting, and hot forming operations. Continuous casting wastewater from the spray water system is treated in a scale pit with oil skimming to recover mill scale and remove O&G. Effluent from the continuous casting scale pit is combined with untreated vacuum degassing wastewater in a roughing clarifier for coarse solids removal. A portion of the clarifier effluent is recycled to the vacuum degassing process. The remainder of the clarifier effluent is filtered, cooled, and either recirculated to continuous casting or discharged. Wastewater from hot forming operations is treated in a separate scale pit with oil skimming to recover mill scale and remove O&G. Scale pit effluent is treated in a roughing clarifier prior to multimedia filtration and cooling. The Agency considered BAT-2 for stainless steel sites: BAT-1 plus metals precipitation for the blowdown stream. A portion of the cooling tower effluent is recirculated to hot forming, while the balance is discharged. Sludge from both casting and hot forming clarifiers is dewatered. The Agency realizes that many sites may be configured such that the combined treatment of the BAT and PSES model plants may not be possible. In such cases, separate treatment equipment for manufacturing processes, as required, equivalent to the combined treatment system would achieve model treatment system effluent quality. EPA considered these variables when costing sites for treatment systems, as discussed in Section 9.

Steel Finishing

Separate technology options for this subcategory were evaluated for two segments: Carbon and Alloy Steel and Stainless Steel. The Carbon and Alloy Steel Segment technology options treat wastewater from acid pickling (typically with hydrochloric or sulfuric acids) and associated annealing operations, cold forming, alkaline cleaning, hot coating, and electroplating operations. The Stainless Steel Segment technology options treat wastewater from salt bath and electrolytic sodium sulfate (ESS) descaling, acid pickling (typically with sulfuric, nitric, and nitric/hydrofluoric acids), annealing operations, cold forming, and alkaline cleaning. For both segments, sites used in-process and end-of-pipe wastewater treatment. For in-process wastewater treatment, sites used countercurrent rinsing, recycle of fume scrubber water, and reuse of acid (acid regeneration, purification, recycle, or recovery).

Table 8-8 lists the in-process and end-of-pipe wastewater treatment technologies reported by 86 water discharging carbon, alloy, and stainless steel finishing sites that provided survey responses. Figures 8-18 and 8-19 show the BAT and PSES technology options for the Carbon and Alloy Steel and Stainless Steel Segments, respectively. As presented in the figures, the technology options for both segments are identical, except that acid purification units have been incorporated into BAT-1 and PSES-1 for sites pickling stainless steel with sulfuric and nitric/hydrofluoric acid. Otherwise, both segments include the following in-process treatment technologies: countercurrent rinsing and recycling of fume scrubber water. End-of-pipe wastewater treatment for BAT-1 and PSES-1 for both segments consists of a diversion tank, oil removal for segregated oily wastes, flow equalization, hexavalent chromium reduction for

hexavalent-chromium-bearing streams, multiple-stage chemical precipitation for all waste streams, gravity clarification, and sludge dewatering.

Other Operations (Direct Reduced Ironmaking)

EPA evaluated BPT options for direct reduced ironmaking (DRI) because the Agency is setting limits for the first time for the conventional pollutants in this segment. The treatment technologies that serve as the basis for the development of the proposed BPT include high-rate recycle with solids removal using a classifier and clarifier, cooling, sludge dewatering, and treatment of blowdown with multimedia filtration. Both sites operating in 1997 reported using this high-rate recycle technology for wastewater generated from DRI WAPCs, with one site reporting the use of multimedia filtration as blowdown treatment (see Table 8-9). Figure 8-20 shows the BPT technology option for DRI.

Other Operations (Forging)

EPA evaluated BPT options for forging because the Agency is setting limits for the first time for the conventional pollutants in this segment. BPT for forging operations consists of oil/water separation and high-rate recycle. Table 8-9 lists the technology reported by sites to treat wastewater generated from forging contact water systems. Figure 8-21 shows the BPT technology option for forging.

Other Operations (Briquetting)

EPA evaluated BPT options for briquetting because the Agency is setting limits for the first time for the conventional pollutants in this segment. The four existing briquetting sites in the United States reported zero discharge of process wastewater. Accordingly, the Agency used zero discharge based on dry air pollution controls as the only technology option to develop the basis for BPT limitations and standards for briquetting operations.

8.3 References

8-1. Association of Iron and Steel Engineers. The Making, Shaping, and Treating of Steel; ISBN 0-930767-00-4; Pittsburgh, PA; 1985.

8-2. U.S. Environmental Protection Agency. Development Document for Effluent Guidelines and Standards for the Nonferrous Metals Forming and Metal Powders Point Source Category. EPA/440/1-86/019, Washington, D.C., September 1986.

8-3. U.S. Environmental Protection Agency. Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA/440/1-82/024, Washington, D.C., May 1982.

8-4. Rituper, R., "High-Performance Effluent-Free Pickling Plants with Fluid Bed Hydrochloric Acid Regeneration." Iron and Steel Engineer, November 1995.

8-5. "Waste-Free Exhaust Air Cleaning In Stainless Steel Pickling Plant." Metallurgical Plant And Technology International (Germany), vol. 16, no. 5, October 1993.

8-6. Keyser, A. G., Kunkel, K. F., and Snedaker, L. A. "Impact of Rolling Emulsion Contaminants on Downstream Surface Quality." AISE Steel Technology, p. 43, September 1998.

8-7. Freeman, H.M. Hazardous Waste Minimization. McGraw-Hill, Inc., New York, NY, 1990.

8-8. U.S. Environmental Protection Agency. Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Point Source Category, December 2000. EPA-821-B-00-005.

8-9. Perry's Chemical Engineers Handbook, Sixth Edition. McGraw-Hill Inc., New York, NY, 1984, pp. 6-8, 12-15 to 12-17, and 25-57.

8-10. Eckenfelder, W.W. Principals of Water Quality Management. CBI Publishing Company, Inc., Boston, MA, 1980.

8-11. Metcalf and Eddy, Inc. Wastewater Engineering: Treatment, Disposal Reuse, Third Edition. McGraw-Hill Inc., New York, NY, 1991.

8-12. Benefield, L. and J. Judkins. Process Chemistry for Water and Wastewater Treatment. Prentice-Hall, Inc., Englewood Cliffs, NJ, 1982.

8-13. Mauk, C.E. "Chemical Oxidation of Cyanide Species by Ozone with Irradiation from Ultraviolet Light". Trans. Society of Mining Engineers, Volume 260, pg 279, 1976.

8-14. Great Lakes Environmental. Equipment Guide for Oil Water Separators and Industrial Wastewater Treatment Equipment Systems, Addison, IL, July 1996.

8-15. Freeman, H.M. Standard Handbook of Hazardous Waste Treatment and Disposal. McGraw-Hill, Inc., New York, NY, 1989.

8-16. LaGrega, M.D., Buckingham, P., and Evans, J. Hazardous Waste Management. McGraw-Hill, Inc., New York, NY, 1994, p. 192.

8-17. Hoffland Environmental, Inc. HEI Sludge Thickener. http://www.hofflandenv.com/Equipment_Line/Sludge_Thickener.htm.

8-18. Hoftstra Engineering University Web Page. Sludgenet. http://147.45.150.5/~mgelfa20/sendesin/page1.htm.

Table 8-1

Iron and Steel In-Process Technologies

Technology	Applicable Subcategories	Comments
High-rate recycle of wastewater	Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Other Operations	Has a significant impact on both the volume of water and the pollutant loadings discharged from a number of iron and steel operations. High-rate recycle is well demonstrated in each of the applicable subcategories. Included in the technology options.
Countercurrent cascade rinsing	Steel Finishing	Reduces the amount of water necessary for rinsing. Included in the technology options.
Fume scrubber recycle	Steel Finishing	Recycle system can significantly reduce the volume of water discharged from WAPC equipment. Included in the technology options.
Hydrochloric acid regeneration	Steel Finishing	Can reduce the amount of spent acid generated by the facility. Also reduces the amount of neutralization treatment chemicals needed and the mass of chlorides discharged. However, this process is energy-intensive and is only economically achievable at certain sites. Not included in the technology options.
Effluent-free pickling process with fluid bed hydrochloric acid regeneration	Steel Finishing	Would achieve zero discharge for hydrochloric acid pickling operations. However, this process is energy-intensive and was not included in the technology options. Also, the quantity of rinse and scrubber water that can be used to cool off-gases depends on the iron content of the pickle liquor, thereby limiting applicability.
Sulfuric acid recovery	Steel Finishing	Can reduce the amount of spent acid generated by the facility. Also reduces the amount of neutralization treatment chemicals needed and the mass of sulfates discharged. However, this process is energy-intensive and was not included in the technology options.
Acid purification	Steel Finishing	Can reduce the amount of spent acid generated by the facility. Also reduces the amount of neutralization treatment chemicals needed and the mass of anions such as nitrate, sulfate and fluoride discharged. Included in the technology options.
Nitric acid free pickling	Steel Finishing	The Agency is currently considering regulating nitrates/nitrites and is investigating the applicability of this technology. For proposal, acid purification was included in the technology options and this technology has not been included.
Effluent-free exhaust cleaning for stainless steel pickling	Steel Finishing	Would eliminate wastewater generated from scrubbing of exhaust gases from stainless steel pickling operations. Has significant capital and operating and maintenance costs as well as possible cross-media impacts. Is not included in the technology options.

Table 8-1 (Continued)

Technology	Applicable Subcategories	Comments
In-tank filtration to extend the life of concentrated baths	Steel Finishing	Not applicable at all sites and not included in the technology options.
Magnetic separation of fines in cold rolling solution	Steel Finishing	Not included in the technology options. Additional data would need to be collected to perform an evaluation.
Ion exchange	Steel Finishing	Would not be economically achievable at high flow rates and is therefore not applicable at all sites. Not included in the technology options.
Evaporation with condensate recovery	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing	Energy-intensive and can have cross-media impacts. Not included in the technology options.
Best management practices/plant maintenance and good housekeeping practices	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing	The benefits of these practices are not quantifiable. Not included in the technology options.

Table 8-2

Iron and Steel End-of-Pipe Treatment and Disposal Technologies

Technology	Applicable Subcategories	Comments
Flow Equalization		
Equalization	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Included in the technology options.
Cooling Technologies		
Cooling towers	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Other Operations	Included in the technology options.
Shell-and-tube heat exchangers	Cokemaking	Included in the technology options.
Coke Plant Treatment Technologies		
Tar removal	Cokemaking	Demonstrated in the cokemaking industry, improving the performance of the free and fixed ammonia still. Included in the options.
Ammonia steam stripping	Cokemaking	Applicable to wastewater containing high concentrations of ammonia. Well demonstrated in the cokemaking industry and included in the technology options.
Biological nitrification	Cokemaking	Applicable to wastewater with high concentrations of ammonia such as those found after steam stripping of waste ammonia liquor. Included in treatment options.
Denitrification	Cokemaking	Capital and operating costs are excessive for removal of nitrate. Not included in the options.

Table 8-2 (Continued)

Technology	Applicable Subcategories	Comments
Cyanide Treatment Technologies		
Cyanide precipitation	Cokemaking	Can remove cyanide from excess ammonia liquor. Demonstrated at cokemaking facilities and included in the technology options.
Alkaline chlorination	Cokemaking Ironmaking	Included in the technology options.
Cyanide oxidation by ozone	Cokemaking Ironmaking	The generation of ozone requires expensive equipment and safety controls. An equivalent technology (cyanide destruction through alkaline chlorination) was included in the technology options. Not included in the technology options.
Oil Wastewater Treatment Technologies		
Oil skimming	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing	Effective for non-emulsified oils. Included in the technology options.
Chemical emulsion breaking followed by gravity oil/water separation	Steel Finishing	Included in the technology options.
API oil/water separator	Steel Finishing Other Operations	Included in the technology options.
Chemical emulsion breaking followed by dissolved air flotation	Steel Finishing	Energy-intensive relative to gravity flotation and therefore not included in the technology options
Ultrafiltration	Steel Finishing	May be cost-prohibitive at high flow rates. Not included in the technology options.

Table 8-2 (Continued)

Technology	Applicable Subcategories	Comments
Metals Treatment Technologies		
Chemical reduction of hexavalent chromium	Steel Finishing	Included in the technology options.
Chemical precipitation and gravity sedimentation	Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Included in the technology options.
Chemical precipitation and microfiltration	Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	May be cost-prohibitive at high flow rates. Not included in the technology options.
Sludge Dewatering Technologies		
Gravity thickening	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Included in the technology options.
Vacuum filtration	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Included in the technology options.

Table 8-2 (Continued)

Technology	Applicable Subcategories	Comments
Sludge Dewatering Technologies (cont.)		
Pressure filtration	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Included in the technology options.
Belt filtration	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Demonstrated for dewatering of biological treatment sludge from cokemaking. Included in the options.
Centrifugation	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Energy-intensive, and therefore not included in the technology options. Equivalent sludge dewatering technologies (gravity thickening and pressure filtration) are included in the technology options.
Sludge drying	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Energy-intensive, and therefore not included in the technology options. May be cost-effective for some sites in certain situations.

Table 8-2 (Continued)

Technology	Applicable Subcategories	Comments
Polishing Technologies		
Multimedia filtration	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Usually used in conjunction with another end-of-pipe technology (e.g., following chemical precipitation) or used to remove solids in the high-rate recycle treatment system. Included in the technology options. Also called mixed-media filtration.
Sand filtration	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Steel Finishing Other Operations	Usually used in conjunction with another end-of-pipe technology (e.g., following chemical precipitation). Similar to multimedia filtration, which has been included in the technology options. Not included in the technology options.
Granular activated carbon	Cokemaking Ironmaking	Included in the technology options.

Table 8-3

Wastewater Treatment Technologies Reported by Industry Survey Respondents for By-Product Recovery Cokemaking Sites

Treatment Technology	Number of By-Products Recovery Cokemaking Surveyed Sites Using the Technology	
	Direct Discharge (14 total sites)	Indirect Discharge (8 total sites)
Tar/oil removal	13	3
Flow equalization before ammonia still	12	4
Free and fixed ammonia still[a]	13	8
Cooling	10	1
Cyanide precipitation	1	2
Dephenolization	1	1
Alkaline chlorination[b]	0	0
Flow equalization before biological treatment or after ammonia still	13	5
Biological nitrification	13	3
Multimedia or sand filtration	4	1
Carbon adsorption	4	0
Sludge dewatering	12	2

[a]One indirect discharger operates an air stripping unit instead of an ammonia still.
[b] Although this technology is not practiced by industry survey respondents, the Agency is aware of one site in North America that practices alkaline chlorination.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-4

High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Blast Furnace Ironmaking and Sintering Sites

Treatment Technology	Number of Blast Furnace Ironmaking and Sintering Surveyed Sites Using the Technology (14 total sites)[a]
High-Rate Recycle	
Clarifier	14
Cooling tower	11
Sludge dewatering	12
Blowdown Treatment	
Chemical precipitation	10
Alkaline chlorination	1
Multimedia filtration[b]	4
Granular activated carbon	1

[a] Includes three sites that co-treat blast furnace and sintering wastewater and one site that treats sintering wastewater only.
[b] Multimedia filtration of recycled flow or low-volume blowdown flow.
Note: Summary includes direct and indirect dischargers.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-5

High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Integrated Steelmaking Sites

Treatment Technology	Number of Integrated Steelmaking Surveyed Sites Using the Technology (21 total sites)[a]
High-Rate Recycle	
Classifier[b]	12
Scale pit[c]	20
CO_2 injection	5
Clarifier	19
Cooling tower[d]	19
Sludge dewatering	13
Blowdown Treatment	
Chemical precipitation	7
Multimedia filtration[e]	18

[a]One site is a non-integrated mill with a BOF.
[b]Classifier used for BOF wastewater only except for one site that uses for continuous casting wastewater.
[c]Scale pit for continuous caster wastewater only.
[d]Cooling tower used for vacuum degassing and continuous caster wastewater.
[e]Multimedia filtration of recycled flow or low-volume blowdown flow.
Note: Summary includes direct and indirect dischargers and excludes zero discharge treatment systems.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-6

High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Integrated and Stand-Alone Hot Forming Sites

Treatment Technology	Number of Integrated and Stand-Alone Hot Forming Surveyed Sites Using the Technology	
	Direct Discharge (32 total sites)	Indirect Discharge (6 total sites)
High-Rate Recycle		
Scale pit	25	3
Clarifier	15	4
Sludge dewatering	12	1
Cooling tower	20	4
Blowdown Treatment		
Chemical precipitation	2	0
Multimedia filtration[a]	10	1
Once-Through Treatment[b]		
Scale pit	7	1
Clarifier	0	0
Sludge dewatering	0	0
Multimedia filtration	0	0

[a]Multimedia filtration of recycled flow or low-volume blowdown flow.
[b]Once-through treatment applies to eight sites.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-7

High-Rate Recycle and Blowdown Treatment Technologies Reported by Industry Survey Respondents for Non-Integrated Steelmaking and Hot Forming Sites

Treatment Technology	Number of Non-Integrated Steelmaking and Hot Forming Surveyed Sites Using the Technology		
	Direct Discharge (33 total sites)	Indirect Discharge (11 total sites)	Direct & Indirect Discharge (2 sites)
High-Rate Recycle			
Scale Pit with oil skimming	29	10	2
Clarifier	17	3	2
Cooling tower[a]	24	9	2
Blowdown Treatment			
Chemical precipitation	7	1	1
Multimedia filtration[b]	25	4	2
Once-Through Treatment[c]			
Scale pit	2	0	
Clarifier	0	0	
Cooling Tower	0	0	

[a]Cooling tower used for vacuum degassing and/or continuous casting wastewater.
[b]Multimedia filtration of recycled flow or low-volume blowdown flow.
[c]Once-through treatment only applies to two sites, both direct dischargers.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-8

In-Process and End-of-Pipe Wastewater Treatment Technologies Reported by Industry Survey Respondents for Steel Finishing Sites

Treatment Technology	Number of Steel Finishing Sites Surveyed Using the Technology	
	Direct Discharge (57 total sites)	Indirect Discharge (32 total sites)
In-Process Treatment		
Countercurrent rinsing	14	10
Recycle of fume scrubber water	33	14
Acid purification and recycle[a]	7	5
End-of-Pipe Treatment		
Oil removal[b]	25	9
Flow equalization	34	19
Hexavalent chromium reduction[c]	23	5
Chemical precipitation	54	20
Gravity sedimentation/clarification	54	17
Sludge dewatering	49	18

[a]Applies to sites with sulfuric acid and nitric/hydrofluoric acid baths for stainless products.
[b]Oil removal technologies in place were primarily oil water separators and oil skimming; however, one site used ultrafiltration.
[c]Applies to sites with hexavalent-chromium-bearing wastewater.
Note: 47 sites reported the use of fume scrubbers.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

Table 8-9

High-Rate Recycle Equipment and Blowdown Wastewater Treatment Technologies Reported by Industry Survey Respondents for Direct Reduced Ironmaking and Forging Sites

Treatment Technology	Number of Sites Surveyed Using the Technology
DRI	(2 sites)
High-Rate Recycle	
Classifier and clarifier	2
Cooling Tower	2
Blowdown Treatment	
Multimedia Filtration	1
FORGING	(7 sites)
Oil Removal[a]	7

[a]Oil removal may be used as high-rate recycle or blowdown treatment.
Note: Summary includes direct and indirect dischargers.

Source: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Survey).

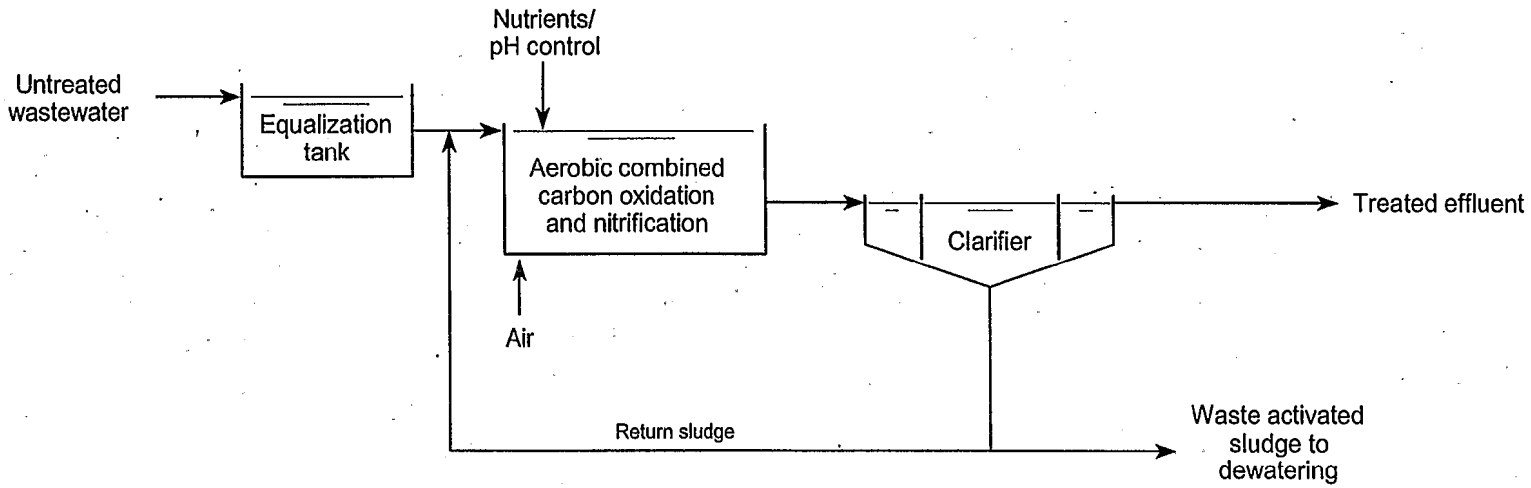
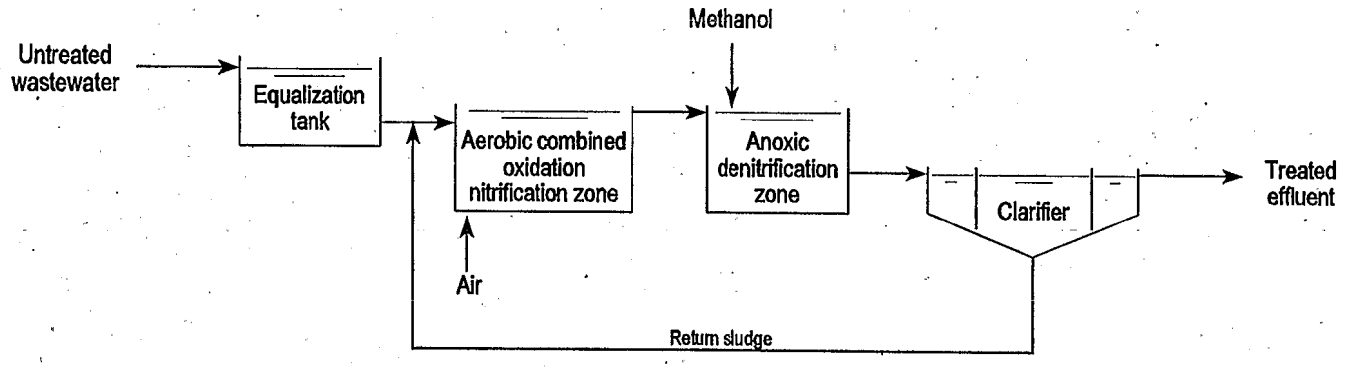


Figure 8-1. Process Flow Diagram of a Typical Biological Nitrification System

FIG_2	10/03/00	EPA

A. End-of pipe denitrification system using an external carbon source



B. Recycle denitrification system using untreated wastewater as a carbon source

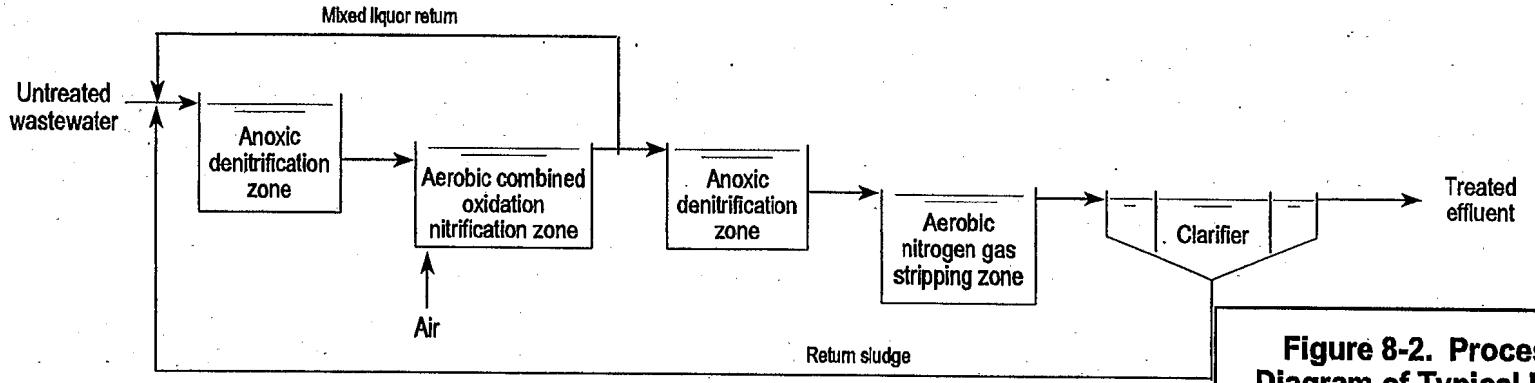


Figure 8-2. Process Flow Diagram of Typical Biological Denitrification Systems

FIG_3a	10/03/00	EPA

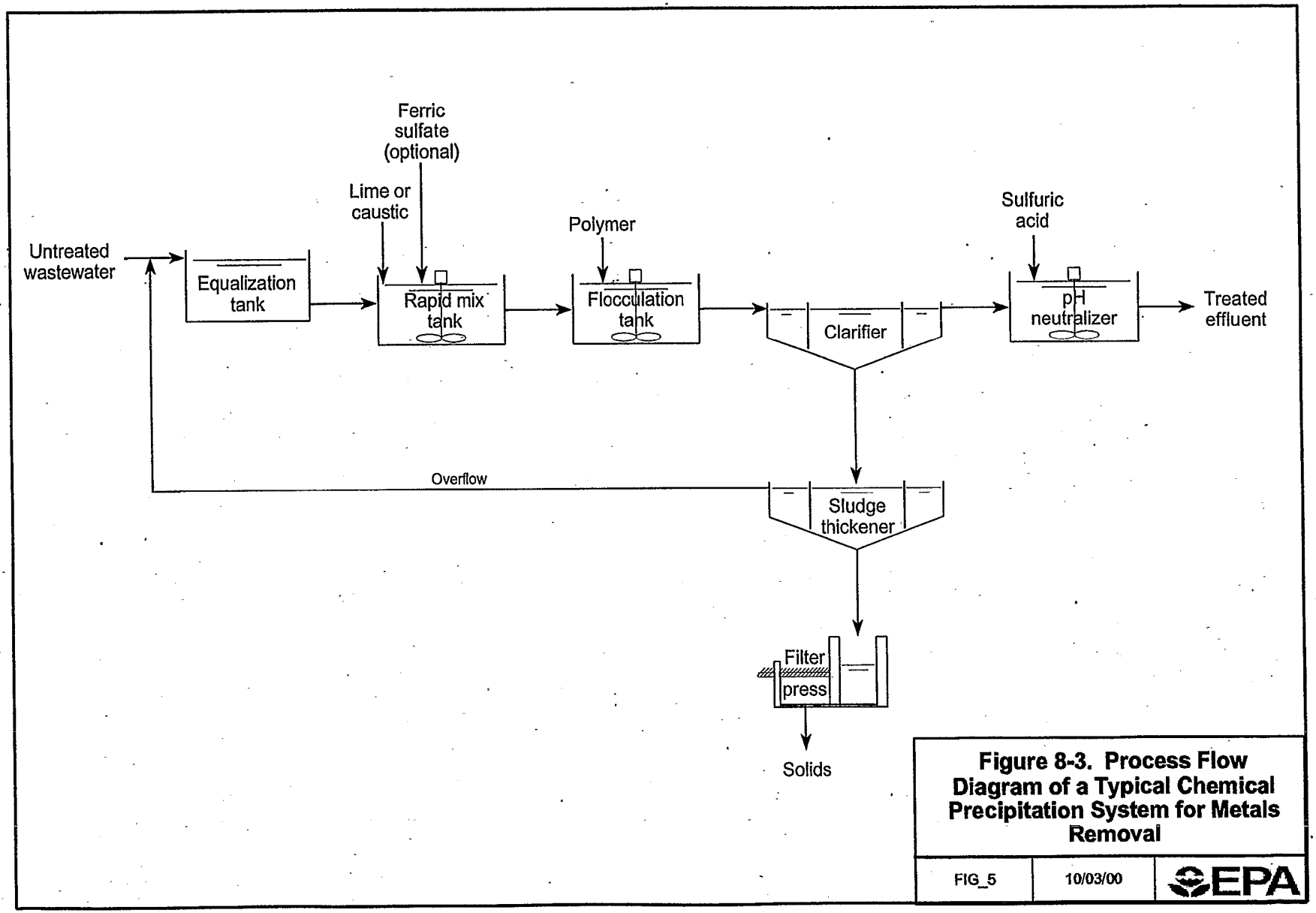


Figure 8-3. Process Flow Diagram of a Typical Chemical Precipitation System for Metals Removal

FIG_5	10/03/00	EPA

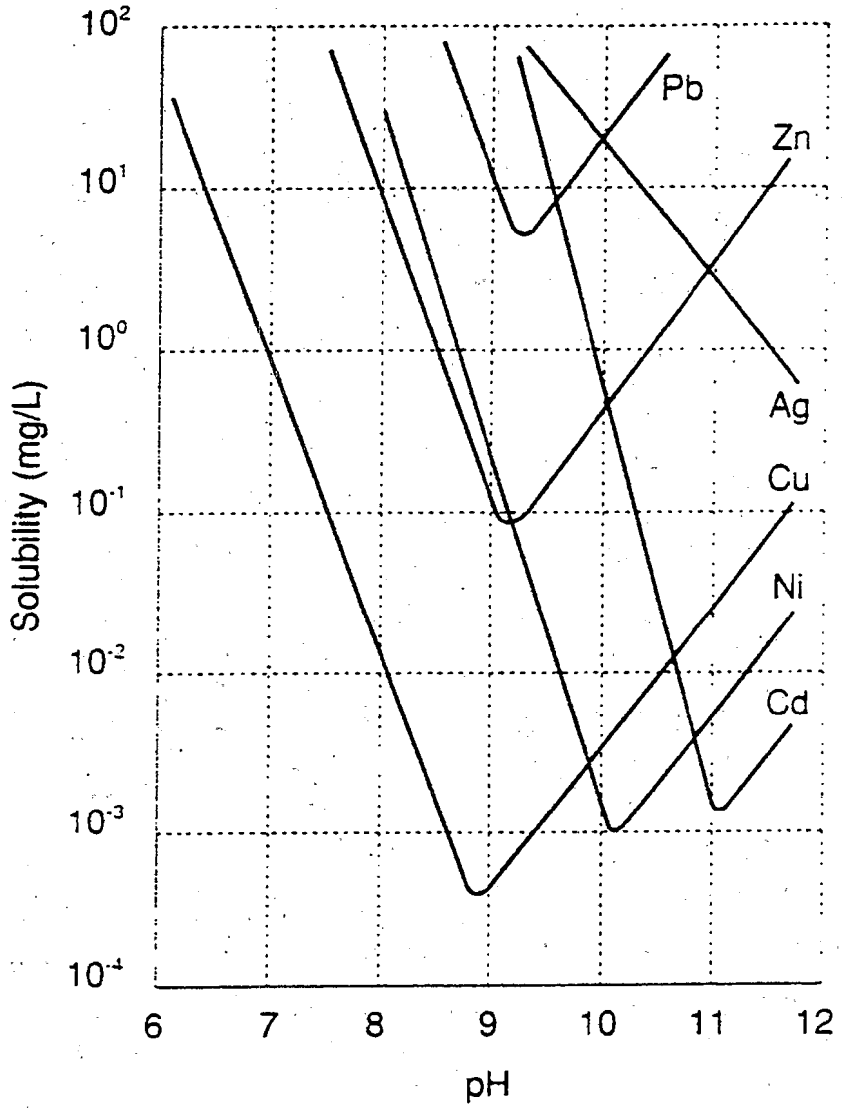


Figure 8-4. Minimum Solubilities of Various Metal Hydroxides

FIG_4	10/03/00	EPA

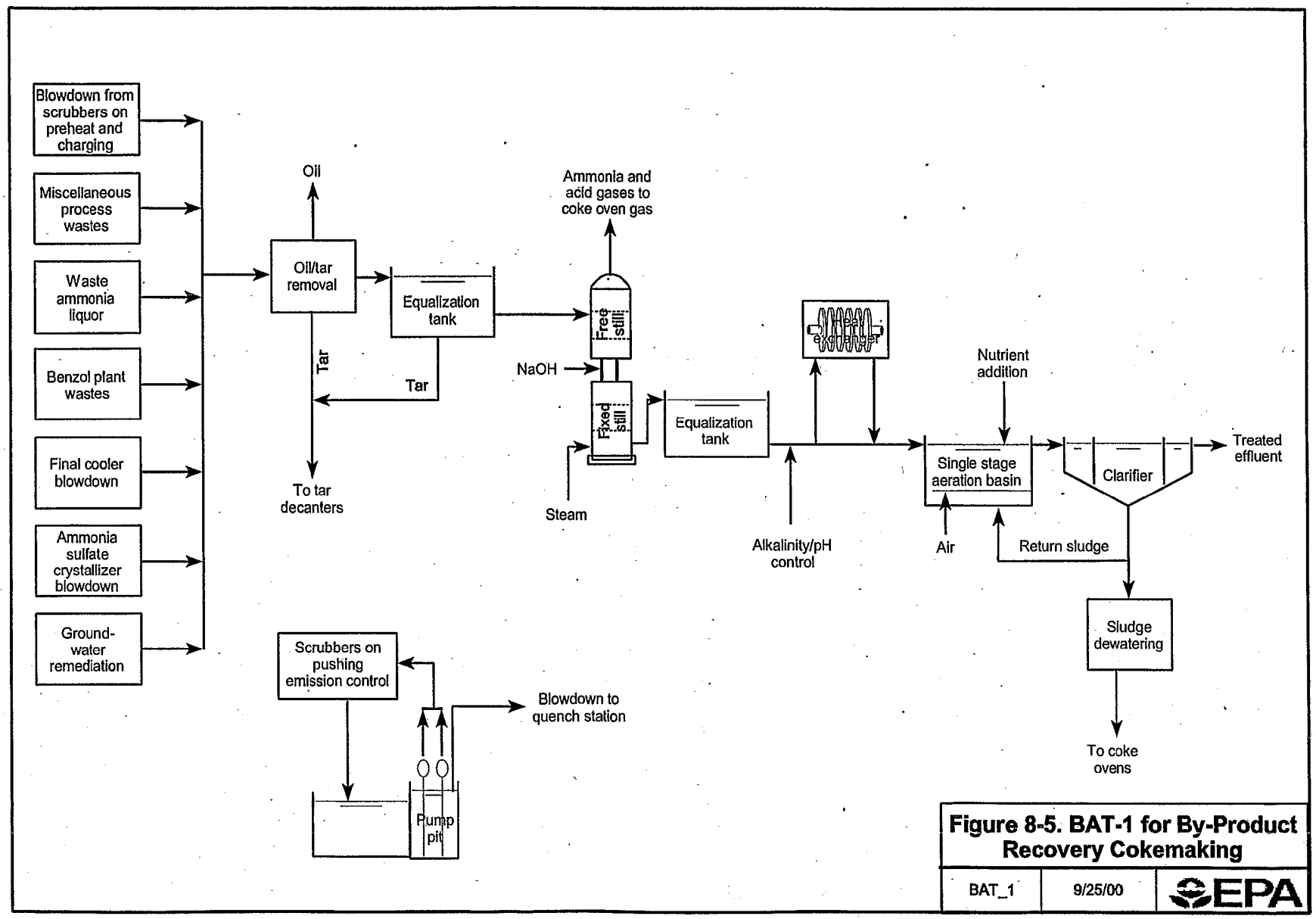


Figure 8-5. BAT-1 for By-Product Recovery Cokemaking

BAT_1	9/25/00	EPA

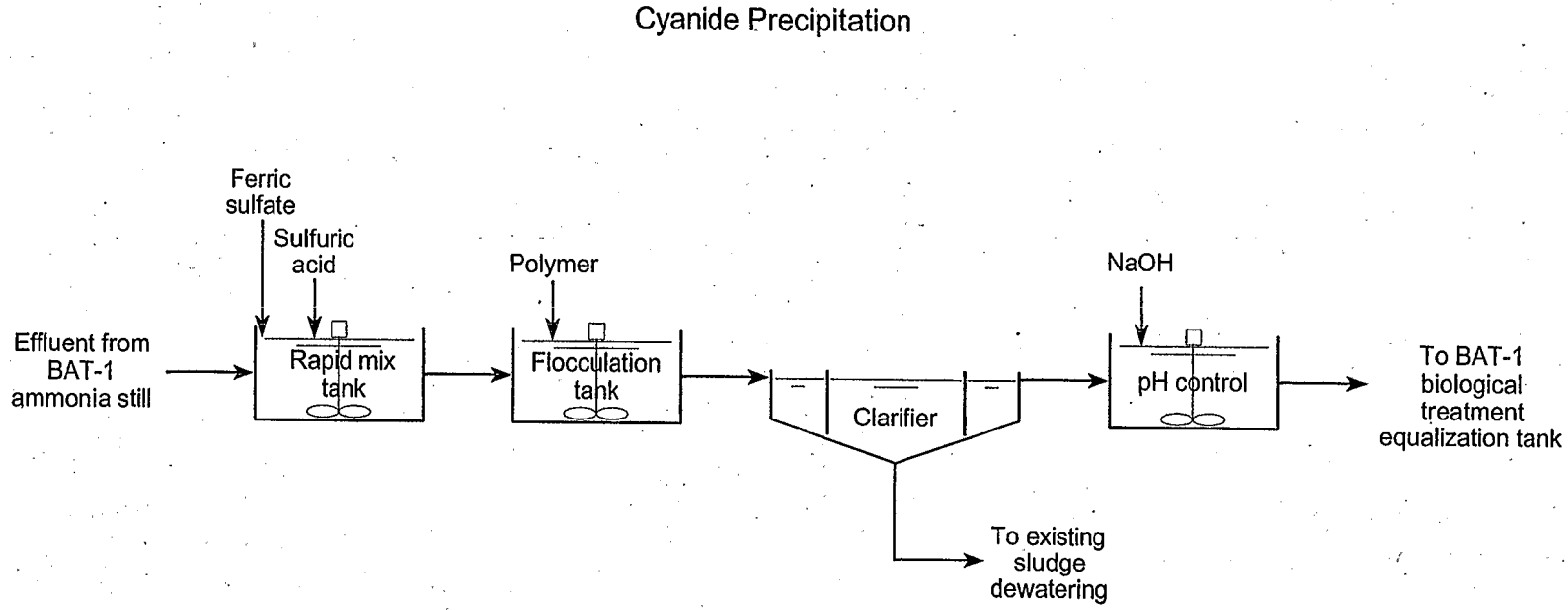


Figure 8-6. BAT-2 for By-Product Recovery Cokemaking

BAT_2	9/25/00	EPA

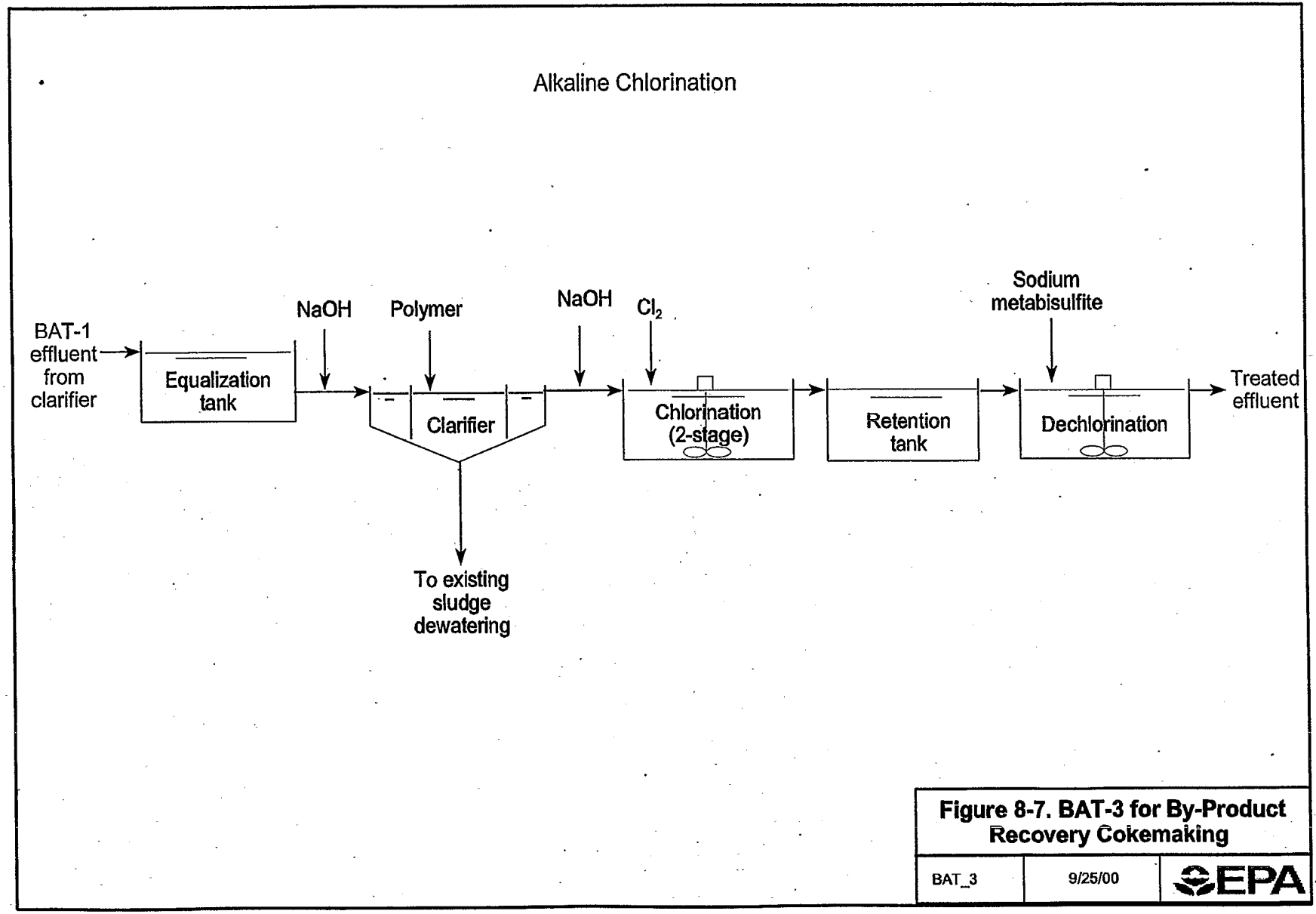


Figure 8-7. BAT-3 for By-Product Recovery Cokemaking

BAT_3	9/25/00	EPA

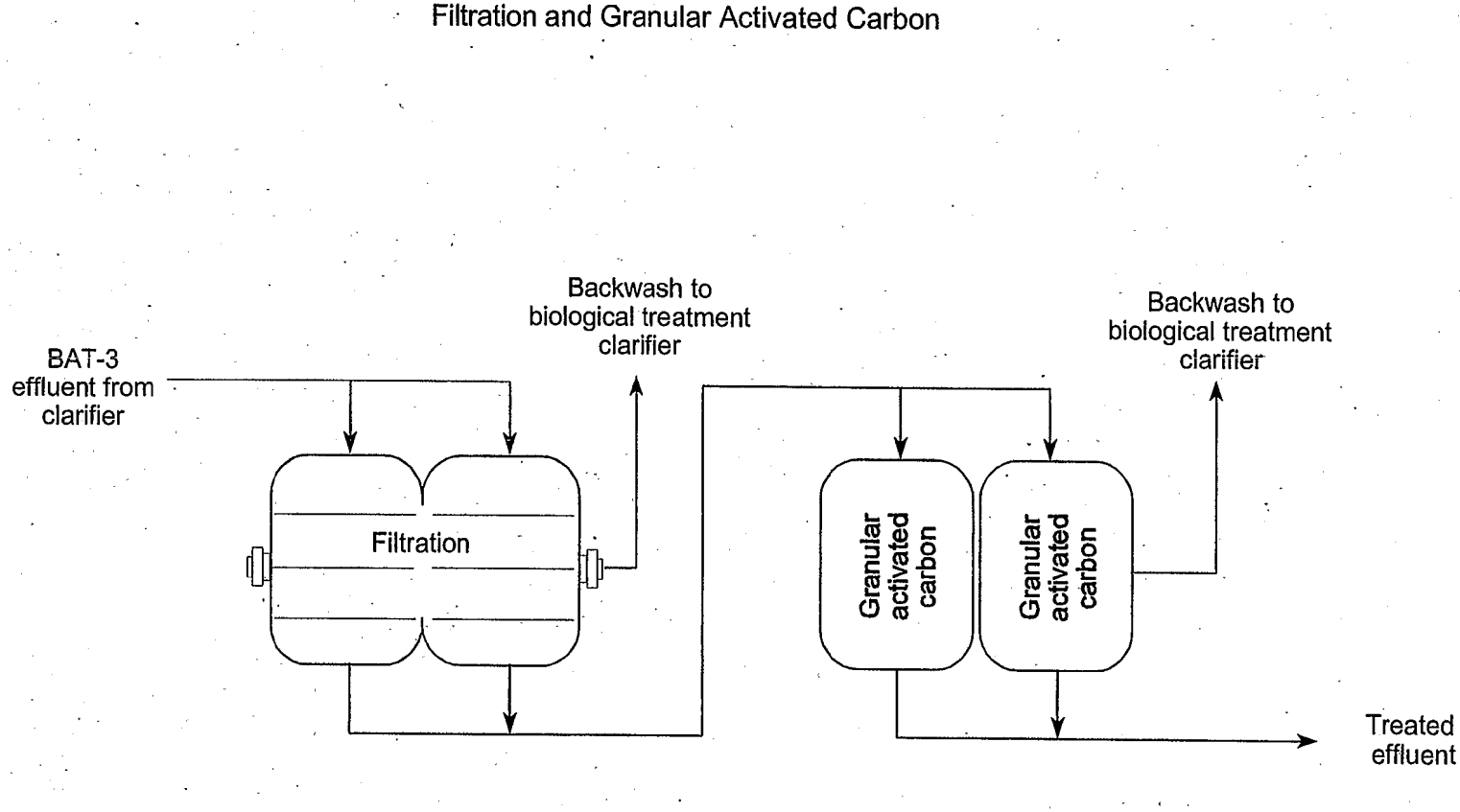


Figure 8-8. BAT-4 for By-Product Recovery Cokemaking

BAT_4	9/25/00	EPA

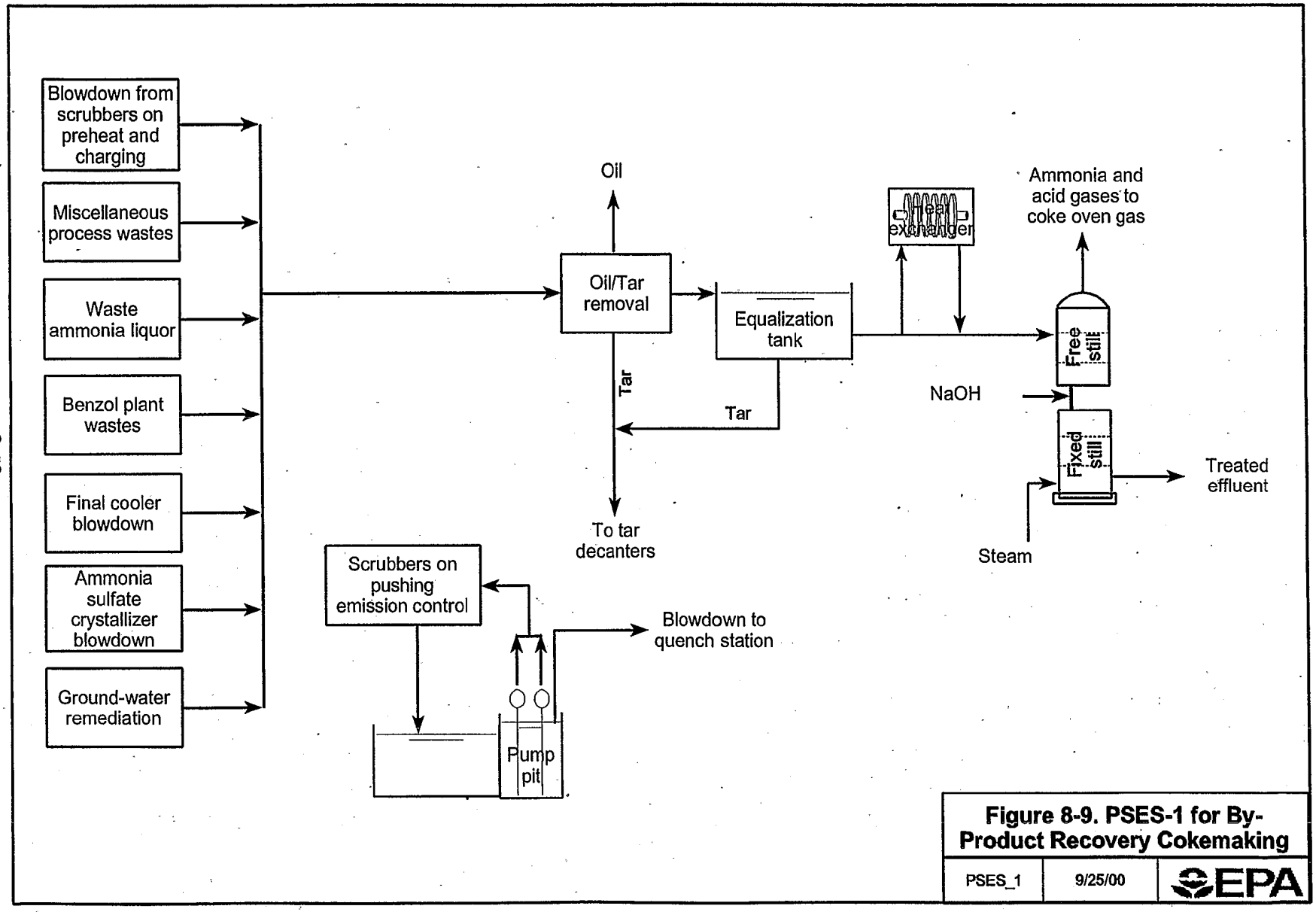


Figure 8-9. PSES-1 for By-Product Recovery Cokemaking

PSES_1	9/25/00	EPA

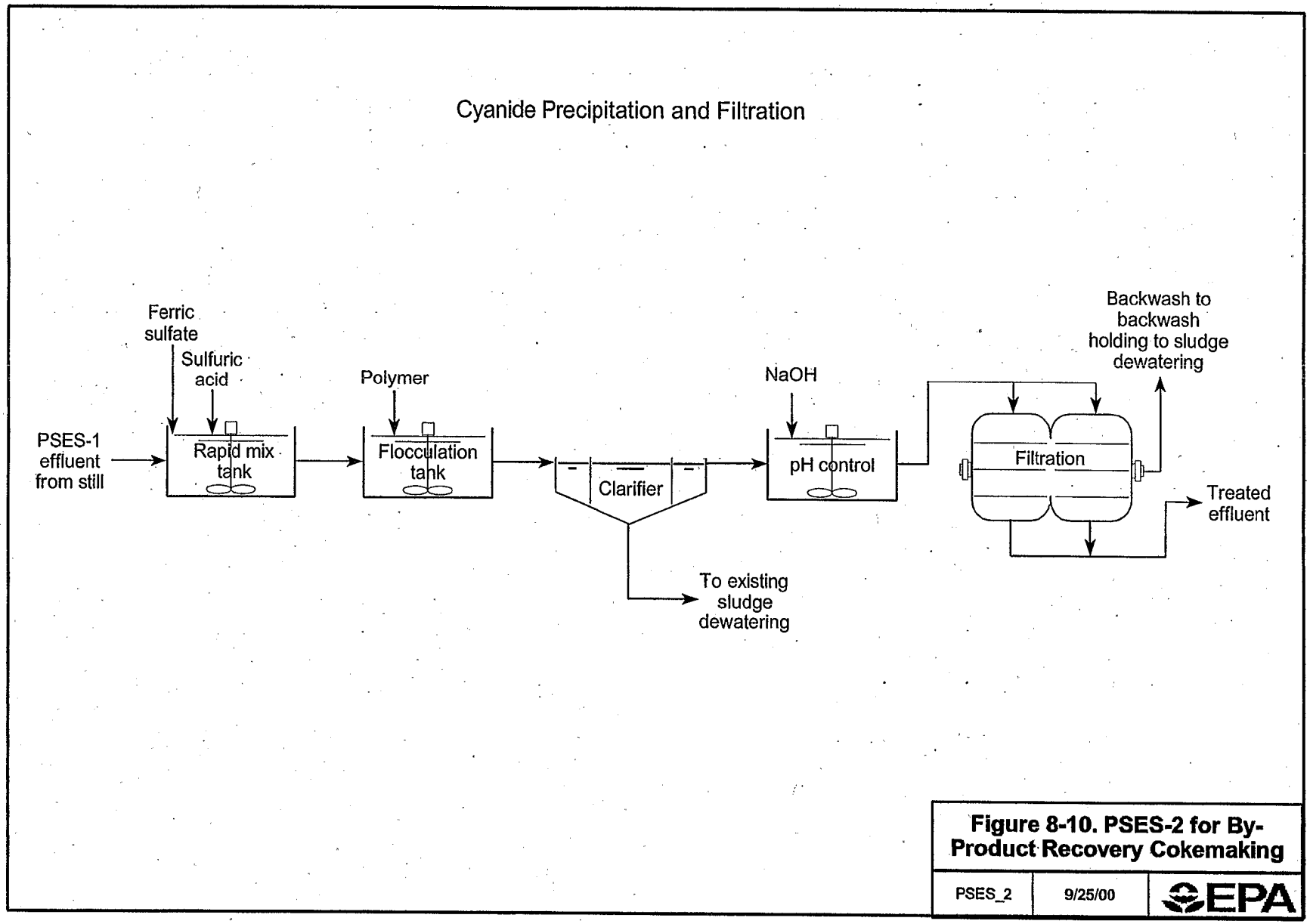
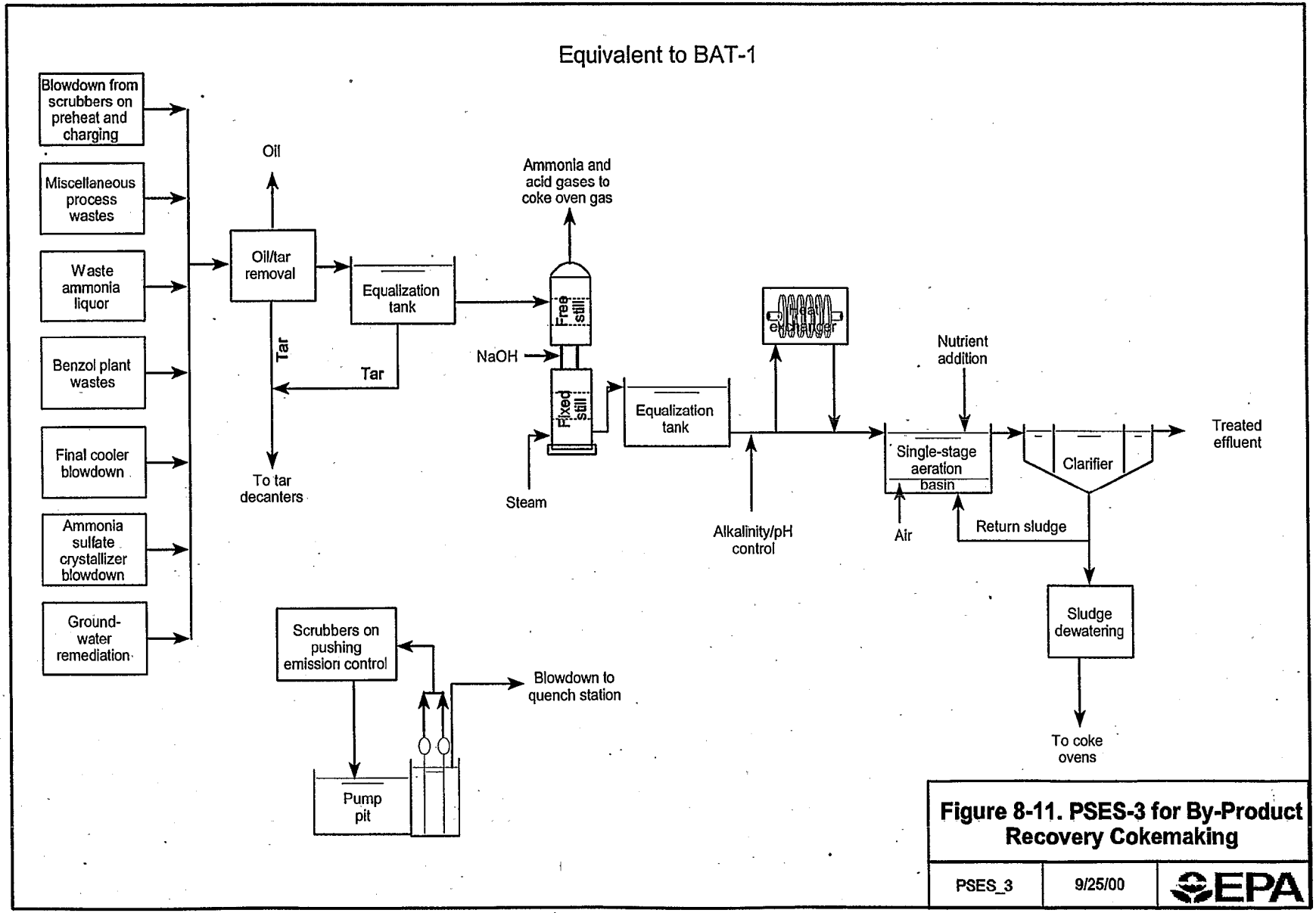


Figure 8-10. PSES-2 for By-Product Recovery Cokemaking

PSES_2	9/25/00	EPA


Equivalent to BAT-1
Blowdown from scrubbers on preheat and charging
Miscellaneous process wastes
Waste ammonia liquor
Benzol plant wastes
Final cooler blowdown
Ammonia sulfate crystallizer blowdown
Ground-water remediation
Oil
Oil/tar removal
Tar
To tar decanters
Equalization tank
Tar
Ammonia and acid gases to coke oven gas
Free still
NaOH
Fixed still
Steam
Final cooler
Equalization tank
Alkalinity/pH control
Nutrient addition
Single-stage aeration basin
Air
Clarifier
Return sludge
Treated effluent
Sludge dewatering
To coke ovens
Scrubbers on pushing emission control
Blowdown to quench station
Pump pit
Figure 8-11. PSES-3 for By-Product Recovery Cokemaking
PSES_3
9/25/00
EPA

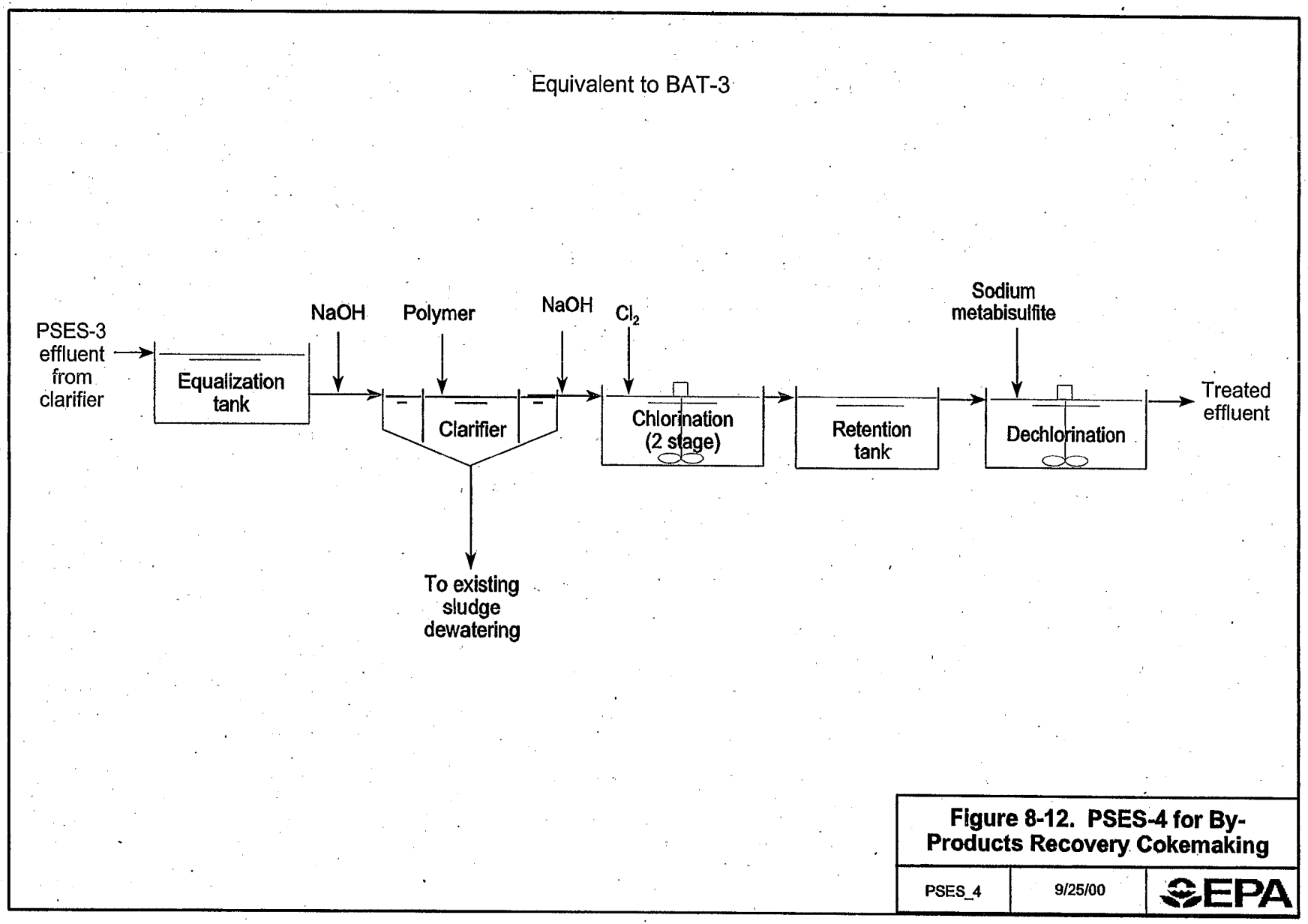


Figure 8-12. PSES-4 for By-Products Recovery Cokemaking

PSES_4	9/25/00	EPA

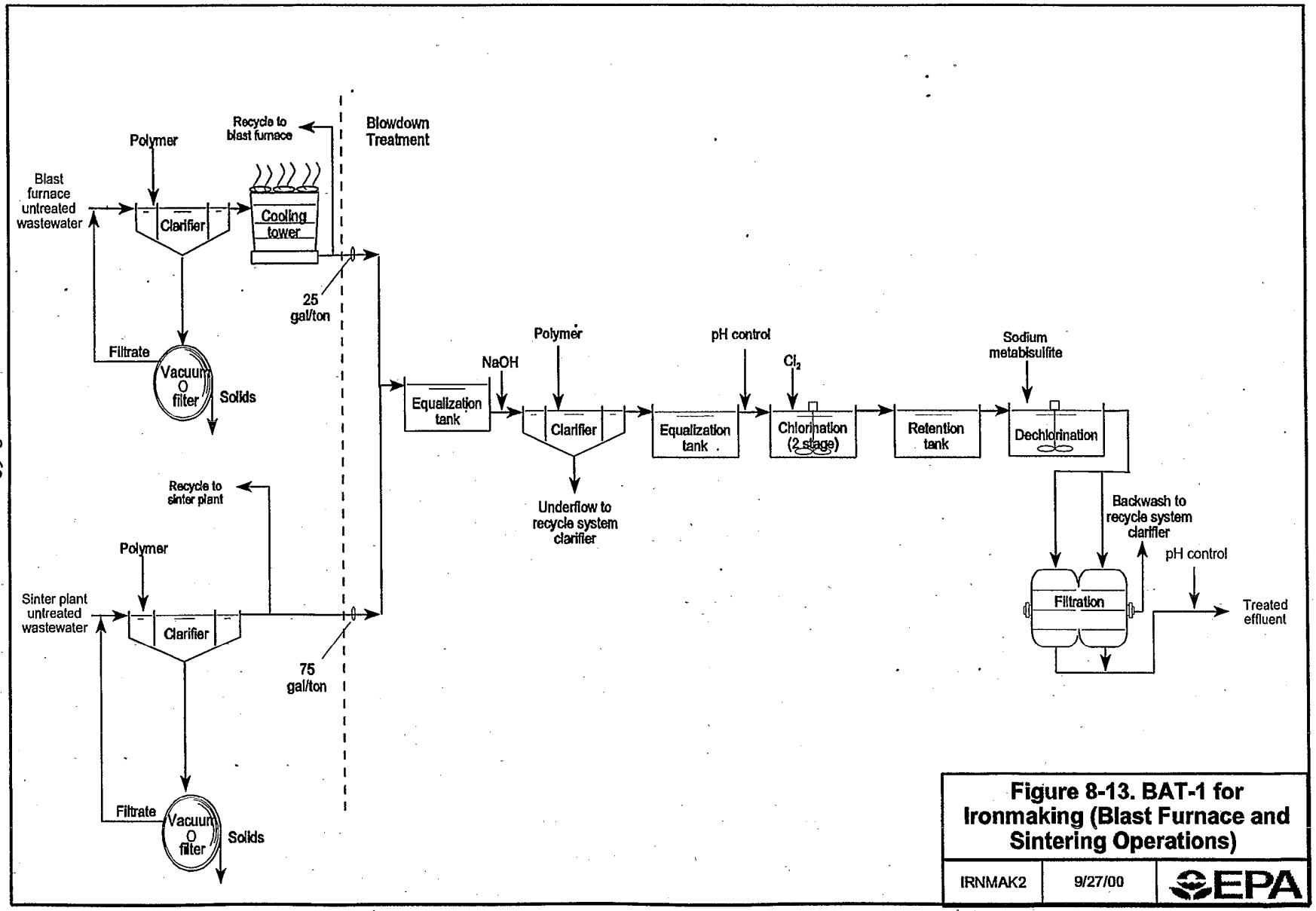


Figure 8-13. BAT-1 for Ironmaking (Blast Furnace and Sintering Operations)

IRNMAK2	9/27/00	EPA

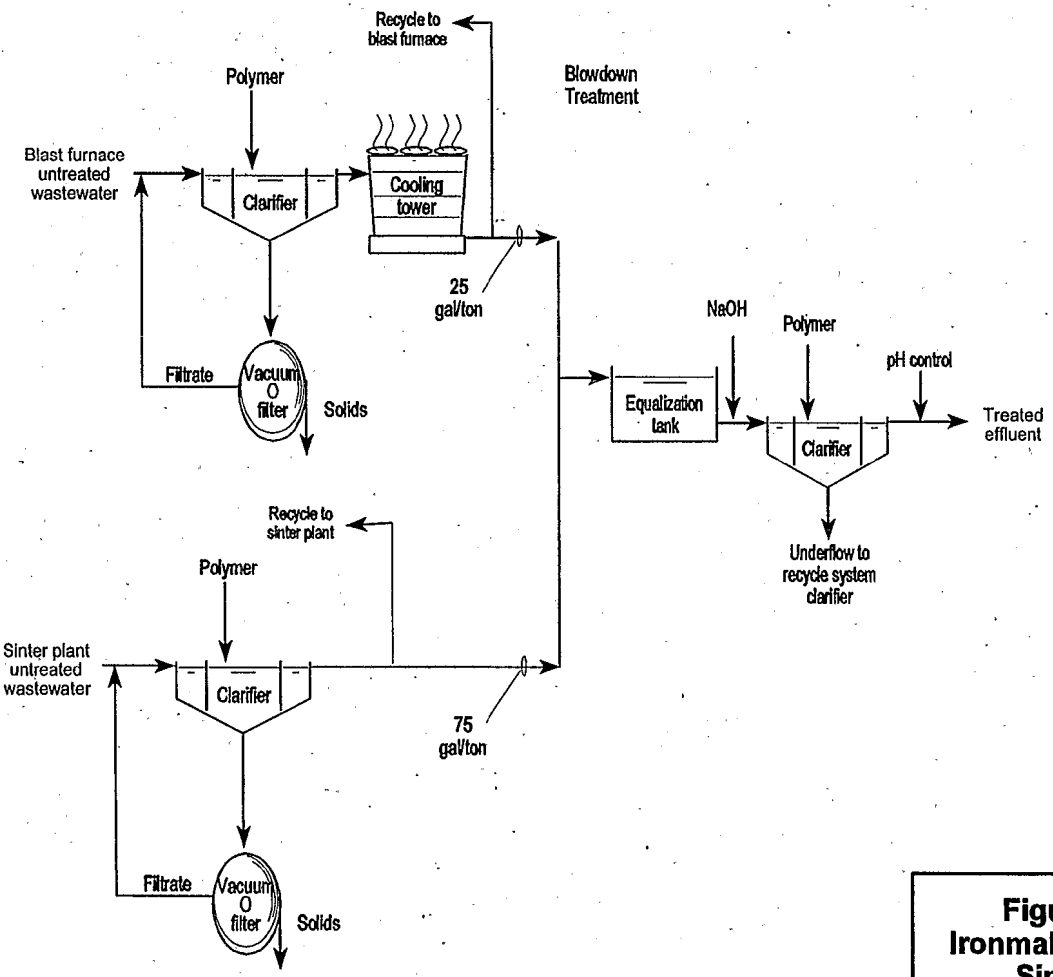


Figure 8-14. PSES-1 for Ironmaking (Blast Furnace and Sintering Operations)

IRNMAK1	9/27/00	EPA

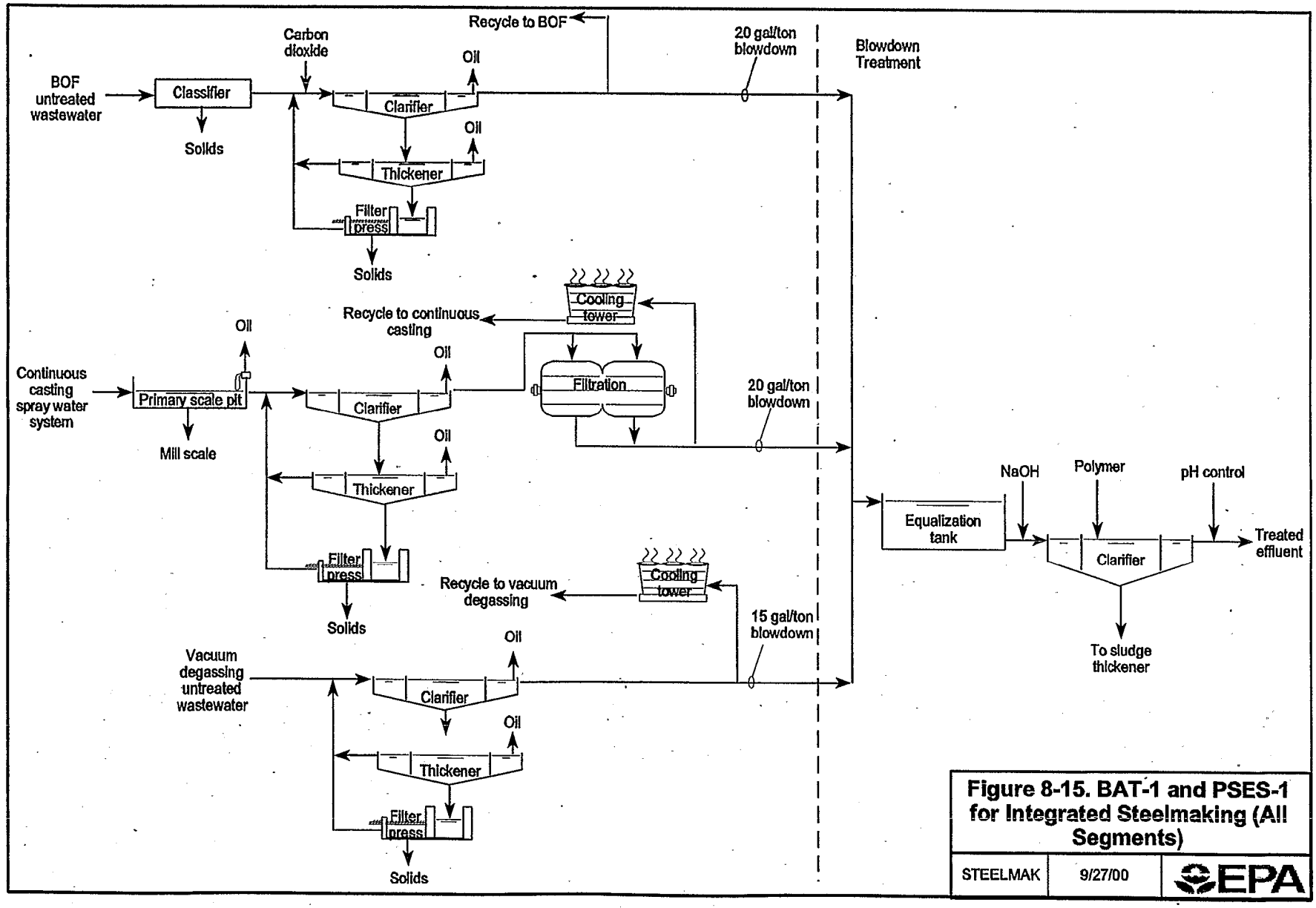


Figure 8-15. BAT-1 and PSES-1 for Integrated Steelmaking (All Segments)

STEELMAK	9/27/00	EPA

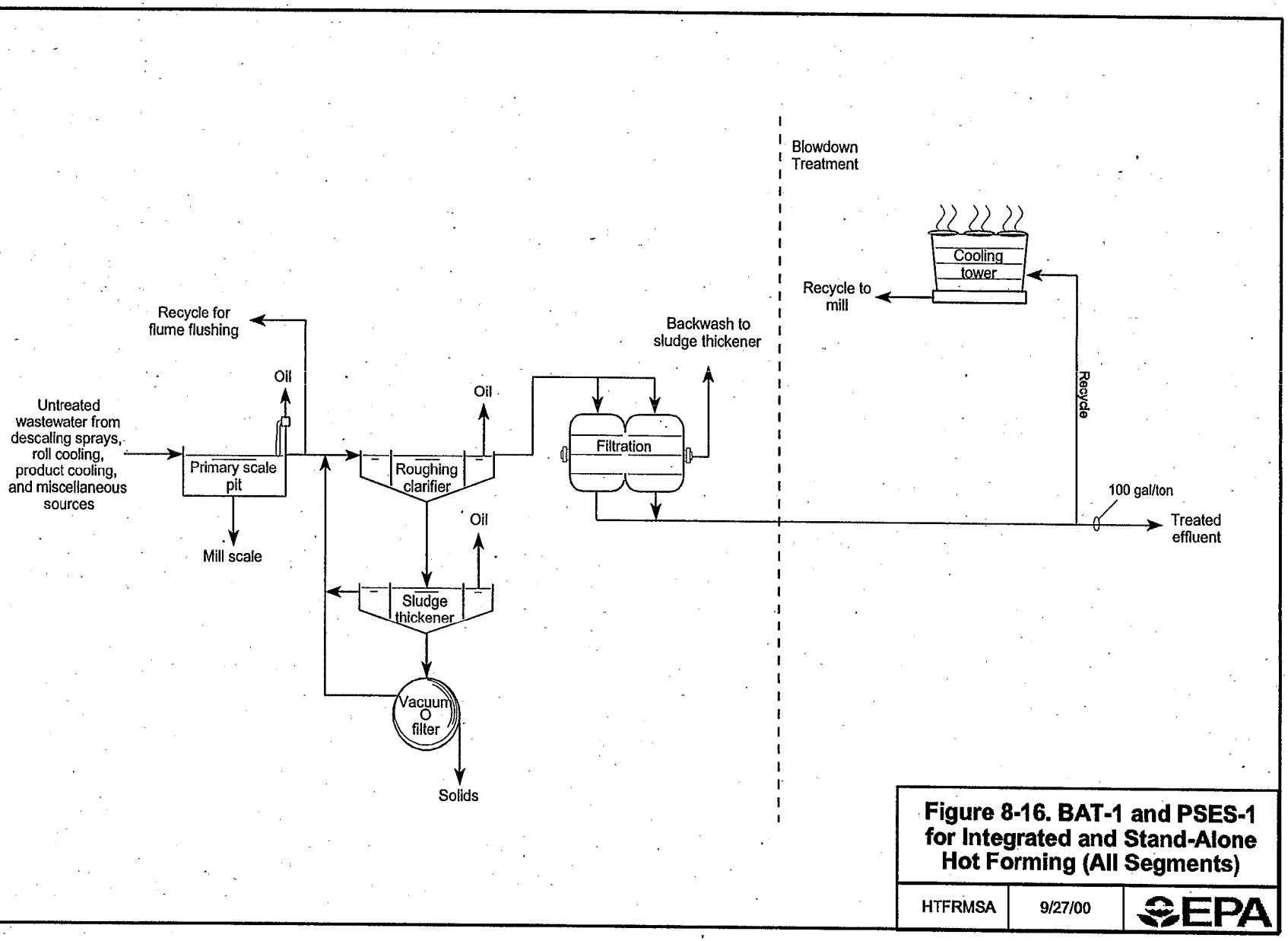


Figure 8-16. BAT-1 and PSES-1 for Integrated and Stand-Alone Hot Forming (All Segments)

HTFRMSA	9/27/00	EPA

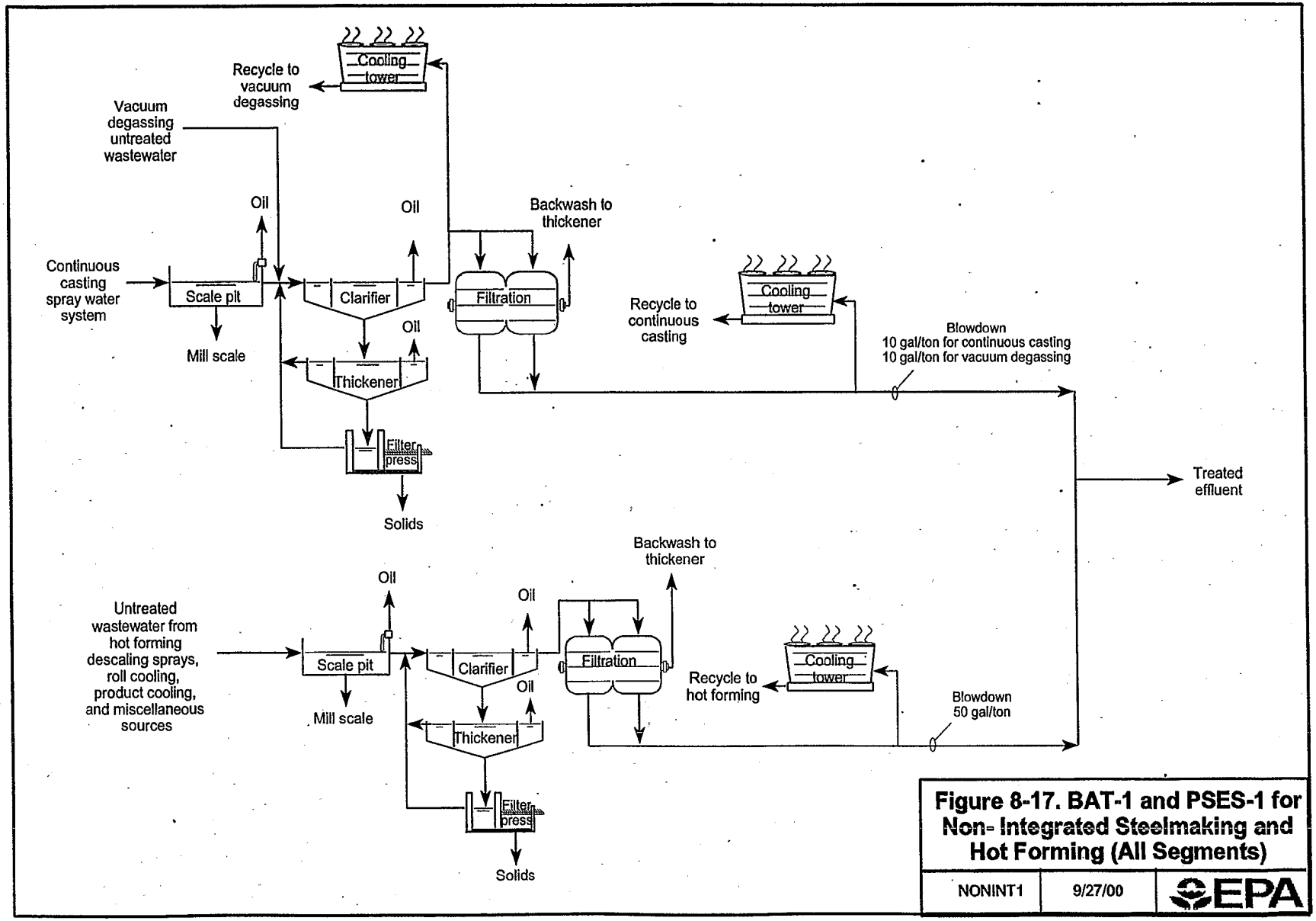


Figure 8-17. BAT-1 and PSES-1 for Non- Integrated Steelmaking and Hot Forming (All Segments)

NONINT1	9/27/00	EPA

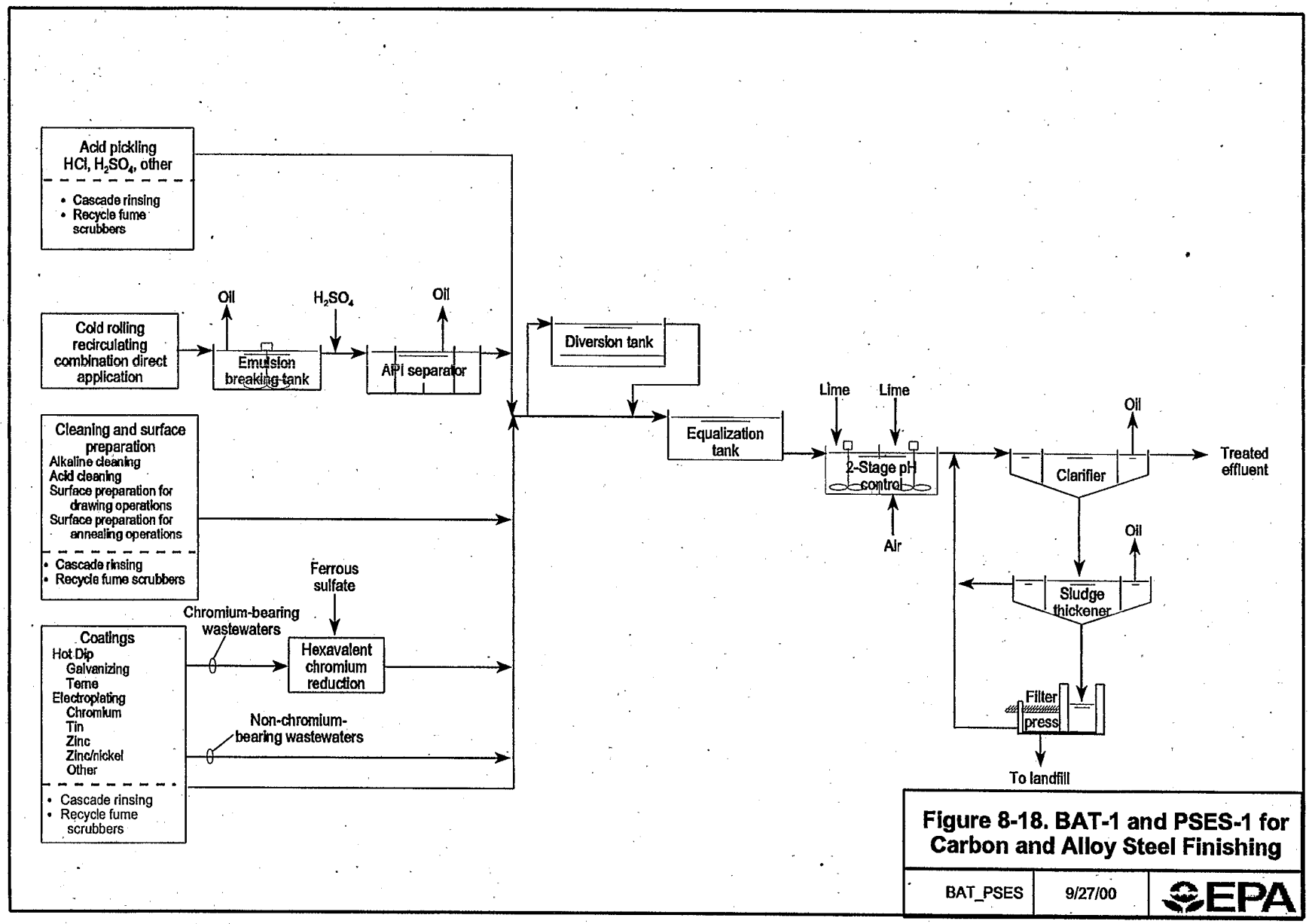


Figure 8-18. BAT-1 and PSES-1 for Carbon and Alloy Steel Finishing

BAT_PSES	9/27/00	EPA

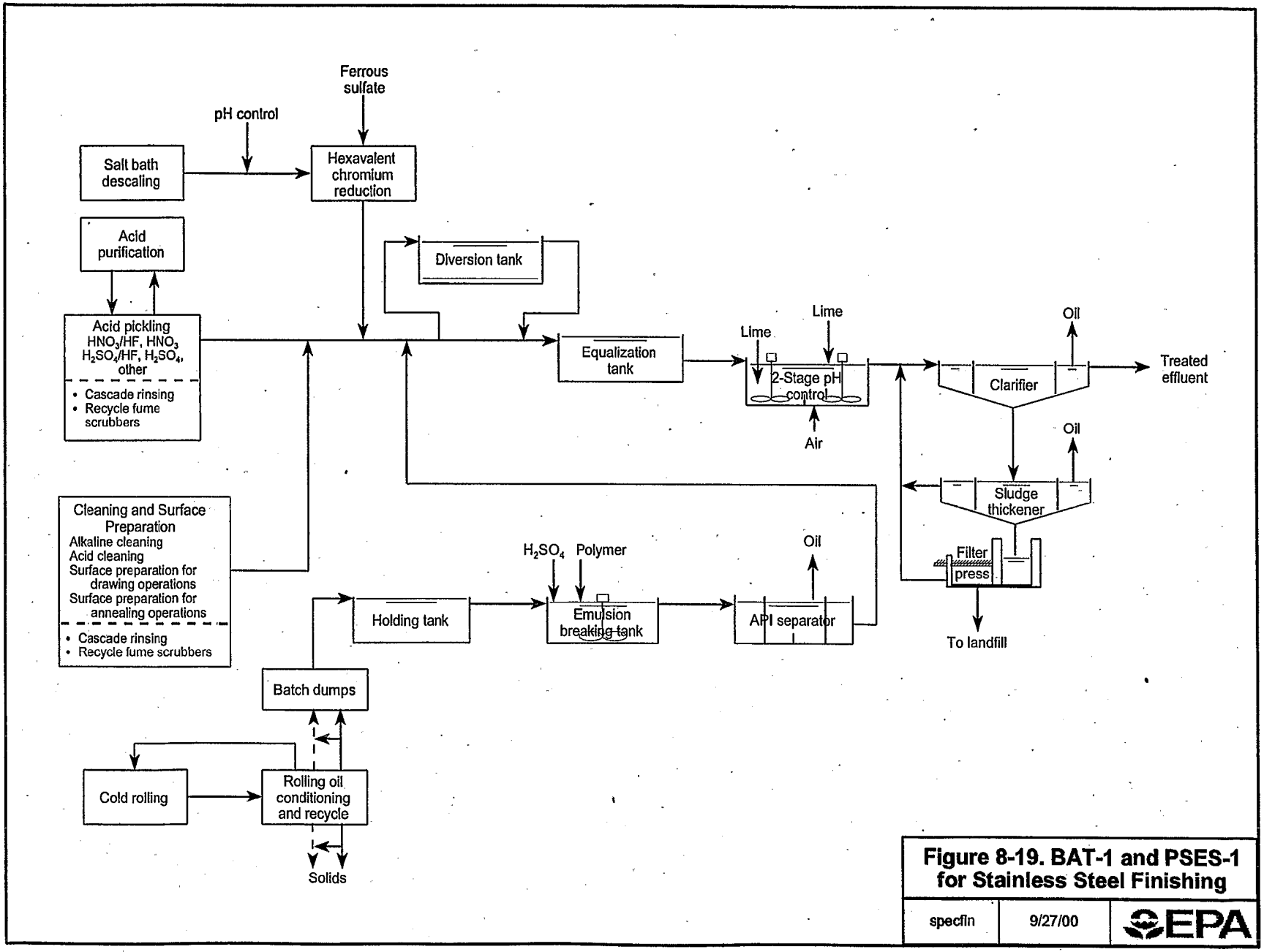


Figure 8-19. BAT-1 and PSES-1 for Stainless Steel Finishing

specfin	9/27/00	EPA

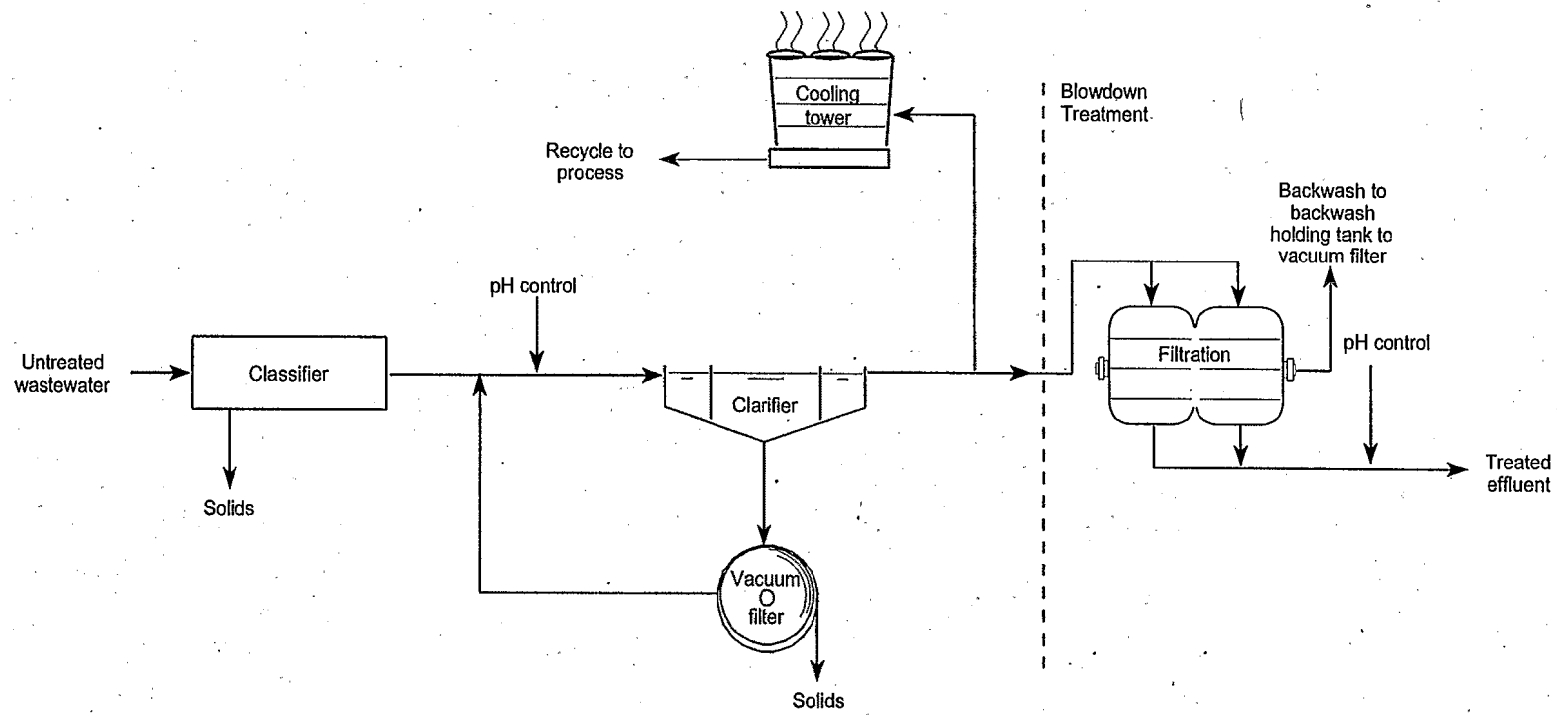


Figure 8-20. BPT-1 for Direct Reduced Ironmaking

OTHOPT1	9/27/00	EPA

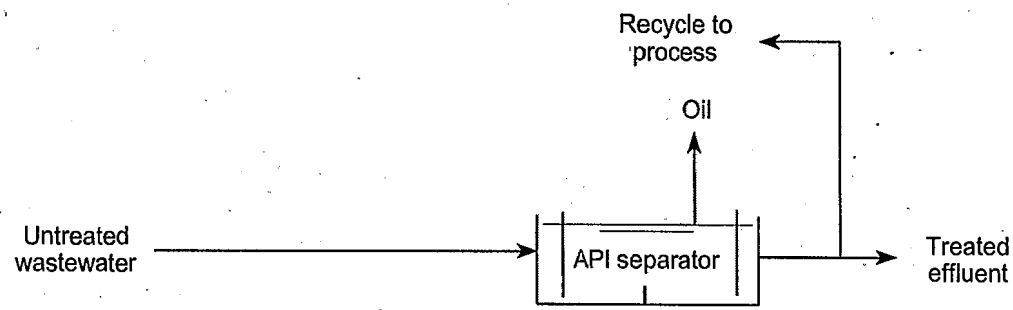


Figure 8-21. BPT-1 for Forging

OTHOPT2	9/27/00	EPA

SECTION 9

INCREMENTAL INVESTMENT AND OPERATING AND MAINTENANCE COSTS FOR PROPOSED REGULATION

This section presents EPA's estimates of incremental investment costs and incremental operating and maintenance costs for the industry to comply with each regulatory option considered for the proposed rule. EPA estimated the compliance costs for each technology option to determine potential economic impacts on the industry and to weigh these costs against the effluent reduction benefits resulting from the proposed technology option. All estimates are based on data collected for the calendar year 1997. Section 10 presents Agency estimates of annual pollutant loadings and removals for each technology option. The Agency is reporting estimates of potential economic impacts associated with the total estimated annualized costs of the proposed regulation separately (Reference 9-1).

Section 9.1 describes EPA's methodology to estimate costs to achieve the effluent quality for each technology option in each subcategory (Section 8 discusses these options). Section 9.2 summarizes the results of the cost analyses, by subcategory, for each technology option evaluated.

9.1 Methodology

EPA developed site-specific cost estimates using data collected from industry survey responses and Agency site visits and sampling episodes. Section 3 provides more information on Agency data collection efforts. EPA also solicited data from vendors of various wastewater treatment technologies, obtained data collected by state agencies, surveyed the technical literature, and enlisted the services of a design and engineering firm that has installed wastewater treatment equipment in the iron and steel industry.

As discussed in Section 8, the Agency developed technology options for each iron and steel subcategory. EPA established a pollution control performance standard for each technology option based on the following components:

- ***Effluent concentrations.*** EPA identified sites with treatment technologies representing each technology option and then evaluated these data to identify sites with the best wastewater treatment performance. The Agency evaluated long-term average effluent concentrations from the analytical data from sites with the best wastewater treatment performance to develop model effluent concentrations. Using this same dataset, EPA calculated long-term averages and variability factors for the development of limitations (see Section 12). For each technology option, EPA compared the model effluent concentrations with effluent concentrations provided by each site to assess wastewater treatment performance.

- ***Technology in place.*** EPA considered the in-process controls and end-of-pipe treatment units comprising each technology option as model pollution control technologies. EPA evaluated industry survey responses to determine wastewater treatment technologies used at sites. The Agency compared model treatment with technology in place at sites to measure wastewater treatment performance. For some survey respondents, available analytical data for outfalls contained substantial amounts of noncontact cooling water or nonprocess wastewater. In these cases, the Agency used technology-in-place solely to assess wastewater treatment performance. Tables 8-3 through 8-9 in Section 8 summarize the results of the technology in place analysis for each iron and steel subcategory.

- ***Production-normalized flow rates (PNFs).*** The Agency developed model PNFs representing appropriate process water management and water conservation practices for each technology option, with emphasis on high-rate recycle. When developing model PNFs, the Agency took into account the nature of subcategory process operations, the rates at which water was applied to processes, recirculating process water quality requirements, and good water management practices. For more information on the development of model PNFs, refer to Section 7. For each technology option, the model PNFs were compared with PNFs calculated from industry survey responses to assess water management practices at sites.

The Agency analyzed these components of pollution control performance to judge whether wastewater treatment units, entire treatment systems, or modifications in operating practices would be necessary for individual sites to achieve model effluent concentrations and PNFs with a particular technology option. If EPA determined that a site exceeded model effluent concentrations or PNFs, the Agency compared the technology in place at the site with the model treatment system of the technology option. EPA then determined the amount of investment, operating and maintenance, and/or one-time costs for those equipment items, water management practices, or operating and maintenance practices that were not consistent with the model treatment systems. There are many possible combinations and variations of the treatment system components of the technology options considered that sites can use to achieve the proposed limitations and standards. Not all sites would be required to install all of the treatment system components to achieve model effluent concentrations and PNFs. For the purposes of preparing these cost estimates, EPA assumed that sites not achieving the model effluent concentrations and PNFs would install treatment identical to the corresponding technology option.

EPA developed a computerized design and cost model to estimate costs using the methodology described above. Sections 9.1.1, 9.1.2, and 9.1.3 describe how EPA developed cost equations for use in the cost model to estimate investment, operating and maintenance, and one-time costs associated with various treatment technologies, respectively. For certain hot forming, continuous casting, and blast furnace operations lacking high-rate recycle systems, EPA

developed cost estimates on a site-specific basis independent of the cost models noted above (see Section 9.1.1).

EPA estimated costs for the iron and steel industry for the base year 1997. The Agency included sites that operated during the 1997 calendar year in the cost analysis if they met the following criteria:

- If a site operated at least one day during the 1997 calendar year; and
- If a site (or operation) shut down after 1997.

If a site (or operation) commenced operations after 1997, EPA did not include the site (or operation).

For some sites, 1997 data did not represent normal operating conditions; for those sites, EPA used data from alternate years. Several sites operated only part of 1997 because of strikes, shut downs, or start-ups. For these sites, EPA used production, analytical, and flow rate data from years that the sites indicated reflected normal operations. If sites installed or significantly altered wastewater treatment systems either during or after 1997, EPA used the data that represented the most current wastewater treatment configuration.

EPA excluded from the cost analysis sites reporting zero discharge of wastewater. The Agency assumed that these sites can continue to operate in this manner and will therefore achieve model effluent concentrations and PNFs.

9.1.1 Investment Costs

For each wastewater treatment facility in each subcategory, EPA determined the equipment items required to achieve the model effluent concentrations and PNFs following the methodology described in Section 9.1. Agency investment cost estimates include costs for the following components:

- ***Equipment:*** Purchased equipment items, including freight;
- ***Installation:*** Mechanical equipment installation, piping installation, civil/structural work (site preparation and grading, construction of equipment foundations and structural supports), costs for materials and labor to construct buildings or enclosed shelters, and electrical and process control instrumentation;
- ***Indirect costs:*** Costs for temporary facilities during construction and installation, spare parts, engineering procurement and contract management, commissioning and start-up, and labor costs for site personnel to oversee equipment installation (owner team costs); and

- ***Contingency***: Additional costs included in estimates to account for unforeseen items in vendor and/or contractor estimates.

The Agency developed investment cost estimates using data sources discussed below:

- ***Vendor and Capital Cost Survey Data.*** The Agency developed cost estimates for purchased equipment and ancillary equipment (pumps, piping, sumps, etc.) for various sizes of technology option components using data from capital cost survey responses and vendor quotes.

- ***Engineering and Design Firm.*** EPA used a design and engineering firm for cost factors to estimate costs associated with the following: shipping of equipment, labor for mechanical equipment installation, site preparation and grading, equipment foundations and structural support, buildings to house treatment equipment and provide enclosed shelter, purchase and installation of piping, and electrical and process control instrumentation. Table 9-1 lists the cost factors used to estimate installed costs of individual treatment units. These cost factors are based on an evaluation of past project costs and budgetary estimates for wastewater treatment installations in the iron and steel industry. The Agency estimated the investment costs of treatment units for various design flow rates by multiplying the purchased equipment cost by approximately 3.5. EPA then plotted the investment cost versus the design flow rate to develop cost equations for use in the computerized cost model. The Agency assumed a linear relationship between investment costs and flow rates, where the range of flows was relatively low. For treatment units that were costed across a wide range of flow rates, EPA extrapolated separate lines for incremental flow ranges. Otherwise, the Agency used the median cost per gallon per minute to estimate investment costs. A detailed summary of the individual treatment units is provided in the Iron and Steel Administrative Record.

  EPA also used an engineering and design firm to estimate investment costs for design flow rates spanning the range of actual industry flow rates for the following treatment systems:

  — Granular activated carbon filtration of cokemaking wastewater (component of BAT-4, By-Product Cokemaking Segment);

  — Alkaline chlorination of cokemaking wastewater (component of BAT-3 and PSES-4, By-Product Cokemaking Segment);

— Metals precipitation of blast furnace and sintering wastewater (component of BAT-1 and PSES-1, Ironmaking Subcategory);

— Alkaline chlorination of blast furnace and sintering wastewater (component of BAT-1, Ironmaking Subcategory);

— Metals precipitation of basic oxygen furnace steelmaking, vacuum degassing, and continuous casting wastewater (component of BAT-1 and PSES-1, Integrated Steelmaking Subcategory; and BAT-2, Non-Integrated Steelmaking and Hot Forming Subcategory); and

— Polishing of wastewater through multimedia filtration (component of BAT-4, By-Product Cokemaking Segment; BAT-1, Ironmaking Subcategory; BAT-1 and PSES-1, Integrated and Stand-Alone Hot Forming Subcategory; and BAT-1 and PSES-1, Non-Integrated Steelmaking and Hot Forming Subcategory).

The engineering and design firm developed investment costs for these treatment systems by determining equipment requirements and specifications according to the specified design flow rates. The firm did not use cost factors to estimate installation costs; instead, it provided line-item estimates for mechanical equipment installation, piping installation, equipment foundations (including site preparation and grading), equipment structural support, buildings, and electrical and process control instrumentation. Figures 9-1 through 9-6 present these treatment systems and Table 9-4 presents the assumptions used to develop these cost estimates. Tables 9-5 through 9-16 present corresponding design specifications and itemized cost sheets. EPA then developed cost curves and model equations as described above.

Table 9-2 summarizes the investment cost equations used to estimate costs for technology option components, the applicable subcategories and technology options, and the sources of these estimates.

EPA identified several sites with once-through wastewater treatment systems that would need to invest in high-rate recycle systems to achieve model PNFs. EPA determined equipment items necessary to achieve high-rate recycle and gathered site-specific information from Agency surveys, site visits, and sampling episodes conducted during this rulemaking. Because these systems are complex and not amenable to a standardized costing approach, the Agency requested the engineering and design firm to estimate investment costs on a site-specific basis using available site-specific information and data.

When estimating costs for sites for entire high-rate recycle or wastewater treatment systems, the Agency took into account land availability, when possible. For sites for which EPA estimated costs for add-on technologies to existing wastewater treatment systems, the Agency assumed that additional space for those technologies was available.

EPA sized wastewater treatment components for each site according to flow rates reported in the industry survey responses. When industry survey responses indicated that existing treatment systems also treated nonprocess water such as ground water, storm water, or noncontact cooling water, the Agency also considered those flows. For sites that EPA estimated would install new blowdown treatment systems to achieve model treatment system effluent quality, the Agency sized these blowdown treatment systems according to model PNFs (in gallons per ton). Blowdown treatment systems were sized according to the flow rate determined by multiplying a site's reported production rate by the model PNF.

9.1.2 Operating and Maintenance Costs

EPA developed estimates of incremental operating and maintenance costs by evaluating operating and maintenance cost data from the detailed and short surveys, supplemented with data from other sources. EPA used specific data from survey responses whenever possible. The Agency estimated operating and maintenance costs for the following items:

- ***Labor.*** Labor costs associated with general operating and maintenance of treatment equipment. EPA used a labor rate of $29.67 per hour to convert the labor requirements of each technology into annual costs which it determined by the following. The Monthly Labor Review, which is published by the U.S. Bureau of Labor Statistics of the U.S. Department of Labor (Reference 9-2), provided the base labor rate. The Agency averaged monthly values for 1997 for production labor in the blast furnace and basic steel products to obtain a base labor rate of approximately $20.90 per hour. Forty-two percent of the base labor rate was then added for overhead (e.g., health insurance, vacation) to obtain the $29.67-per-hour labor rate. Industry survey responses indicated labor rates between $13.00 and $85.64. The median labor rate reported by industry surveys was $28.95. Data collected from the industry survey, site visits, and other contacts with the industry show that the great majority of wastewater treatment systems are staffed on a 24-hour basis. This includes complex wastewater treatment systems for by-product recovery cokemaking, ironmaking, and steelmaking operations; hot forming operations with mechanical treatment systems; and steel finishing operations where wastewater from multiple processes are cotreated. Consequently, the Agency used 24-hour staffing as the baseline labor staffing complement, where reported. Incremental labor costs associated with the assigned wastewater treatment system upgrades were estimated and added to the baseline labor costs to assess incremental cost impacts of the proposed regulation.

- ***Maintenance.*** Costs (excluding labor costs) associated with upkeep of equipment, repairs, operating supplies, royalties, and patents. When these costs could not be estimated based on industry survey responses, the Agency assumed annual maintenance costs to be 6 percent of the investment cost of equipment (Reference 9-3). Maintenance costs reported by industry ranged from 0.2 percent to 6.3 percent of investment costs. The median maintenance cost, as a percentage of investment costs, reported by industry was 1.1 percent.

- ***Chemicals.*** Costs for chemicals used for various wastewater technologies. EPA evaluated industry survey responses to determine chemical usage rates for well-operated treatment systems. When these costs could not be estimated based on industry survey responses, the Agency obtained chemical prices from the Chemical Marketing Reporter from December 1997 (Reference 9-4).

- ***Energy.*** Energy requirements and costs associated with operation of treatment equipment. In general, additional energy requirements were a result of new or upgraded high-rate recycle and treatment systems having electric motors to drive water pumps, chemical mixers, aeration equipment such as blowers and compressors, and cooling tower fans. When energy costs for equipment could not be estimated based on industry survey responses, EPA obtained electricity prices from the U.S. Department of Energy's Energy Information Administration's Average Industrial Electrical Costs in 1998. The average electrical cost to industrial users between 1994 and 1997 was $0.047 per kilowatt hour (kWh) (Reference 9-5). Section 13 presents the estimated energy requirements for each technology option and a more detailed discussion of methodology. The median electrical cost reported in industry surveys was $0.04 per kWh.

- ***Sludge/Residuals (Hazardous/Nonhazardous) Disposal.*** Cost of disposing of generated sludge. The Agency calculated incremental sludge generation rates associated with each technology option. Section 13 presents the methodology and results for this analysis. After considering sludge generation rates, sludge disposal destinations, and sludge disposal costs, the Agency determined that the incremental cost associated with sludge disposal from these technology options is minimal. Therefore, EPA has not included costs associated with sludge disposal in cost estimates for the proposal, except for incremental costs associated with sludge disposal of technology options PSES-3 and PSES-4 of the By-Product Segment of the Cokemaking Subcategory. The Agency calculated site-specific sludge disposal costs for these technology options because several sites would generate and dispose of sludge associated with biological treatment, where no sludge of this nature was previously generated at the site.

- ***Sampling/Monitoring.*** Sampling and monitoring costs to determine compliance with permits or performance of treatment systems. Because of the operational complexity associated with alkaline chlorination, biological treatment, and cyanide precipitation, the Agency estimated additional costs to sample and monitor treatment performance. EPA estimated additional compliance sampling and monitoring costs for dioxins and furans, which are not currently regulated under 40 CFR 420, for sinter plants because of the significant costs associated with these analyses. These costs were estimated to be $12,000 per year per site. For other pollutants such as thiocyanate, mercury, selenium, and fluoride that are not currently regulated under 40 CFR 420, the Agency did not estimate incremental sampling and monitoring costs because many of these pollutants are currently sampled and monitored by sites because of water quality standards. Moreover, the Agency did not incorporate monitoring cost savings realized by sites because of the elimination of naphthalene, tetrachloroethylene, and benzene as a result of the proposed regulation.

Table 9-3 presents the equations used to calculate individual equipment operating and maintenance costs, along with the range over which the equations have been developed. The table provides information sources for each of the cost equations in the footnotes. A more detailed description of the development of these costs for each equipment item is provided in the Iron and Steel Administrative Record.

9.1.3 One-Time Costs

When assessing costs for technology options consisting of biological treatment, chemical precipitation, or multimedia filtration, EPA found that analytical data from some survey responses showed that, despite the facilities having technology in place equivalent to a technology option, their PNFs or effluent concentrations exceeded model values. In such cases, the Agency evaluated treatment system design and operating parameters to determine additional investment and operating and maintenance costs required to achieve the model PNFs and effluent quality. If design and operating parameters were equivalent to model treatment operating parameters or when these parameters were not provided in a site's survey response, the Agency allocated a single-occurrence cost associated with hiring an outside consultant to upgrade wastewater treatment system performance (e.g., improve site operation and maintenance to optimize biological treatment system performance). For chemical precipitation systems, the Agency also assumed a 15 percent increase in operating and maintenance costs (primarily due to additional chemical use).

For technology options incorporating high-rate recycle, EPA evaluated production-normalized flow rates and recycle technology in place to determine whether a site required investment and operating and maintenance costs to achieve the model PNFs. The Agency found many instances where facilities have installed high-rate recycle systems, but the discharge flow rates exceed the selected model discharge flow rates on a production-normalized

basis. If the system was able to recirculate the incremental flow necessary to achieve the model PNF, EPA did not assign an investment cost for new facilities in the main treatment and recycle circuit. In cases where the increase in recycle rate was minimal with respect to the total recirculating flow rate, EPA assigned a one-time cost for consultant and mill services to evaluate the treatment and recycle system and to modify water management practices and operations to achieve the model discharge flow rate. If the treatment and recycle system lacked sufficient hydraulic capacity to recirculate the incremental flow necessary to achieve the model discharge flow rate, EPA sized and costed additional process water treatment and recycle facilities for the main treatment and recycle circuit. The Agency assumed that the one-time costs would include relatively minor costs associated with controlling make-up water flow rates and eliminating sources of extraneous water. Incremental operation and maintenance costs were not assigned. The Agency assumed the increased costs associated with modifying the recycle rate would be minimal and offset by likely savings in process water chemical treatment.

EPA assumed these one-time costs for minimal improvements in wastewater treatment performance or recycle rates to be $50,000. This estimate is based on a 10-week study, comprising 400 hours of direct labor (160 hours of field work and 240 hours of office work) at a labor rate of $100 per hour, approximately $5,000 for airfare, food, lodging, and other direct costs (equipment rental, analytical costs, telephone costs), and $5,000 for miscellaneous expenses.

9.2 Results

This section presents Agency national estimates of incremental investment and operating and maintenance costs by technology option for each industry subcategory. Agency cost estimates for this rulemaking are factored estimates and are considered to be accurate within ±25 to ±30 percent (Reference 9-3).

9.2.1 Cokemaking Subcategory - By-Product Segment

The Agency estimated the cost impacts of four BAT and PSES technology options for 22 by-products recovery cokemaking sites in the United States that discharge wastewater. Of these 22 sites, 14 are direct dischargers and 8 are indirect dischargers. The table below summarizes the technology options evaluated. Agency cost estimates for these options are discussed in the subsections below and presented in Table 9-17.

Technology Options for By-Product Segment

Treatment Unit	BAT-1	BAT-2	BAT-3	BAT-4	PSES-1	PSES-2	PSES-3	PSES-4
Tar/oil removal	✔	✔	✔	✔	✔	✔	✔	✔
Equalization/ammonia still feed tank	✔	✔	✔	✔	✔	✔	✔	✔
Free and fixed ammonia still	✔	✔	✔	✔	✔	✔	✔	✔
Temperature control	✔	✔	✔	✔			✔	✔
Cyanide precipitation with sludge dewatering		✔				✔		
Equalization tank	✔	✔	✔	✔			✔	✔
Biological treatment with secondary clarification	✔	✔	✔	✔			✔	✔
Sludge dewatering	✔	✔	✔	✔			✔	✔
Alkaline chlorination (2-stage)			✔	✔				✔
Multimedia filtration				✔		✔		
Granular activated carbon				✔				

BAT-1

EPA analyzed long-term average effluent data and wastewater treatment operating parameters provided in industry survey responses from all 14 direct discharging sites. Based on this analysis, EPA made the estimates discussed below.

One site would install additional aeration capacity for biological treatment to achieve the model treatment concentration for ammonia as nitrogen. The Agency believes that the current operating hydraulic retention time (HRT) and solids retention time (SRT) at this site are insufficient to consistently achieve model treatment concentrations. Consequently, the Agency estimated investment costs for additional biological treatment basin capacity required to achieve a 50-hour HRT and an SRT of 100 days, which are based on industry survey responses from by-product cokemaking sites with model treatment and performance. EPA also estimates that this site would incur a one-time cost to reduce the use of control water and would install an equalization tank ahead of existing ammonia stills to minimize influent and effluent variability for ammonia-N.

The Agency also estimates that:

- One site would incur a one-time cost to reduce the use of control water and install a heat exchanger prior to biological treatment, to ensure proper temperature control;
- One site would incur a one-time cost to reduce the use of control water; and

- Three sites have model treatment technology in place, but would incur a one-time cost to improve the operation of existing biological treatment systems.

One site does not operate biological treatment following ammonia distillation. Instead, this site operates an ammonia still followed by a dephenolization system, sand filtration, and granular activated carbon filtration. The Agency assumed that the owner or operator of this site would replace the existing physical chemical treatment system with a biological treatment system to achieve ammonia as nitrogen and total phenol model treatment concentrations. Although this would require an investment of approximately $4 million, the Agency estimates that this site would realize annual operating and maintenance cost savings.

The Agency estimates that the remaining seven sites have existing wastewater treatment systems that would achieve compliance with BAT-1 model effluent concentrations and PNFs. Therefore, EPA estimates that these sites would not incur any costs to comply with BAT-1.

BAT-2

In addition to the costs associated with complying with BAT-1, EPA estimates that eight sites would install a cyanide precipitation system. Effluent total cyanide concentrations reported in industry survey responses indicate that these sites would not achieve model effluent concentrations. Six sites discharge wastewater with total cyanide concentrations below the model BAT-2 effluent concentrations and would not require this technology.

BAT-3

In addition to the costs associated with BAT-1, EPA estimates that all 14 direct discharge sites would install alkaline chlorination systems to achieve BAT-3 model effluent concentrations and PNFs.

BAT-4

In addition to the costs associated with BAT-3, EPA estimates that 11 sites would install granular activated carbon systems and nine sites would install multimedia filtration systems to comply with BAT-4. Two sites use sand or multimedia filtration systems and two sites operate sand filters followed by granular activated carbon filters. One site operates a granular activated carbon filtration as a bypass system and has sufficient design capacity to treat its effluent.

PSES-1

Of the eight indirect discharging sites, three use biological treatment. Two sites operate an ammonia still followed by cyanide precipitation; one of these sites also operates a sand filtration system following cyanide precipitation. The remaining three sites operate an ammonia

still. The Agency estimates that two sites would incur a one-time cost to improve ammonia still performance, and would increase annual operating and maintenance costs by 15 percent for additional steam consumption. The Agency estimates that three sites with conventional activated sludge systems would incur a one-time cost to improve biological treatment system performance.

PSES-2

In addition to the costs associated with PSES-1, the Agency estimates that four sites would install cyanide precipitation and multimedia filtration systems to comply with PSES-2. Four sites can achieve PSES-2 model effluent concentrations and PNFs for ammonia, cyanide, and benzo-a-pyrene. Therefore, EPA estimates that these sites would not incur any cost as a result of complying with PSES-2.

PSES-3

The Agency estimates that five sites would install biological treatment systems to comply with PSES-3. The Agency estimated investment costs of installing biological treatment systems designed and operated based on a 50-hour HRT and an SRT of 100 days, along with associated equalization, clarification and sludge handling systems. EPA also estimates that three sites with existing biological treatment would incur a one-time cost to improve system performance.

PSES-4

EPA estimates that, in addition to the costs incurred to comply with PSES-3, all eight indirect discharging sites would install alkaline chlorination systems to achieve PSES-4 model effluent concentrations and PNFs.

Non-Recovery Segment

The Agency is aware of one non-recovery cokemaking plant that operated in 1997. This site does not discharge process wastewater and would therefore not incur any additional costs to achieve zero discharge.

9.2.2 Ironmaking Subcategory

Of the 20 integrated sites in the United States, 9 discharge blast furnace wastewater only and three discharge blast furnace and sintering wastewater. The Agency is aware of one stand-alone sinter plant that operated in 1997 and discharged wastewater. Of the 14 sites that discharge blast furnace or sinter plant wastewater, 9 operated dedicated blast furnace treatment systems (one is an indirect discharging site); 3 operated combined sintering and blast furnace treatment systems, 1 co-treated wastewater from sintering, blast furnace, and other iron and steel manufacturing processes, and 1 operated a dedicated sinter plant treatment system. Of the 14 sites with blast furnace ironmaking operations that discharge wastewater, 10 sites had

Clean Water Act section 301(g) variances for ammonia and phenol (see Section 15). The Agency assumed that sites with these variances in existing permits would reapply for and be granted 301(g) variances during permit renewal. Therefore, EPA did not estimate costs for alkaline chlorination systems to achieve BAT-1 model treatment for sites with cyanide concentrations below or equivalent to BAT-1 model treatment concentrations. The table below summarizes the technology options for treatment of blast furnace and sintering wastewater, whether co-treated or treated separately. Agency cost estimates for these options are discussed in the subsection below and presented in Table 9-18.

Technology Options for Ironmaking Subcategory

Treatment Unit	BAT-1	PSES-1
Clarifier	✔	✔
Sludge dewatering	✔	✔
Cooling tower (blast furnace only)	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Metals precipitation	✔	✔
Alkaline chlorination (2-stage)	✔	
Multimedia filtration	✔	

BAT-1/PSES-1

EPA evaluated industry survey responses from 13 direct discharging sites and one indirect discharging site. The Agency estimates that two sites with existing once-through treatment systems would install high-rate recycle systems to achieve model treatment. Based on effluent concentrations reported in the survey responses for lead and zinc, the Agency assumed one of these sites would also install a blowdown treatment metals precipitation system to achieve model treatment concentrations. To estimate the investment costs for these high-rate recycle systems, the Agency used site knowledge and an engineering and design firm to estimate investment costs (independent of the cost model) for each site.

In addition to the wastewater treatment modifications above and after taking Section 301(g) variances into consideration, the Agency also estimates that:

- One site would install a blowdown treatment system comprising metals precipitation, solids handling, alkaline chlorination, and multimedia

filtration to achieve model effluent concentrations and incur a one-time cost to achieve the model PNF.

- One site would install a blowdown treatment system comprising alkaline chlorination and multimedia filtration system and incur a one-time cost to improve its existing metals precipitation system. Based on chemical usage rates reported by this site, EPA estimates that annual operating and maintenance costs would increase by 15 percent.

- One site would install a multimedia filtration system to achieve model lead and zinc concentrations.

- One site would install a blowdown metals precipitation system and solids handling system prior to an existing sand filtration system.

- One site would install a multimedia filtration and solids handling system and incur a one-time cost for flow reduction of blast furnace and sintering operations.

- One site would install a blowdown metals precipitation, solids handling, and multimedia filtration system to achieve model lead and zinc concentrations and incur a one-time cost to achieve the model PNF for discharge of sintering wastewater.

- One site would install a blowdown metals precipitation, solids handling, and multimedia filtration system to achieve model lead and zinc concentrations and incur a one-time cost to achieve the model PNF.

- One site would incur a one-time cost for to reduce flow and install a multimedia filtration system.

- Two sites would incur a one-time cost to modify operating practices of existing metals precipitation systems. Based on chemical usage rates reported by these sites, EPA estimates that annual operating and maintenance costs would increase by 15 percent.

- Two sites would incur a one-time cost to reduce flow and improve operation of its existing metals precipitation system.

9.2.3 Integrated Steelmaking Subcategory

According to industry survey responses, there are 20 integrated sites with basic oxygen furnaces (BOFs) and continuous casting operations. Thirteen of these sites have vacuum degassing operations. The Agency is also aware of one non-integrated site that operates a BOF. EPA estimated incremental costs for these 21 sites. The table below summarizes the technology options for treatment of wastewater from BOF, vacuum degassing, and continuous casting operations, whether co-treated or treated separately. Agency cost estimates for these options are discussed in the subsection below and presented in Table 9-19.

Technology Options for Integrated Steelmaking Subcategory

Treatment Unit	BAT-1	PSES-1
Classifier (BOF only)	✔	✔
Scale pit with oil skimming (continuous casting only)	✔	✔
Clarifier	✔	✔
Sludge dewatering	✔	✔
Multimedia filtration[a] (continuous casting only)	✔	✔
Cooling tower (vacuum degassing and continuous casting)	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Metals precipitation	✔	✔

[a] May be used in recycle circuit or as blowdown treatment.

BAT-1/PSES-1

The Agency estimates that 8 of the 21 sites would install blowdown metals precipitation systems to achieve BAT-1/PSES-1 model treatment concentrations and incur one-time costs to achieve model PNFs. EPA estimates that two of these sites would invest additional capital to reroute existing discharges to these add-on metals precipitation systems. Based on site visits and information provided in industry survey responses, the Agency estimates that approximately 300 feet of piping would be required to reroute this wastewater at both sites and estimates an additional $250,000 of investment costs at each site to purchase and install this piping.

The Agency is aware of one site that performs once-through treatment of continuous casting wastewater. To estimate the investment costs to install a high-rate recycle

system at this site, the Agency used site knowledge and an engineering and design firm to estimate investment costs independently of the cost model.

In addition to the wastewater treatment modifications mentioned above, the Agency also estimates that:

- One site would install a blowdown metals precipitation system to achieve model treatment.
- One site would incur a one-time cost to improve the operation of its existing metals precipitation system. Based on chemical usage rates reported by this site, EPA estimates the site would increase annual operating and maintenance costs by 15 percent.
- The Agency believes that one site would not incur any costs as a result of complying with BAT-1 and that nine sites would achieve BAT-1 model PNFs after incurring one-time costs.

9.2.4 Integrated and Stand-Alone Hot Forming Subcategory

The Agency estimates that 44 carbon steel integrated and stand-alone hot forming sites discharge wastewater to surface water in the United States and seven sites discharge wastewater to POTWs. EPA estimates that the three integrated and stand-alone hot forming sites that manufacture stainless steel products are indirect discharging sites. No survey respondent with stainless steel hot forming operations reported direct discharge of wastewater.

The table below summarizes the technology options evaluated for the carbon and alloy and stainless segments of this subcategory. Agency cost estimates for these options are discussed in the subsections below and presented in Table 9-20.

Technology Options for Integrated and Stand-Alone Hot Forming Subcategory

Treatment Unit	BAT-1	PSES-1
Scale pit with oil skimming	✔	✔
Roughing clarifier with oil removal	✔	✔
Sludge dewatering	✔	✔
Multimedia filtration[a]	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Multimedia filtration[a]	✔	✔

[a] May be used in recycle circuit or as blowdown treatment.

BAT-1 (Carbon and Alloy Segment)

The Agency estimates that 12 sites would install high-rate recycle systems to replace existing partial or once-through treatment systems. To estimate the investment costs to install a high-rate recycle system for 10 of these sites, the Agency used site knowledge and an engineering and design firm to estimate investment costs independently of the cost model. EPA also estimated costs for one of these sites to segregate hot forming and finishing wastewater that was co-treated in an end-of-pipe system. The Agency distributed costs associated with this modification to the Integrated and Stand-Alone Hot Forming Subcategory and Steel Finishing Subcategory according to the relative percentage of wastewater flow reported by this site from both subcategories. The Agency used the cost model to estimate investment costs for the other two sites with once-through treatment systems. EPA also estimates that one site would invest approximately $2 million to reroute hot forming wastewater discharge to an existing sand filtration system.

In addition to the wastewater treatment modifications mentioned above, the Agency also estimates that:

- Ten sites would incur one-time costs to achieve model PNFs;
- Two sites would incur one-time costs to improve operation of existing multimedia filtration systems to achieve model effluent concentrations;
- Five sites would install blowdown multimedia filtration systems and incur one-time costs to achieve model effluent concentrations and PNFs;
- Two sites would install blowdown filtration units to achieve model effluent concentrations; and
- Twelve sites would not incur any costs to comply with BAT-1.

The Agency estimates that six of the sites mentioned above would install multimedia filtration systems to treat flow rates below 50 gallons per minute (gpm). Based on vendor information obtained for small-scale multimedia filtration systems, the Agency estimates an investment cost of $200,000 would be required to purchase and install these systems.

PSES-1 (Carbon and Alloy Segment)

Of the seven indirect discharging carbon steel integrated and stand-alone hot forming sites, the Agency estimates that one site would incur a one-time cost to achieve the model PNF. EPA also estimates that two sites would install blowdown filtration systems to treat flow rates less than 50 gpm and incur a one-time cost to achieve model treatment concentrations and that four sites would not incur any costs to comply with PSES-1.

PSES-1 (Stainless Segment)

Of the three indirect discharging stainless sites, the Agency estimates that one site would install a high-rate recycle system to replace an existing once-through system, and that two sites would incur a one-time cost to achieve the model PNF.

9.2.5 Non-Integrated Steelmaking and Hot Forming Subcategory

The Agency estimates that 39 carbon steel mini-mills discharge wastewater from vacuum degassing, continuous casting, or hot forming operations, whether co-treated or treated separately, to surface waters of the United States and 15 discharge wastewater from these operations to POTWs. The Agency also estimates that four stainless steel mini-mills discharge wastewater from vacuum degassing, continuous casting, or hot forming operations, whether co-treated or treated separately, to surface waters of the United States and four discharge wastewater from these operations to POTWs.

The table below summarizes the technology options evaluated for the carbon and alloy and stainless segments. Agency cost estimates for these options are discussed in the subsections below and presented in Table 9-21.

Technology Options for Non-Integrated Steelmaking and Hot Forming

Treatment Unit	BAT-1	BAT-2	PSES-1
Scale pit with oil skimming (continuous casting and hot forming only)	✔	✔	✔
Clarifier	✔	✔	✔
Sludge dewatering	✔	✔	✔
Cooling tower	✔	✔	✔
Multimedia filtration[a]	✔	✔	✔
High-rate recycle	✔	✔	✔
Blowdown treatment			
Metals precipitation[a,b]		✔	
Multimedia filtration[a]	✔	✔	✔

[a]May be used in recycle circuit or as blowdown treatment.
[b]Applies to Stainless Steel Segment only.

BAT-1 (Carbon and Alloy Segment)

The Agency estimates that two sites would replace existing once-through treatment systems with high-rate recycle systems and three sites would install blowdown

multimedia filtration systems to treat flow rates below 50 gpm to achieve model treatment concentrations. EPA estimates that nine sites would install blowdown multimedia filtration systems and incur a one-time cost to achieve model treatment; of these nine sites, seven would treat flow rates below 50 gpm. The Agency believes that there are four mini-mills that would not incur any costs to comply with BAT-1. The Agency believes that 21 mini-mills would achieve model PNFs after incurring a one-time cost.

PSES-1 (Carbon and Alloy Segment)

The Agency estimates that two sites would install a blowdown multimedia filtration system to treat flow rates below 50 gpm to achieve model effluent concentrations, 10 sites would install a blowdown multimedia filtration system to treat flow rates below 50 gpm and incur a one-time flow reduction cost, and three sites would incur a one-time cost to achieve model PNFs.

BAT-1 (Stainless Segment)

The Agency estimates that two sites would incur one-time costs to achieve model PNFs, one site would install a blowdown multimedia filtration system and incur a one-time cost to achieve model effluent concentrations and PNFs, and one site would not incur any costs to comply with BAT-1.

BAT-2 (Stainless Segment)

The Agency estimated costs for metals precipitation but the demonstrated technology showed the pollutant removals were insignificant, as discussed in Section 10.

PSES-1 (Stainless Segment)

The Agency estimates that four sites would incur a one-time cost to achieve model PNFs.

9.2.6 Steel Finishing Subcategory

The Agency estimates that 51 carbon steel and 18 stainless steel finishing mills discharge wastewater to surface water in the United States and 31 carbon steel and 14 stainless steel finishing mills discharge wastewater to POTWs.

The table below summarizes the technology options evaluated for the carbon and alloy and stainless segments. The Agency evaluated PNFs from manufacturing lines at each site for comparison with model PNFs. For lines with PNFs within 25 percent of the model PNF, EPA allocated a one-time cost to sites to achieve model PNFs. The Agency assumes relatively minor costs are associated with controlling rinse water flow rates to achieve these flow reductions and would be included in the one-time cost. For manufacturing lines with PNFs greater than 25

percent, the Agency estimated costs to install countercurrent rinse tanks at $250,000 per line. This estimate is based on installation of an additional 10,000-gallon rinse tank with associated pumps and blowers for bath agitation. Also in this estimated cost, the Agency assumed lost line revenue from downtime for two days for tank installation, at an average of $448/ton of cold rolled coil sheet steel based on a median production rate of 95 tons/day for all finishing sites (Reference 9-6). Furthermore, EPA did not assign incremental operating and maintenance costs for installation of countercurrent rinse tanks. The Agency assumed that operating and maintenance costs incurred because of installation of these tanks would be minimal and offset by likely savings in rinse water usage and process water chemical treatment. The Agency will pursue further data gathering after-proposal to more accurately estimate costs associated with installation of an additional rinse tank. Agency cost estimates for the evaluated technology options are discussed in the subsections below and presented in Table 9-22.

Technology Options for Steel Finishing Subcategory

Treatment Unit	BAT-1	PSES-1
In-Process Controls		
Countercurrent rinses	✔	✔
Recycle of fume scrubber water	✔	✔
Acid purification units (stainless steel only)	✔	✔
Wastewater Treatment		
Diversion tank	✔	✔
Oil removal	✔	✔
Hydraulic and waste loading equalization	✔	✔
Hexavalent chromium reduction	✔	✔
Multiple-stage pH control for metals precipitation	✔	✔
Clarification	✔	✔
Sludge dewatering	✔	✔

BAT-1 (Carbon and Alloy Segment)

The Agency estimates that eight sites would incur a one-time flow reduction cost for a single line to achieve model PNFs. Based on industry survey responses, six sites would incur a one-time cost to optimize existing metals precipitation systems. The Agency assumed a 15 percent increase in annual operating and maintenance costs for these sites. EPA estimates that

three sites would require wastewater treatment modifications and incur a one-time cost to achieve model effluent concentrations and PNFs. One of these sites was costed to segregate hot forming and finishing wastewater that was co-treated in an end-of-pipe system. EPA distributed costs associated with this modification to the Integrated and Stand-Alone Hot Forming Subcategory and Steel Finishing Subcategory according to the relative percentage of wastewater flow reported by this site from both subcategories.

In addition to the in-process control and wastewater treatment modifications mentioned above, the Agency also estimates that:

- Six sites would install countercurrent rinse tanks on a single line;
- Thirteen sites would install countercurrent rinse tanks and incur a one-time cost to achieve model PNFs on multiple lines;
- Four sites would install countercurrent rinse tanks on multiple lines and incur a one-time cost and a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems; and
- Eleven sites would not incur any cost to comply with BAT-1.

PSES-1 (Carbon and Alloy Segment)

The Agency estimates that four sites would require wastewater treatment modifications to achieve model treatment. EPA estimated costs for three of these sites to install metals precipitation systems, clarifiers, and associated sludge handling systems and for the other site was to install a clarifier.

In addition to the wastewater treatment modifications mentioned above, the Agency also estimates that:

- Six sites would incur a one-time cost to achieve model PNFs on a single line;
- Two sites would incur a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems;
- Two sites would install metals precipitation systems, clarifiers, and associated sludge handling systems, install countercurrent rinse tanks, and incur a one-time cost to achieve model PNFs;
- Three sites would install a countercurrent rinse tank on a single line;

- Two sites would install a countercurrent rinse tank on a single line, incur a one-time cost to achieve model PNFs, and incur a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems;
- Two sites would install countercurrent rinse tanks on multiple lines; and
- Ten sites would not incur costs to comply with PSES-1.

BAT-1 (Stainless Segment)

The Agency estimates that nine sites contract hauled or treated spent acid pickling baths. Of these nine sites, EPA assumed that seven would install a single acid purification unit and countercurrent rinse tanks on multiple lines as a result of BAT-1 model effluent concentrations and PNFs, while two would install multiple acid purification units and install countercurrent rinse tanks on multiple lines.

In addition to the in-process control modifications mentioned above, the Agency also estimates that:

- Two sites would incur a one-time cost to achieve model PNF for a single line;
- Three sites would install countercurrent rinse tanks on multiple lines and incur a one-time cost to achieve model PNFs;
- Two sites would install countercurrent rinse tanks on multiple lines and incur a one-time cost and a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems; and
- Two sites would not incur a cost to comply with BAT-1.

PSES-1 (Stainless Segment)

The Agency estimates that five sites contract hauled or treated spent acid pickling baths, assuming that these sites would install acid purification units to achieve model effluent concentrations. Of these five sites, the Agency also estimates that two would incur a one-time cost and a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems.

In addition to the in-process control and wastewater treatment modifications mentioned above, the Agency also estimates that:

- Two sites would incur a one-time cost and a 15 percent increase in annual operating and maintenance costs to optimize existing metals precipitation systems;
- One site would install countercurrent rinse tanks on a single line;
- One site would install countercurrent rinse tanks on multiple lines, incur a one-time cost to achieve model PNFs on multiple lines, and incur a 15 percent increase in annual operating and maintenance costs to optimize an existing metals precipitation system; and
- Five sites would not incur a cost to comply with PSES-1.

9.2.7 Other Operations Subcategory

Direct Reduced Ironmaking (DRI) Segment

The table below presents the BPT technology option evaluated for this segment. EPA is not discussing or presenting cost estimates because data aggregation or other masking techniques are insufficient to protect confidential business information. The Agency evaluated effluent total suspended solids concentrations reported by sites, PNFs, and technology in place to determine appropriate costs to achieve model treatment.

Technology Options for DRI Segment

Treatment Unit	BPT/PSES-1
Classifier	✔
Clarifier	✔
Sludge dewatering	✔
Cooling tower	✔
High-rate recycle	✔
Blowdown treatment	
Multimedia filtration	✔

Forging Segment

Of the eight direct discharging forging operations and four indirect discharging forging operations, the Agency estimates that six sites would incur a one-time cost to achieve model PNFs. EPA assigned a one-time cost of $20,000 for consultant and mill services to evaluate how to modify contact water management practices to achieve the model PNF for

forging. Forging operations at iron and steel sites are small-scale operations that range in production from 500 to 90,000 tons of steel per year. Sites estimated to incur a one-time cost forge well below 20,000 tons of steel per year. Consequently, the Agency's estimate is based on a short-term study, consisting of 150 hours of direct labor (50 hours of field work and 100 hours of office work) at a labor rate of $100 per hour. The Agency also estimates approximately $2,500 for airfare, food, lodging, and other direct costs (equipment rental, analytical costs, telephone costs) and $2,500 for miscellaneous expenses. Table 9-23 presents Agency cost estimates for the BPT option.

Technology Options for Forging Segment

Treatment Unit	BPT
High-rate recycle	✔
Blowdown treatment	
Oil/water separator	✔

9.3 References

9-1 U.S. Environmental Protection Agency. Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA 821-B-00-009, Washington, D.C., December 2000.

9-2 U.S. Department of Labor, Monthly Labor Review. Washington, D.C., 1997.

9-3 Perry, R. and Green, D. Perry's Chemical Engineer's Handbook, Sixth Edition. McGraw-Hill, Inc., 1984.

9-4 Chemical Market Reporter. Schnell Publishing Company, December 1997.

9-5 U.S. Department of Energy. Electric Power Annual 1998. Volume I. Washington, D.C., 1998.

9-6 U.S. Department of Commerce. Current Industrial Reports, Steel Mill Products - 1997. MA33B, September 1998.

Table 9-1

Cost Factors to Determine Investment Costs

Category	Item	Cost Factor (% of equipment cost)
Direct costs[a]	Equipment cost	100
	Freight	3
	Installation labor	40
	Site preparation	15
	Equipment foundations and structural support	40
	Buildings	15
	Piping	35
	Electrical and process control	30
	Subtotal	278
Indirect costs	Temporary facilities (1%)[b]	3
	Spare parts (1.5%)[b]	4
	Engineering procurement and contract management (12%)[b]	34
	Commissioning and start-up (3%)[b]	8
	Owner team (10%)[b]	28
	Subtotal (27.5% of subtotal of direct costs)	77
Total project cost		**355**

[a]Direct cost factors include contingency costs.
[b]Percentage of subtotal of direct costs; standard factors used by engineering and design firm.

Table 9-2

Iron and Steel Investment Cost Equations

Equipment	Investment Cost Equation	Applicable Subcategory	Range of Validity	Source(s)
Biological nitrification (chemicals include caustic, phosphoric acid, polymer, and defoaming agent)	($): 22,013 × flow (gpm)	Cokemaking	50 to 500 gpm	Capital cost survey, vendor information
Flow equalization tank (prior to ammonia stripping and biological nitrification)	($): (1-day HRT) × flow (gpm) × 1440 min/day = V If V is ≤ 250,000, then investment ($) = $1.09/gal × 250,000 gal ≤ 500,000, then investment ($) = $1.09/gal × 500,000 gal ≤ 750,000, then investment ($) = $1.09/gal × 750,000 gal ≤ 1,000,000, then investment ($) = $1.09/gal × 1,000,000 gal ≤ 1,250,000, then investment ($) = $1.09/gal × 1,250,000 gal	Cokemaking	250,000 to 1,250,000 gallons	Capital cost survey, vendor information
Clarification of activated sludge	($): 782.4 × flow rate (gpm) @ 600 gal/day/ft^2	Cokemaking	20 to 90 ft diameter	Capital cost survey, vendor information
Heat exchanger	($): 933 × flow rate (gpm)	Cokemaking	20 to 300 gpm of hot water flow influent temp: 140°F effluent temp: 80°F	Capital cost survey, vendor information

Table 9-2 (Continued)

Equipment	Investment Cost Equation	Applicable Subcategory	Range of Validity	Source(s)
Sludge thickening of activated sludge and metal hydroxides	($): 168.3 × flow (gpm) + 213,320 where flow is through thickener (activated sludge) ($): 1,581.5 × flow (gpm) + 144,799 where flow is assumed to be 4% of flow to the clarifier (metal hydroxides)	Cokemaking Ironmaking Steel Finishing	0.5 to 1,390 gpm	Capital cost survey, vendor information
Belt filter press	($): 813 × wastewater flow (gpm) where flow is flow through biological nitrification	Cokemaking	4 to 14 tons/day of wet sludge	Capital cost survey, vendor information
Cyanide precipitation (chemicals include ferric sulfate, sulfuric acid, polymer, and sodium hydroxide)	($) 762.36 × flow (gpm) + 113,338 Sulfuric acid feed system: 88.816 × flow (gpm) + 35,692 Ferric sulfate feed system: 79.059 × flow (gpm) + 23,332 Polymer feed system: 68.132 × flow (gpm) + 12,061 Sodium hydroxide feed system: 14.306 × flow (gpm) + 35,927	Cokemaking	40 to 400 gpm	Capital cost survey, vendor information
Alkaline chlorination of cokemaking wastewater	($): 3,165 × flow (gpm) + 1,000,000 [hatch, includes feed systems]	Cokemaking	88 to 2,340 gpm	Engineering and design firm
Sludge thickening for iron-cyanide sludge	($): 63,261 × flow (gpm) + 144,799	Cokemaking	40 to 400 gpm	Capital cost survey, vendor information
Plate and frame filter press	($): 117.6 × flow (gpm) + 47,553 (Cokemaking) ($): 1,340.8 × flow (gpm) + 47,553 (Steel Finishing)	Cokemaking Steel Finishing	104 to 1,390 gpm	Capital cost survey, vendor information
Multimedia filtration	($): 454.38 × flow (gpm) + 895,589 92.55 × flow (gpm) + 3,000,000	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming Other Operations	50 to >5,200 gpm	Engineering and design firm

Table 9-2 (Continued)

Equipment	Investment Cost Equation	Applicable Subcategory	Range of Validity	Source(s)
Granular activated carbon	($): 950.31 × flow (gpm) + 848,478	Cokemaking	88 to 2,340 gpm	Engineering and design firm
Chemical precipitation	($): 1,344.4 × flow (gpm) + 1,000,000 (Ironmaking) ($): 1,324.8 × flow (gpm) + 842,049 (Integrated Steelmaking) ($): 748.02 × flow (gpm) + 162,686 (Steel Finishing)	Ironmaking Integrated Steelmaking Steel Finishing	104 to 1,390 gpm	Capital cost survey, vendor information
Alkaline chlorination of blast furnace and sintering wastewater	($): 1,344.4 × flow (gpm) + 811,989	Ironmaking	104 to 1,390 gpm	Engineering and design firm
Vacuum filtration	($): 1.13 × (sludge generation (lbs/day)) + 151,037 where sludge generation is 26 lbs/day/gpm	Ironmaking	104 to 1,390 gpm	Capital cost survey, vendor information
Roughing clarifier	($): 86.4 × flow (gpm)	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	5,000 to 15,000 gpm	Capital cost survey, vendor information
Cooling tower	($): 32.17 × flow (gpm) + 234,335	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	500 to 60,000 gpm	Capital cost survey, vendor information
Recycle pump station	($): 10.529 × flow (gpm) + 56,925	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	6,900 to 35,000 gpm	Capital cost survey, vendor information
Acid purification unit	($): 500,000	Steel Finishing	9 gpm	Vendor information

Table 9-2 (Continued)

Equipment	Investment Cost Equation	Applicable Subcategory	Range of Validity	Source(s)
Lime feed system	($): 50,591 × flow (gpm) + 27,665	Steel Finishing	104 to 1,390 gpm	Vendor information
Inclined plate clarification	($): 508.3 × flow (gpm) + 33,538	Steel Finishing	50 to 400 gpm	Capital cost survey, vendor information

Variable Definitions

HPD - 24 hours of operation per day.
DPY - 365 days of operation per year.
FT3 - Daily cake volume from all presses.
Lbs/day - Pounds per day.

Table 9-3

Iron and Steel Operating and Maintenance (O&M) Cost Equations

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Biological nitrification (chemicals include caustic, phosphoric acid, polymer, and defoaming agent)	Electrical ($/yr): 810 × flow (gpm) Chemicals ($/yr): 639 × flow (gpm) O&M labor ($/yr): 8,760 hrs/yr × $29.67/hr = $260,000 Maintenance equipment and vendors ($/yr): 0.06 × (5,711 × flow (gpm)) Monitoring ($/yr): $60,000 Sludge disposal ($/yr): cost included with belt filter O&M	Cokemaking	50 to 500 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Flow Equalization Tank (prior to ammonia stripping and biological nitrification)	Electrical (before ammonia stripper) ($/yr): (0.092 HP/gpm × flow (gpm)) × 0.7456 kW/HP × 8,760 hrs/yr × 0.047/kWh where flow is ammonia still flow Electrical (before biological nitrification) ($/yr): 0.092 HP/gpm × flow (gpm) × 0.7456 kW/HP × 8,760 hrs/yr × $0.047/kWh where flow is biological treatment flow Chemicals ($/yr): 0 O&M labor (before ammonia stripper and biological nitrification) ($/yr): 1.5 hrs/day × 365 days/yr × $29.67/hr = 16,250 Maintenance equipment and vendors (before ammonia stripper) ($/yr): flow (gpm)/100 gpm × $5,534 where flow is ammonia still flow Maintenance equipment and vendors (before biological nitrification) ($/yr): flow (gpm)/100 gpm × $5,534 where flow is biological treatment flow	Cokemaking	250,000 to 1,250,000 gallons
Clarification of activated sludge	Electrical, chemical, O&M labor, maintenance equipment, and vendor costs included with biological nitrification O&M	Cokemaking	20 to 90 ft diameter

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Heat exchanger	Electrical ($/yr): (0.0746 × wastewater flow (gpm)) kWh × 8,760 hrs/yr × $0.047/kWh O&M labor ($/yr): 1 hr/wk × 52 wk/yr × $29.67/hr = 1,540 Maintenance equipment and vendors ($/yr): (933 × flow (gpm)) × 0.06	Cokemaking	20 to 300 gpm of hot water flow Influent temp: 140°F Effluent temp: 80°F
Sludge thickening of activated sludge and metal hydroxides	Electrical ($/yr): (Flow (gpm)/35 × 5) × 0.7456 kW/HP × 8,760 hrs/yr × $0.047/kWh where flow is 4% of flow to the clarifier Chemicals ($/yr): (cost included with biological nitrification, chemical precipitation, and clarification) O&M labor ($/yr): DPY/2 × 1 hour × $29.67/hr = $5,420 Maintenance equipment and vendors ($/yr): 0.06 × investment cost Sludge disposal ($/yr): (applies to Cokemaking Subcategory only, cost included with belt filter O&M)	Cokemaking Ironmaking Steel Finishing	0.5 to 1,390 gpm
Belt filter press	Electrical, chemical, O&M labor, maintenance equipment, and vendor costs included with biological nitrification O&M Sludge disposal ($/yr): Flow (gpm) × 24 lbs/day/gpm × 365 days/yr × $0.0025/lb	Cokemaking	4 to 14 tons/day of wet sludge

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Cyanide precipitation (chemicals include ferric sulfate, sulfuric acid, polymer, and sodium hydroxide)	Electrical ($/yr): 6.67 × flow (gpm) Chemicals ($/yr): 989.75 × flow (gpm) (all chemicals) O&M labor ($/yr): 1,343.6 × flow (gpm) Maintenance equipment and vendors ($/yr): 250 × flow (gpm) Monitoring ($/yr): 2,000 Sludge disposal ($/yr): 16.4 × flow (gpm)	Cokemaking	40 to 400 gpm
Sludge thickening for iron-cyanide sludge	All O&M costs are included with cyanide precipitation	Cokemaking	40 to 400 gpm
Plate and frame filter press	Electrical ($/yr): 0 Chemicals ($/yr): (costs are included in chemical feed systems) O&M labor ($/yr): $29.67 x 3 hrs/day x DPY	Cokemaking	40 to 400 gpm
Polymer feed system	All O&M costs are included where polymer is used.	Cokemaking Ironmaking Integrated Steelmaking Steel Finishing	40 to 1,390 gpm
Ferric sulfate feed system	All O&M costs are included with cyanide precipitation.	Cokemaking	40 to 400 gpm
Sodium hydroxide feed system	All O&M costs are included where sodium hydroxide is used.	Cokemaking Ironmaking Integrated Steelmaking	40 to 400 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Sulfuric acid feed system	Electrical ($/yr): [0.005 × flow (gpm) + 0.0261] kW × 1,440 min/day × DPY × $0.047/kWh Chemicals ($/yr): (chemical costs included where sulfuric acid is used) O&M labor ($/yr): HPD/8 × DPY × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × (88.816 × flow (gpm) + 35,692)	Cokemaking Ironmaking	40 to 400 gpm
Alkaline chlorination	Electrical ($/yr): 90.6 × flow (gpm) Chemicals ($/yr): — Sodium hypochlorite: 6.43 × flow (gpm) × (mg/L CN × 8.5 + mg/L NH4 × 7.4) — Sodium hydroxide: 1.58 × flow (gpm) — Sulfuric acid: 83.6 × flow (gpm) — Sodium bisulfite: 1.82 × flow (gpm) × (mg/L CN × 1.7 + mg/L NH4 × 1.5) O&M labor ($/yr): 1 hr/shift × 3 shifts/day × DPY × $29.67/hr = 32,500 Maintenance equipment and vendors ($/yr): 250 × flow (gpm) Monitoring ($/yr): 2,000	Cokemaking	88 to 2,340 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Multimedia filtration	Electrical ($/yr): [(0.0504 × (flow rate in gpm)) + 1.0139] × 8,760 hrs/yr × $0.047/kWh Chemicals ($/yr): 0 O&M Labor ($/yr): 1.5 hrs/day × 365 days/yr × $29.67/hr = 16,240 Maintenance equipment and vendors ($/yr): 0.06 × investment cost Monitoring ($/yr): NA	Cokemaking Ironmaking Integrated Steelmaking Integrated and Stand-Alone Hot Forming Non-integrated Steelmaking and Hot Forming Other Operations	< 50 gpm to >5,200 gpm
Granular activated carbon	Electrical ($/yr): 9.6 × flow (gpm) Chemicals ($/yr): NA O&M labor ($/yr): 8.13 × flow (gpm) Maintenance equipment and vendors ($/yr): 1228.6 × flow (gpm) Monitoring ($/yr): 60 × flow (gpm)	Cokemaking	88 to 2,340 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Chemical precipitation	Electrical ($/yr): [(0.0934 × flow (gpm)) + 0.7763]HP × 0.7456 kW/HP × DPY × HPD × $0.047/kWh Chemicals ($/yr): — Lime flow (gpm) × 1,440 mm/day × 0.0004 lbs/gal × DPY × $0.035/lb (Steel Finishing) — NaOH flow (gpm) × 1,440 min/day × 0.0033 lbs/gal × DPY × $0.15/lb (Ironmaking, Integrated Steelmaking) — Polymer flow (gpm) × 1,440 min/day × 0.00005 lbs/gal × DPY × $0.20/lb (Ironmaking, Integrated Steelmaking) flow (gpm) × 1,440 min/day × 0.000018 lbs/gal × DPY × $0.20/lb (Steel Finishing) O&M labor ($/yr): 3 shifts/day × 4 hrs/shift × DPY × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × investment cost Monitoring ($/yr): NA	Ironmaking Integrated Steelmaking Steel Finishing	104 to 1,390 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Alkaline chlorination of blast furnace and sintering wastewater	Electrical ($/yr): 79.8 × flow (gpm) Chemicals ($/yr): — Sodium hypochlorite 0.0027 lbs/gal × flow (gal/min) × 1,440 min/day × 365 days/year × 1.47 $/lb — Sulfuric acid 0.0006 lbs/gal × (flow rate (gpm)) × 1,440 min/day × 365 days/yr × 0.043 $/lb — Sodium bisulfite (0.00054 lbs/gal) × flow (gpm) × 1440 min/day × 365 days/yr × (104 g/mol $NaHSO_3$/ 81 g/mol HSO_3) × $0.325/lb O&M labor ($/yr): 1 hr/shift × 3 shifts/day × DPY × $29.67/hr = $32,000 Maintenance Equipment and Vendors ($/yr): 0.06 × (2,733.2 × flow (gpm) + 811,989) Monitoring ($/yr): 2,000	Ironmaking	104 to 1,390 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Vacuum filtration	Electrical ($/yr): [(0.0002 × (sludge generation (lbs/day)) + 3.491]kW × DPY × HPD × $0.047/kWh Chemicals ($/yr): 156 lbs/day × DPY × $0.21/lb (diatomaceous earth) O&M labor ($/yr): DPY × 3 shifts/day × 4 hr/shift × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × investment cost Monitoring ($/yr): 0	Ironmaking	104 to 1,390 gpm
Roughing clarifier	Electrical ($/yr): 0 Chemicals ($/yr): 0 O&M labor ($/yr): DPY/2 × 1hr × $29.67/hr = $5,420 Maintenance equipment and vendors ($/yr): 0.06 × investment cost Monitoring ($/yr): NA	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	5,000 to 15,000 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Cooling tower	Electrical ($/yr): [((0.035 × flow rate (gpm))/3.5 gpm/ft) + ((flow (gpm) × 40 feet)/(3,960 × 0.75))] × 0.7456kW/HP × DPY × HPD × $0.047/kWh Chemicals ($/yr): — Biocide: $4.00 × cooling tower flow (gpm) × 10 minutes/1,000 × DPY/2 — Scale inhibitor: 0.02 lbs/day/gpm × cooling tower flow (gpm) × DPY × $0.19/lb O&M labor ($/yr): ((1.5 hrs/day × DPY × $29.67/hr) + (4 persons × 40 hrs/person × $29.67/hr)) = $21,000 Maintenance equipment and vendors ($/yr): 0.06 × (32.17 × flow (gpm) +234,335) Monitoring ($/yr): 0	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	500 to 60,000 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Recycle pump station	Electrical ($/yr): (0.0193 × flow (gpm) + 90.527)HP × 0.7456 kW/HP × HPD × DPY × $0.047/kWh Chemicals ($/yr): 0 O&M labor ($/yr): 40 hrs/yr × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × (10,529 × flow (gpm) + 56,925) Monitoring ($/yr): 0	Integrated and Stand-Alone Hot Forming Non-Integrated Steelmaking and Hot Forming	6,900 to 35,000 gpm
Acid purification unit	Electrical ($/yr): 5 HP × 0.7456kW/HP × HPD × DPY × $0.047/kWh = $1,540 Chemical cost savings ($/yr): $0.47/ton of steel finished per year O&M labor ($/yr): ((0.5 hrs/day × DPY)+(3hrs/wk × DPY/7)) × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × ((500,000) + (0.075 × 500,000/5yrs)) = $10,100 Monitoring ($/yr): (0.075 × investment)/5 = $7,500 Waste disposal savings (if site contract hauls waste ($/yr): $0.67/ton steel finished per year	Steel Finishing	9 gpm

Table 9-3 (Continued)

Equipment	Cost Equation	Applicable Subcategory	Range of Validity
Lime feed system	All O&M costs are included in chemical precipitation	Steel Finishing	104 to 1,390 gpm
Inclined plate clarification	Electrical ($/yr): 0 Chemicals ($/yr): 0 O&M labor ($/yr): DPY/2 × 1 hr × $29.67/hr Maintenance equipment and vendors ($/yr): 0.06 × (508.3 × flow (gpm) + 33,538) Monitoring ($/yr): 0	Steel Finishing	50 to 400 gpm

Variable Definitions:

HPD - 24 hours of operation per day.
DPY - 365 days of operation per year.
FT3 - Daily cake volume from all presses.
lbs/day - Pounds per day.

Table 9-4

Assumptions Used to Estimate Investment Costs

Category	Assumption
Spatial limitations	Additions to the wastewater treatment system will be located within 500 feet of the existing system.
	An approximate length of 500 feet is used for the supply of water to the new water treatment facility.
	Equipment is located so that the length between processing tanks, sumps, and processing equipment will be within 20 feet.
	Outfalls or sewers leading to outfalls are located within 100 feet of the exit of the new water treatment facility.
	Motors are located within 150 feet from motor control center, 160 feet of conduit per motor, 260 feet of control cable per motor.
Solids handling	Sludge or filter backwash generated from add-on treatment systems will be thickened and dewatered with existing equipment in existing high-rate recycle systems, except for blast furnace operations, where separate sludge dewatering facilities were costed for blowdown treatment systems to segregate high zinc-content sludges from wastewater sludges that may be recycled to the blast furnaces.
Civil/structural costs	Site preparation is minimal; no major demolition, excavation of existing foundations or movement of railroad tracks.
	Soil conditions are such that no piles are required.
	No excavation of hazardous materials.
Piping/installation	1,000 feet of 2-inch carbon steel pipe has been included for plant air distribution. There is no allowance for an air compressor.
	Pipe has been sized to keep the water velocity less than 8 feet per second.
	2-inch nominal piping and under is priced as schedule 80 threaded carbon steel.
	Pipe over 2 inches is priced as standard schedule carbon steel pipe with welded joints.
	316 stainless steel pipe is used for chlorine, caustic, and acid piping.
	Costs for supports and painting are included.
	Insulation costs are not included.
	10% of the total cost allowed for manual valves.
Electrical/process control instrumentation	5% of the total cost allowed for instrumentation.
	Electrical and other utility services are available at the site.

Table 9-5

Design Specifications for Cokemaking Granular Activated Carbon Treatment Systems

Item	Type	100,000 gpd		400,000 gpd		2,700,000 gpd	
		Number	Size	Number	Size	Number	Size
Pump station 1	Vertical turbine	2 pumps	1.5 HP	2 pumps	7.5 HP	2 pumps	40 HP
Pump station 2	Vertical turbine	2 pumps	1/3 HP	2 pumps	1/3 HP	2 pumps	2 HP
Filter backwash pump	Vertical turbine	2 pumps	5 HP	2 pumps	5 HP	2 pumps	2 BHP
Equalization basin	Concrete	1	3,500 ft^3	1	13,500 ft^3	1	90,000 ft^3
Sump 1	Concrete	1	450 ft^3	1	700 ft^3	1	4,000 ft^3
Backwash surge basin	Concrete	1	450 ft^3	1	700 ft^3	1	4,000 ft^3
Activated carbon system	Filters	2	4' × 3'/ 7.5 HP	2	7' × 7'/ 7.5 HP	3	15' × 10/ 20 HP

Table 9-6

Estimated Investment Costs for Cokemaking Granular Activated Carbon Systems (100,000 - 2,700,000 gpd)

100,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Activated carbon system	2	$80,000	$160,000
	Activated carbon	1	$5,000	$5,000
	Pump station 1	2	$1,100	$2,200
	Pump station 2	2	$2,500	$5,000
	Filter backwash pumps	2	$3,000	$6,000
	Total freight			**$5,300**
	Subtotal			**$183,500**
Installation	**Mechanical equipment installation**			
	Activated carbon system	2	$11,000	$22,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Filter backwash pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$58,000	$58,000
	Control valves/instrumentation	1	$10,200	$10,200
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Activated carbon system	1	$27,400	$27,400
	Equalization basin	1	$66,600	$66,600
	Sump 1	1	$19,000	$19,000
	Backwash surge basin	1	$19,000	$19,000

Table 9-6 (Continued)

100,000 gpd				
Installation (cont.)	**Equipment structural support**			
	Pump station 1 platform	1	$4,000	$4,000
	Pump station 2 platform	1	$2,000	$2,000
	Filter backwash pumps	1	$8,000	$8,000
	Buildings			
	Activated carbon system	1	$21,000	$21,000
	Electrical and process control			
	Power/equipment	1	$48,100	$48,100
	Control/instrumentation	1	$40,600	$40,600
	Building services	1	$4,400	$4,400
	Subtotal			**$360,300**
Indirect costs	Temporary facilities (1%)			$5,400
	Spare parts (1.5%)			$8,200
	Engineering procurement and contract management (12%)			$65,300
	Commissioning (3%)			$16,300
	Owner team (10%)			$54,400
	Subtotal			**$149,600**
Total costs	Total direct and indirect costs			$693,400
	Contingency (20%)			$138,700
	Total Project Cost			**$832,100**

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Activated carbon system	2	$90,000	$180,000
	Activated carbon	1	$15,000	$15,000
	Pump station 1	2	$6,400	$12,800
	Pump station 2	2	$1,100	$2,200
	Filter backwash pumps	2	$6,500	$13,000
	Total freight			$6,700
	Subtotal			**$229,700**

Table 9-6 (Continued)

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation	Mechanical equipment installation			
	Activated carbon system	2	$12,000	$24,000
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$1,500	$3,000
	Filter backwash pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$91,100	$91,100
	Control valves/instrumentation	1	$16,100	$16,100
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Activated carbon system	1	$35,000	$35,000
	Equalization basin	1	$152,300	$152,300
	Sump 1	1	$22,000	$22,000
	Backwash surge basin	1	$22,000	$22,000
	Equipment structural support			
	Pump station 1 platform	1	$8,000	$8,000
	Pump station 2 platform	1	$2,000	$2,000
	Filter backwash pumps	1	$8,000	$8,000
	Buildings			
	Activated carbon system	1	$28,000	$28,000
	Electrical and process control			
	Power/equipment	1	$48,100	$48,100
	Control/instrumentation	1	$40,600	$40,600
	Building services	1	$5,800	$5,800
	Subtotal			**$514,000**
Indirect costs	Temporary facilities (1%)			$7,400
	Spare parts (1.5%)			$11,200
	Engineering procurement and contract management (12%)			$89,200
	Commissioning (3%)			$22,300
	Owner team (10%)			$74,400
	Subtotal			**$204,500**

Table 9-6 (Continued)

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Total costs	Total direct and indirect costs			$948,200
	Contingency (20%)			$189,600
	Total Project Cost			**$1,137,800**

2,700,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Activated carbon system	3	$86,000	$258,000
	Activated carbon	1	$100,000	$100,000
	Pump station 1	2	$10,600	$21,200
	Pump station 2	2	$3,000	$6,000
	Filter backwash pumps	2	$1,500	$3,000
	Total freight			$11,600
	Subtotal			**$399,800**
Installation	**Mechanical equipment installation**			
	Activated carbon system	3	$12,000	$36,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,000	$4,000
	Filter backwash pumps	2	$1,500	$3,000
	Piping installation			
	Piping/supports	1	$175,400	$175,400
	Control valves/instrumentation	1	$31,000	$31,000
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Activated carbon system	1	$60,100	$60,100
	Equalization basin	1	$657,400	$657,400
	Sump 1	1	$59,100	$59,100
	Backwash surge basin	1	$59,100	$59,100
	Equipment structural support			
	Pump station 1 platform	1	$12,000	$12,000
	Pump station 2 platform	1	$12,000	$12,000
	Filter backwash pumps	1	$4,000	$4,000
	Buildings			
	Activated carbon system	1	$54,000	$54,000

Table 9-6 (Continued)

2,700,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Electrical and process control**			
	Power/equipment	1	$82,500	$82,500
	Control/instrumentation	1	$44,400	$44,400
	Building services	1	$11,300	$11,300
	Subtotal			**$1,310,300**
Indirect costs	Temporary facilities (1%)			$17,100
	Spare parts (1.5%)			$25,700
	Engineering procurement and contract management (12%)			$205,200
	Commissioning (3%)			$51,300
	Owner team (10%)			$171,000
	Subtotal			**$470,300**
Total costs	Total direct and indirect costs			$2,180,400
	Contingency (20%)			$436,100
	Total Project Cost			**$2,616,500**

Table 9-7

Design Specifications for Cokemaking Alkaline Chlorination Treatment Systems

Item	Type	100,000 gpd		400,000 gpd		2,700,000 gpd	
		Number	Size	Number	Size	Number	Size
Pump station 1	Vertical turbine	2 pumps	1/2 HP	2 pumps	1.5 HP	2 pumps	10 HP
Pump station 2	Vertical turbine	2 pumps	1/2 HP	2 pumps	3 HP	2 pumps	15 BHP
Pump station 3	Vertical turbine	2 pumps	1/2 HP	2 pumps	2 HP	2 pumps	15 HP
Pump station 4	Vertical turbine	2 pumps	1/2 HP	2 pumps	2 HP	2 pumps	15 HP
Pump station 5	Vertical turbine	2 pumps	1.5 HP	2 pumps	5 HP	2 pumps	30 BHP
pH adjust pump	Diaphragm	2	3 HP	2	3 HP	2	3 HP
Clarifier pump	Progressive capacity	2	3 HP	2	3 HP	2	5 BHP
NaOH pump 1	Diaphragm/ANSI	2	2 HP (diaphragm)	2	2 HP (ANSI)	2	2 HP (ANSI)
NaOH pump 2	Diaphragm	2	3 HP	2	3 HP	2	3 HP
Equalization basin	Concrete	1	4,000 ft^3	1	4,000 ft^3	1	90,000 ft^3
Reactor clarifier	Mild steel	1	12' diameter × 12' side	1	22 ft diameter × 12 ft side	1	60' diam.
Chlorination mixing tank	Concrete/lined	1	10 ft × 10 ft × 5 ft/ 5 HP	1	20 ft × 10 ft × 10 ft/ 15 HP	2	25 ft × 20 ft × 13 ft/2 @ 20 HP
Chlorination system	Building	1	10 ft × 9 ft × 20 ft/ 3 HP	1	10 ft × 9 ft × 20 ft/ 3 HP	1	15 ft × 20 ft × 20 ft/ 2 @ 3 HP
Retention tank	Concrete/lined	1	50 ft × 10 ft × 10 ft	1	50 ft × 20 ft × 20 ft	1	100 ft × 50 ft × 25 ft
Dechlorination tank	Concrete/lined	1	10 ft × 10 ft × 5 ft/ 5 HP	1	20 ft × 10 ft × 10 ft/ 15 HP	2	25 ft × 20 ft × 13 ft/ 2 @ 20 HP
Dechlorination system	Building/tank pad	1	8 ft × 8 ft × 15 ft/ 10 ft × 10 ft	1	8 ft × 8 ft × 15 ft/ 10 ft × 10 ft	1	8 ft × 8 ft × 15 ft/ 10 ft × 10 ft
NaOH tank 1	Carbon steel	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10' diameter × 10' side

FRP - Fiberglass, reinforced plastic.
ANSI - American National Standards Institute.

Table 9-8

Estimated Investment Costs for Cokemaking Alkaline Chlorination Treatment Systems (100,000 - 2,700,000 gpd)

100,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$40,000	$40,000
	Chlorination/dechlorination mixing systems	1	$33,300	$33,200
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$1,000	$2,000
	Pump station 2	2	$1,000	$2,000
	Pump station 3	2	$1,000	$2,000
	Pump station 4	2	$1,000	$2,000
	Pump station 5	2	$1,100	$2,200
	pH adjust pumps	2	$2,200	$4,400
	Clarifier pumps	2	$3,500	$7,000
	NaOH pumps 1	2	$3,500	$7,000
	NaOH pumps 2	2	$2,200	$4,400
	Total freight			**$3,800**
	Subtotal			**$130,000**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$100,000	$100,000
	Chlorination/dechlorination mixing systems	1	$10,000	$10,000
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Pump station 3	2	$1,500	$3,000
	Pump station 4	2	$1,500	$3,000
	Pump station 5	2	$1,500	$3,000
	pH adjust pumps	2	$2,000	$4,000
	Clarifier pumps	2	$2,000	$4,000
	NaOH pumps 1	2	$2,000	$4,000
	NaOH pumps 2	2	$2,000	$4,000

Table 9-8 (Continued)

100,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$65,500	$65,500
	Control valves/instrumentation	1	$11,600	$11,600
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/ clarifier pumps	1	$8,800	$8,800
	NaOH pumps	2	$3,500	$7,000
	NaOH tanks	1	$4,200	$4,200
	Chlorination mixing tank	1	$20,500	$20,500
	Chlorination system	1	$12,600	$12,600
	Retention tank	1	$110,800	$110,800
	Dechlorination mixing tank	1	$20,500	$20,500
	Dechlorination system	1	$12,500	$12,500
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$59,100	$59,100
	Equipment structural support			
	Pump station 1 platform	1	$4,000	$4,000
	Pump station 2 platform	1	$4,000	$4,000
	Pump station 3 platform	1	$4,000	$4,000
	Pump station 4 platform	1	$4,000	$4,000
	Pump station 5 platform	1	$4,000	$4,000
	Buildings			
	Chlorination system	1	$2,000	$2,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$99,400	$99,400
	Control/instrumentation	1	$90,300	$90,300
	Building Services	1	$600	$600
	Subtotal			**$693,900**

Table 9-8 (Continued)

100,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$8,200
	Spare parts (1.5%)			$12,400
	Engineering procurement and contract management (12%)			$98,900
	Commissioning (3%)			$24,700
	Owner team (10%)			$82,400
	Subtotal			**$226,600**
Total costs	Total direct and indirect costs			$1,050,500
	Contingency (20%)			$210,100
	Total Project Cost			**$1,260,600**

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$52,000	$52,000
	Chlorination/dechlorination mixing systems	1	$118,800	$118,800
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$5,000	$10,000
	Pump station 2	2	$5,000	$10,000
	Pump station 3	2	$5,000	$10,000
	Pump station 4	2	$5,000	$10,000
	Pump station 5	2	$5,100	$10,200
	pH adjust pumps	2	$2,200	$4,400
	Clarifier pumps	2	$3,500	$7,000
	NaOH pumps 1	2	$5,000	$10,000
	NaOH pumps 2	2	$2,200	$4,400
	Total freight			**$8,000**
	Subtotal			**$274,800**

Table 9-8 (Continued)

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$105,000	$105,000
	Chlorination/dechlorination mixing systems	1	$35,600	$35,600
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$2,000	$4,000
	Pump station 3	2	$2,000	$4,000
	Pump station 4	2	$2,000	$4,000
	Pump station 5	2	$2,000	$4,000
	pH adjust pumps	2	$2,000	$4,000
	Clarifier pumps	2	$2,000	$4,000
	NaOH pumps 1	2	$1,500	$3,000
	NaOH pumps 2	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$106,900	$106,900
	Control valves/instrumentation	1	$18,900	$18,900
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/clarifier pumps	1	$19,300	$19,300
	NaOH pumps	2	$3,500	$7,000
	NaOH tanks	1	$4,200	$4,200
	Chlorination mixing tank	1	$41,000	$41,000
	Chlorination system	1	$12,900	$12,900
	Retention tank	1	$221,600	$221,600
	Dechlorination mixing tank	1	$41,000	$41,000
	Dechlorination system	1	$12,900	$12,900
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$59,200	$59,200

Table 9-8 (Continued)

400,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Equipment structural support**			
	Pump station 1 platform	1	$6,000	$6,000
	Pump station 2 platform	1	$8,000	$8,000
	Pump station 3 platform	1	$6,000	$6,000
	Pump station 4 platform	1	$6,000	$6,000
	Pump station 5 platform	1	$12,000	$12,000
	Buildings			
	Chlorination system	1	$2,000	$2,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$99,500	$99,500
	Control/instrumentation	1	$90,300	$90,300
	Building services	1	$600	$600
	Subtotal			**$958,300**
Indirect costs	Temporary facilities (1%)			$12,300
	Spare parts (1.5%)			$18,500
	Engineering procurement and contract management (12%)			$148,000
	Commissioning (3%)			$37,000
	Owner team (10%)			$123,300
	Subtotal			**$339,100**
Total costs	Total direct and indirect costs			$1,572,200
	Contingency (20%)			$314,400
	Total Project Cost			**$1,886,600**

Table 9-8 (Continued)

2,700,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$155,000	$155,000
	Chlorination/dechlorination mixing systems	1	$798,000	$798,000
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$10,500	$21,000
	Pump station 3	2	$10,500	$21,000
	Pump station 4	2	$10,500	$21,000
	Pump station 5	2	$11,000	$22,000
	pH adjust pumps	2	$2,200	$4,400
	Clarifier pumps	2	$5,500	$11,000
	NaOH pumps 1	2	$8,500	$17,000
	NaOH pumps 2	2	$3,500	$7,000
	Total freight			**$33,500**
	Subtotal			**$1,148,900**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$300,000	$300,000
	Chlorination/dechlorination mixing systems	1	$239,400	$239,400
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,500	$5,000
	Pump station 3	2	$2,500	$5,000
	Pump station 4	2	$2,500	$5,000
	Pump station 5	2	$2,500	$5,000
	pH adjust pumps	2	$2,000	$4,000
	Clarifier pumps	2	$2,000	$4,000
	NaOH pumps 1	2	$2,000	$4,000
	NaOH pumps 2	2	$2,000	$4,000

Table 9-8 (Continued)

2,700,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$191,200	$191,200
	Control valves/instrumentation	1	$33,700	$33,700
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/clarifier pumps	1	$78,800	$78,800
	NaOH pumps	2	$3,500	$7,000
	NaOH tanks	1	$5,300	$5,300
	Chlorination mixing tank	2	$97,400	$194,800
	Chlorination system	1	$32,800	$32,800
	Retention tank	1	$1,000,800	$1,000,800
	Dechlorination mixing tank	2	$97,400	$194,800
	Dechlorination system	1	$11,500	$11,500
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$657,400	$657,400
	Equipment structural support			
	Pump station 1 platform	1	$16,000	$16,000
	Pump station 2 platform	1	$16,000	$16,000
	Pump station 3 platform	1	$16,000	$16,000
	Pump station 4 platform	1	$16,000	$16,000
	Pump station 5 platform	1	$16,000	$16,000
	Buildings			
	Chlorination system	1	$6,000	$6,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$195,800	$195,800
	Control/instrumentation	1	$117,000	$117,000
	Building services	1	$1,500	$1,500
	Subtotal			**$3,396,300**

Table 9-8 (Continued)

2,700,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$45,500
	Spare parts (1.5%)			$68,200
	Engineering procurement and contract management (12%)			$545,400
	Commissioning (3%)			$136,400
	Owner team (10%)			$454,500
	Subtotal			**$1,250,000**
Total costs	Total direct and indirect costs			$5,795,200
	Contingency (20%)			$1,159,000
	Total Project Cost			**$6,954,200**

Table 9-9

Design Specifications for Metals Precipitation Systems for Blast Furnace and Sintering Wastewater

Item	Type	150,000 gpd		750,000 gpd		2,000,000 gpd	
		Number	Size	Number	Size	Number	Size
Pump station 1	Vertical turbine	2 pumps	1/2 HP	2 pumps	3 HP	2 pumps	7.5 HP
Pump station 2	Vertical turbine	2 pumps	2 HP	2 pumps	10 HP	2 pumps	25 HP
Clarifier pump	Diaphragm/ANSI	2	1/3 HP (diaphragm)	2	1 HP (diaphragm)	2	1/2 HP (ANSI)
Filter press pump	Diaphragm	2	1/3 HP	2	1/3 HP	2	3 BHP
NaOH pump	ANSI	2	1/3 HP	2	1/2 HP	2	1.5 BHP
Acid pump	Diaphragm	2	1/3 HP	2	1/3 HP	2	3 BHP
Sump	Concrete	1	10 ft^3	1	40 ft^3	1	80 ft^3
Equalization basin	Concrete	1	5,100 ft^3	1	26,000 ft^3	1	67,000 ft^3
Reactor clarifier	Mild steel	1	15 ft diameter × 12 ft side/ 1 HP & 2.5 HP	1	35 ft diameter × 12 ft side/ 1 HP & 5 HP	1	51 ft diameter × 12 ft side/2 HP & 10 HP
Clarifier overflow	Concrete	1	450 ft^3	1	1,260 ft^3	1	14,000 ft^3
NaOH tank	Carbon steel	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side
Acid tank	FRP	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side
pH control tank	Stainless	1	90 ft^3/1HP	1	450 ft^3/1HP	1	1,200 ft^3/3 HP
Filter press	Pneumatic	1	18 ft × 7 ft × 6 ft/10 HP & 7.5 HP	1	18 ft × 7 ft × 6 ft/10 HP & 7.5 HP	1	18 ft × 7 ft × 6 ft/ 10 HP & 7.5 HP

FRP - Fiberglass, reinforced plastic.
ANSI - American National Standards Institute.

Table 9-10

Estimated Investment Costs for Metals Precipitations Systems for Blast Furnace and Sintering Wastewater (150,000 - 2,000,000 gpd)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$40,000	$40,000
	pH control tank	1	$8,900	$8,900
	Acid/NaOH tanks	4	$10,000	$40,000
	Filter press	1	$175,000	$175,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$3,000	$6,000
	Clarifier pumps	2	$2,200	$4,400
	Filter press pumps	2	$2,200	$4,400
	NaOH pumps	2	$5,500	$11,000
	Acid pumps	2	$2,200	$4,400
	Total freight			**$8,900**
	Subtotal			**$306,000**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$110,000	$110,000
	pH control tank	1	$2,300	$2,300
	Acid/NaOH tanks	4	$1,000	$4,000
	Filter press	1	$52,500	$52,500
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Clarifier pumps	2	$2,000	$4,000
	Filter press pumps	2	$2,000	$4,000
	NaOH pumps	2	$1,500	$3,000
	Acid pumps	2	$2,000	$4,000

Table 9-10 (Continued)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$78,500	$78,500
	Control valves/instrumentation	1	$13,800	$13,800
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$37,800	$37,800
	Clarifier pumps	1	$3,500	$3,500
	pH control tank	1	$1,800	$1,800
	Acid/NaOH tanks and pumps	1	$14,000	$14,000
	Filter press	1	$7,000	$7,000
	Equalization basin	1	$90,300	$90,300
	Sump/filter press pumps	1	$6,700	$6,700
	Equipment structural support			
	Pump station 1 platform	1	$2,000	$2,000
	Pump station 2 platform	1	$4,000	$4,000
	Electrical and process control			
	Power/equipment	1	$82,200	$82,200
	Control/instrumentation	1	$78,800	$78,800
	Subtotal			**$610,200**
Indirect costs	Temporary facilities (1%)			$9,200
	Spare parts (1.5%)			$13,700
	Engineering procurement and contract management (12%)			$109,900
	Commissioning (3%)			$27,500
	Owner team (10%)			$91,600
	Subtotal			**$251,900**
Total costs	Total direct and indirect costs			$1,168,100
	Contingency (20%)			$233,600
	Total Project Cost			**$1,401,700**

Table 9-10 (Continued)

750,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$75,000	$75,000
	pH control tank	1	$23,500	$23,500
	Acid/NaOH tanks	4	$10,000	$40,000
	Filter press	1	$175,000	$175,000
	Pump station 1	2	$5,500	$11,000
	Pump station 2	2	$8,000	$16,000
	Clarifier pumps	2	$3,500	$7,000
	Filter press pumps	2	$2,200	$4,400
	NaOH pumps	2	$8,000	$16,000
	Acid pumps	2	$2,200	$4,400
	Total freight			**$11,200**
	Subtotal			**$383,500**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$162,000	$162,000
	pH control tank	1	$6,000	$6,000
	Acid/NaOH tanks	4	$1,000	$4,000
	Filter press	1	$52,500	$52,500
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$2,000	$4,000
	Clarifier pumps	2	$2,000	$4,000
	Filter press pumps	2	$2,000	$4,000
	NaOH pumps	2	$1,500	$3,000
	Acid pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$114,000	$114,000
	Control valves/instrumentation	1	$20,100	$20,100

Table 9-10 (Continued)

750,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Civil/structural (includes costs associated with site preparation and grading)**			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$59,000	$59,000
	Clarifier pumps	1	$3,500	$3,500
	pH control tank	1	$5,300	$5,300
	Acid/NaOH tanks and pumps	1	$14,000	$14,000
	Filter press	1	$7,000	$7,000
	Equalization basin	1	$257,600	$257,600
	Sump/filter press pumps	1	$7,500	$7,500
	Equipment structural support			
	Pump station 1 platform	1	$4,000	$4,000
	Pump station 2 platform	1	$8,000	$8,000
	Electrical and process control			
	Power/equipment	1	$82,200	$82,200
	Control/instrumentation	1	$78,800	$78,800
	Subtotal			**$908,500**
Indirect costs	Temporary facilities (1%)			$12,900
	Spare parts (1.5%)			$19,400
	Engineering procurement and contract management (12%)			$155,000
	Commissioning (3%)			$38,800
	Owner team (10%)			$129,200
	Subtotal			**$355,300**
Total costs	Total direct and indirect costs			$1,647,300
	Contingency (20%)			$329,500
	Total Project Cost			**$1,976,700**

Table 9-10 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$130,000	$130,000
	pH control tank	1	$47,400	$47,400
	Acid/NaOH tanks	4	$10,000	$40,000
	Filter press	1	$175,000	$175,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$9,500	$19,000
	Clarifier pumps	2	$5,500	$11,000
	Filter press pumps	2	$2,200	$4,400
	NaOH pumps	2	$8,500	$17,000
	Acid pumps	2	$7,500	$15,000
	Total freight			**$14,300**
	Subtotal			**$491,100**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$253,000	$253,000
	pH control tank	1	$12,000	$12,000
	Acid/NaOH tanks	4	$10,000	$40,000
	Filter press	1	$52,500	$52,500
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,500	$5,000
	Clarifier pumps	2	$1,500	$3,000
	Filter press pumps	2	$2,000	$4,000
	NaOH pumps	2	$2,000	$4,000
	Acid pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$139,200	$139,200
	Control valves/instrumentation	1	$24,600	$24,600

Table 9-10 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Civil/structural (includes costs associated with site preparation and grading)**			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$224,800	$224,800
	Clarifier pumps	1	$7,000	$7,000
	pH control tank	1	$10,500	$10,500
	Acid/NaOH tanks and pumps	1	$17,500	$17,500
	Filter press	1	$8,700	$8,700
	Equalization basin	1	$508,300	$508,300
	Sump/filter press pumps	1	$12,500	$12,500
	Equipment structural support			
	Pump station 1 platform	1	$6,000	$6,000
	Pump station 2 platform	1	$8,000	$8,000
	Electrical and process control			
	Power/equipment	1	$105,900	$105,900
	Control/instrumentation	1	$78,800	$78,800
	Subtotal			**$1,534,300**
Indirect costs	Temporary facilities (1%)			$20,300
	Spare parts (1.5%)			$30,400
	Engineering procurement and contract management (12%)			$243,000
	Commissioning (3%)			$60,800
	Owner team (10%)			$202,500
	Subtotal			**$557,000**
Total costs	Total direct and indirect costs			$2,582,400
	Contingency (20%)			$516,500
	Total Project Cost			**$3,098,900**

Table 9-11

Design Specifications for Alkaline Chlorination Systems for Blast Furnace and Sintering Wastewater

Item	Type	150,000 gpd		750,000 gpd		2,000,000 gpd	
		Number	Size	Number	Size	Number	Size
Pump station 1	Vertical turbine	2 pumps	1 HP	2 pumps	4 HP	2 pumps	10 HP
Pump station 2	Vertical turbine	2 pumps	1 HP	2 pumps	3 HP	2 pumps	7.5 HP
Pump station 3	Vertical turbine	2 pumps	1 HP	2 pumps	3 HP	2 pumps	7.5 HP
Pump station 4	Vertical turbine	2 pumps	1 HP	2 pumps	3 HP	2 pumps	7.5 HP
pH adjust pump	Diaphragm	2	3 HP	2	3 HP	2	3 HP
NaOH pump	Diaphragm	2	1/2 HP	2	1/2 HP	2	1/2 HP
Equalization basin	Concrete	1	5,100 ft^3	1	25,000 ft^3	1	67,000 ft^3
Chlorination mixing tank	Concrete	1	11 ft × 10 ft × 5 ft/5 HP	1	20 ft × 15 ft × 10 ft/20 HP	1	25 ft × 20 ft × 15 ft/3 @ 20 HP
Chlorination system	Building	1	10 ft × 9 ft × 20 ft/3 HP	1	10 ft × 9 ft × 20 ft/3 HP	1	15 ft × 20 ft × 20 ft/2 @ 3 HP
Retention tank	Concrete	1	50 ft × 11 ft × 10 ft	1	50 ft × 30 ft × 20 ft	1	80 ft × 50 ft × 20 ft
Dechlorination tank	Concrete	1	11 ft × 10 ft × 5 ft/5 HP	1	20 ft × 15 ft × 10 ft/20 HP	1	25 ft × 20 ft × 15 ft/3 @ 20 HP
Dechlorination system	Building/tank pad	1	8 ft × 8 ft × 15 ft/10 ft × 10 ft	1	8 ft × 8 ft × 15 ft/10 ft × 10 ft	1	8 ft × 8 ft × 15 ft/10 ft × 10 ft
NaOH tank	Carbon steel	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side

FRP - Fiberglass, reinforced plastic.
ANSI - American National Standards Institute.

Table 9-12

Estimated Investment Costs for Alkaline Chlorination Systems for Blast Furnace and Sintering Wastewater (150,000 - 2,000,000 gpd)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Chlorination/dechlorination mixing systems	1	$44,700	$44,700
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Pump station 3	2	$1,500	$3,000
	Pump station 4	2	$1,500	$3,000
	pH adjust pumps	2	$2,200	$4,400
	NaOH pumps	2	$2,200	$4,400
	Total freight			**$2,600**
	Subtotal			**$88,100**
Installation	**Mechanical equipment installation**			
	Chlorination/dechlorination mixing systems	1	$13,400	$13,400
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Pump station 3	2	$1,500	$3,000
	Pump station 4	2	$1,500	$3,000
	pH adjust pumps	2	$2,000	$4,000
	NaOH pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$69,700	$69,700
	Control valves/instrumentation	1	$12,300	$12,300

Table 9-12 (Continued)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Civil/structural (includes costs associated with site preparation and grading)**			
	Equipment foundations			
	NaOH pumps	1	$3,500	$3,500
	NaOH tanks	1	$4,200	$4,200
	Chlorination mixing tank	1	$25,100	$25,100
	Chlorination system	1	$12,600	$12,600
	Retention tank	1	$118,500	$118,500
	Dechlorination mixing tank	1	$25,100	$25,100
	Dechlorination system	1	$12,500	$12,500
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$77,800	$77,800
	Equipment structural support			
	Pump station 1 platform	1	$4,000	$4,000
	Pump station 2 platform	1	$4,000	$4,000
	Pump station 3 platform	1	$4,000	$4,000
	Pump station 4 platform	1	$4,000	$4,000
	Buildings			
	Chlorination system	1	$2,000	$2,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$71,900	$71,900
	Control/instrumentation	1	$67,300	$67,300
	Building Services	1	$600	$600
	Subtotal			**$560,000**

Table 9-12 (Continued)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$6,500
	Spare parts (1.5%)			$9,700
	Engineering procurement and contract management (12%)			$77,800
	Commissioning (3%)			$19,400
	Owner team (10%)			$64,800
	Subtotal			**$178,200**
Total costs	Total direct and indirect costs			$826,300
	Contingency (20%)			$165,300
	Total Project Cost			**$991,600**

750,000 gallon per day				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Chlorination/dechlorination mixing systems	1	$223,500	$223,500
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$5,000	$10,000
	Pump station 2	2	$5,000	$10,000
	Pump station 3	2	$5,000	$10,000
	Pump station 4	2	$5,000	$10,000
	pH adjust pumps	2	$2,200	$4,400
	NaOH pumps	2	$2,200	$4,400
	Total freight			**$8,800**
	Subtotal			**$301,100**
Installation	**Mechanical equipment installation**			
	Chlorination/dechlorination mixing systems	1	$67,000	$67,000
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$2,000	$4,000
	Pump station 3	2	$2,000	$4,000
	Pump station 4	2	$2,000	$4,000
	pH adjust pumps	2	$2,000	$4,000
	NaOH pumps	2	$2,000	$4,000

Table 9-12 (Continued)

750,000 gallon per day				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$104,000	$104,000
	Control valves/instrumentation	1	$18,400	$18,400
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	NaOH pumps	1	$3,500	$3,500
	NaOH tanks	1	$4,200	$4,200
	Chlorination mixing tank	1	$64,800	$64,800
	Chlorination system	1	$12,600	$12,600
	Retention tank	1	$385,100	$385,100
	Dechlorination mixing tank	1	$64,800	$64,800
	Dechlorination system	1	$12,600	$12,600
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$264,400	$264,400
	Equipment structural support			
	Pump station 1 platform	1	$8,000	$8,000
	Pump station 2 platform	1	$8,000	$8,000
	Pump station 3 platform	1	$8,000	$8,000
	Pump station 4 platform	1	$8,000	$8,000
	Buildings			
	Chlorination system	1	$2,000	$2,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$74,000	$74,000
	Control/instrumentation	1	$67,300	$67,300
	Building Services	1	$600	$600
	Subtotal			**$1,208,800**

Table 9-12 (Continued)

750,000 gallon per day				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$15,100
	Spare parts (1.5%)			$22,600
	Engineering procurement and contract management (12%)			$181,200
	Commissioning (3%)			$45,300
	Owner team (10%)			$151,000
	Subtotal			**$415,200**
Total costs	Total direct and indirect costs			$1,925,100
	Contingency (20%)			$385,000
	Total Project Cost			**$2,310,100**

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Chlorination/dechlorination mixing systems	1	$590,100	$590,100
	NaOH tanks	2	$10,000	$20,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$9,000	$18,000
	Pump station 3	2	$9,000	$18,000
	Pump station 4	2	$9,000	$18,000
	pH adjust pumps	2	$2,200	$4,400
	NaOH pumps	2	$2,200	$4,400
	Total freight			**$20,700**
	Subtotal			**$711,600**
Installation	**Mechanical equipment installation**			
	Chlorination/dechlorination mixing systems	1	$177,000	$177,000
	NaOH tanks	2	$1,000	$2,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,500	$5,000
	Pump station 3	2	$2,500	$5,000
	Pump station 4	2	$2,500	$5,000
	pH adjust pumps	2	$2,000	$4,000
	NaOH pumps	2	$2,000	$4,000

Table 9-12 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$126,900	$126,900
	Control valves/instrumentation	1	$22,400	$22,400
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	NaOH pumps	1	$3,500	$3,500
	NaOH tanks	1	$4,200	$4,200
	Chlorination mixing tank	1	$120,300	$120,300
	Chlorination system	1	$31,100	$31,100
	Retention tank	1	$746,600	$746,600
	Dechlorination mixing tank	1	$120,300	$120,300
	Dechlorination system	1	$12,500	$12,500
	pH adjust pumps	1	$3,500	$3,500
	Equalization basin	1	$544,900	$544,900
	Equipment structural support			
	Pump station 1 platform	1	$16,000	$16,000
	Pump station 2 platform	1	$16,000	$16,000
	Pump station 3 platform	1	$16,000	$16,000
	Pump station 4 platform	1	$16,000	$16,000
	Buildings			
	Chlorination system	1	$6,000	$6,000
	Dechlorination system	1	$2,000	$2,000
	Electrical and process control			
	Power/equipment	1	$114,000	$114,000
	Control/instrumentation	1	$86,500	$86,500
	Building Services	1	$1,500	$1,500
	Subtotal			**$2,217,200**

Table 9-12 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$29,300
	Spare parts (1.5%)			$43,900
	Engineering procurement and contract management (12%)			$351,500
	Commissioning (3%)			$87,900
	Owner team (10%)			$292,900
	Subtotal			**$805,500**
Total costs	Total direct and indirect costs			$3,734,400
	Contingency (20%)			$746,900
	Total Project Cost			**$4,481,300**

Table 9-13

Design Specifications for Metals Precipitation Systems for Basic Oxygen Furnace, Vacuum Degassing, and Continuous Casting Wastewater

Item	Type	150,000 gpd		750,000 gpd		2,000,000 gpd	
		Number	Size	Number	Size	Number	Size
Pump station 1	Vertical turbine	2 pumps	1/2 HP	2 pumps	3 HP	2 pumps	7.5 HP
Pump station 2	Vertical turbine	2 pumps	2 HP	2 pumps	10 HP	2 pumps	25 HP
Clarifier pumps	Diaphragm/ANSI	2 pumps	1/3 HP (diaphragm)	2 pumps	1 HP (diaphragm)	2 pumps	1/2 HP (ANSI)
NaOH pump	ANSI	2 pumps	1/3 HP	2 pumps	1/2 HP	2 pumps	1.5 BHP
Acid pump	Diaphragm	2 pumps	1/3 HP	2 pumps	1/3 HP	2 pumps	3 BHP
Equalization basin	Concrete	1	5,100 ft^3	1	26,000 ft^3	1	67,000 ft^3
Reactor clarifier	Mild Steel	1	15 ft diameter × 12 ft side/ 1 HP & 2.5 HP	1	35 ft diameter × 12 ft side/ 1 HP & 5 HP	1	51 ft diameter × 12 ft side/2 HP & 10 HP
Clarifier overflow	Concrete	1	450 ft^3/2 HP	1	1,260 ft^3/10 HP	1	14,000 ft^3/20 HP
NaOH tank	Carbon steel	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side
Acid tank	FRP	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side	2	10 ft diameter × 10 ft side
pH control tank	Stainless	1	90 ft^3/1HP	1	450 ft^3/1HP	1	1200 ft^3/3 HP

FRP - Fiberglass, reinforced plastic.
ANSI - American National Standards Institute.

Table 9-14

Estimated Investment Costs for Metals Precipitation Systems for Basic Oxygen Furnace, Vacuum Degassing, and Continuous Casting Wastewater (150,000 - 2,000,000 gpd)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$40,000	$40,000
	pH control tank	1	$8,900	$8,900
	Acid/NaOH tanks	4	$10,000	$40,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$3,000	$6,000
	Clarifier pumps	2	$2,200	$4,400
	NaOH pumps	2	$5,500	$11,000
	Acid pumps	2	$2,200	$4,400
	Total freight			**$3,500**
	Subtotal			**$121,200**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$110,000	$110,000
	pH control tank	1	$2,300	$2,300
	Acid/NaOH tanks	4	$1,000	$4,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$1,500	$3,000
	Clarifier pumps	2	$2,000	$4,000
	NaOH pumps	2	$1,500	$3,000
	Acid pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$77,800	$77,800
	Control valves/instrumentation	1	$13,700	$13,700

Table 9-14 (Continued)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Civil/structural (includes costs associated with site preparation and grading)**			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$37,800	$37,800
	Clarifier pumps	1	$3,500	$3,500
	pH control tank	1	$1,800	$1,800
	Acid/NaOH tanks and pumps	1	$14,000	$14,000
	Equalization basin	1	$90,300	$90,300
	Equipment structural support			
	Pump station 1 platform	1	$2,000	$2,000
	Pump station 2 platform	1	$4,000	$4,000
	Electrical and process control			
	Power/equipment	1	$68,400	$68,400
	Control/instrumentation	1	$63,500	$63,500
	Subtotal			**$510,000**
Indirect costs	Temporary facilities (1%)			$6,300
	Spare parts (1.5%)			$9,500
	Engineering procurement and contract management (12%)			$75,800
	Commissioning (3%)			$18,900
	Owner team (10%)			$63,100
	Subtotal			**$173,600**
Total costs	Total direct and indirect costs			$804,900
	Contingency (20%)			$161,000
	Total Project Cost			**$965,900**

Table 9-14 (Continued)

750,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$75,000	$75,000
	pH control tank	1	$23,500	$23,500
	Acid/NaOH tanks	4	$10,000	$40,000
	Pump station 1	2	$5,500	$11,000
	Pump station 2	2	$8,000	$16,000
	Clarifier pumps	2	$3,500	$7,000
	NaOH pumps	2	$8,000	$16,000
	Acid pumps	2	$2,200	$4,400
	Total freight			**$5,800**
	Subtotal			**$198,700**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$162,000	$162,000
	pH control tank	1	$6,000	$6,000
	Acid/NaOH tanks	4	$1,000	$4,000
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$2,000	$4,000
	Clarifier pumps	2	$2,000	$4,000
	NaOH pumps	2	$1,500	$3,000
	Acid pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$113,300	$113,300
	Control valves/instrumentation	1	$20,000	$20,000
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$59,000	$59,000
	Clarifier pumps	1	$3,500	$3,500
	pH control tank	1	$5,300	$5,300
	Acid/NaOH tanks and pumps	1	$14,000	$14,000
	Equalization basin	1	$257,700	$257,700

Table 9-14 (Continued)

750,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Equipment structural support**			
	Pump station 1 platform	1	$4,000	$4,000
	Pump station 2 platform	1	$8,000	$8,000
	Electrical and process control			
	Power/equipment	1	$68,400	$68,400
	Control/instrumentation	1	$63,500	$63,500
	Subtotal			**$807,700**
Indirect costs	Temporary facilities (1%)			$10,100
	Spare parts (1.5%)			$15,100
	Engineering procurement and contract management (12%)			$120,800
	Commissioning (3%)			$30,200
	Owner team (10%)			$100,600
	Subtotal			**$276,800**
Total costs	Total direct and indirect costs			$1,283,200
	Contingency (20%)			$256,600
	Total Project Cost			**$1,539,800**

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Reactor clarifier	1	$130,000	$130,000
	pH control tank	1	$47,400	$47,400
	Acid/NaOH tanks	4	$10,000	$40,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$9,500	$19,000
	Clarifier pumps	2	$5,500	$11,000
	NaOH pumps	2	$8,500	$17,000
	Acid pumps	2	$7,500	$15,000
	Total freight			**$8,900**
	Subtotal			**$306,300**

Table 9-14 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation	**Mechanical equipment installation**			
	Reactor clarifier	1	$253,000	$253,000
	pH control tank	1	$12,000	$12,000
	Acid/NaOH tanks	4	$10,000	$40,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,500	$5,000
	Clarifier pumps	2	$1,500	$3,000
	NaOH pumps	2	$2,000	$4,000
	Acid pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$92,100	$92,100
	Control valves/instrumentation	1	$63,500	$63,500
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Reactor clarifier/overflow tank	1	$224,800	$224,800
	Clarifier pumps	1	$7,000	$7,000
	pH control tank	1	$10,500	$10,500
	Acid/NaOH tanks and pumps	1	$17,500	$17,500
	Equalization basin	1	$508,300	$508,300
	Equipment structural support			
	Pump station 1 platform	1	$6,000	$6,000
	Pump station 2 platform	1	$8,000	$8,000
	Electrical and process control			
	Power/equipment	1	$92,100	$92,100
	Control/instrumentation	1	$63,500	$63,500
	Subtotal			**$1,419,300**

Table 9-14 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$17,300
	Spare parts (1.5%)			$25,900
	Engineering procurement and contract management (12%)			$207,100
	Commissioning (3%)			$51,800
	Owner team (10%)			$172,600
	Subtotal			**$474,700**
Total costs	Total direct and indirect costs			$2,200,300
	Contingency (20%)			$440,100
	Total Project Cost			**$26,401,400**

Table 9-15

Design Specifications for Multimedia Filtration Systems

Item	Type	150,000 gpd		500,000 gpd		2,000,000 gpd		7,500,000 gpd		20,000,000 gpd	
		Number	Size	Number	Size	Number	Size	Number	Size	Number	Size
Pump station 1	Horizontal split	2 pumps	1.5 HP	2 pumps	5 HP	2 pumps	20 HP	2 pumps	25 HP	2 pumps	60 HP
Pump station 2	Diaphragm/ Vertical turbine[a]	2 pumps	3 HP	2 pumps	3 HP	2 pumps	1 HP	2 pumps	3 HP	2 pumps	3 HP
Filter backwash pump	Vertical turbine	2	1.5 HP	2	3 HP	2	10 HP	2	10 HP	2	20 HP
Sump 1	Concrete	1	450 ft^3	1	800 ft^3	1	3,000 ft^3	1	3,000 ft^3	1	6,000 ft^3
Filter backwash surge basin	Concrete	1	450 ft^3	1	800 ft^3	1	3,000 ft^3	1	3,000 ft^3	1	6,000 ft^3
Filtration system	Sand pressure	2	6 ft diameter × 9 ft side/ 7.5 HP	2	8 ft diameter × 9 ft side/ 7.5 HP	2	12 ft diameter × 9 ft side/ 20 HP	8	12 ft diameter × 9 ft side/ 20 HP	8	16' diam. × 9' side/ 60 HP

[a]Diaphragm pumps (150,000 gpd - 500,000 gpd); vertical turbine pumps (2,000,000 - 20,000,000 gpd).

Table 9-16

Estimated Investment Costs for Multimedia Filtration Systems (150,000 - 20,000,000 gallons per day)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Filters	2	$100,000	$200,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$2,200	$4,400
	Filter backwash pumps	2	$3,000	$6,000
	Total freight			**$6,400**
	Subtotal			**$219,800**
Installation	**Mechanical equipment installation**			
	Filters	2	$11,000	$22,000
	Pump station 1	2	$1,500	$3,000
	Pump station 2	2	$2,000	$4,000
	Filter backwash pumps	2	$1,500	$3,000
	Piping installation			
	Piping/supports	1	$82,800	$82,800
	Control valves/instrumentation	1	$14,600	$14,600
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Filtration plant	1	$81,900	$81,900
	Sump 1	1	$19,000	$19,000
	Filter backwash surge basin	1	$19,000	$19,000
	Equipment structural support			
	Pump station 1 platform	1	$3,500	$3,500
	Pump station 2 platform	1	$4,000	$4,000
	Filter backwash pumps	1	$4,000	$4,000
	Buildings			
	Filtration plant	1	$24,500	$24,500

Table 9-16 (Continued)

150,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Electrical and process control**			
	Power/equipment	1	$43,600	$43,600
	Control/instrumentation	1	$40,600	$40,600
	Building services	1	$5,100	$5,100
	Subtotal			**$374,600**
Indirect costs	Temporary facilities (1%)			$6,000
	Spare parts (1.5%)			$8,900
	Engineering procurement and contract management (12%)			$71,300
	Commissioning (3%)			$17,300
	Owner team (10%)			$59,400
	Subtotal			**$163,400**
Total costs	Total direct and indirect costs			$757,800
	Contingency (20%)			$151,600
	Total Project Cost			**$909,400**

500,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Filters	2	$105,000	$210,000
	Pump station 1	2	$5,000	$10,000
	Pump station 2	2	$3,500	$7,000
	Filter backwash pumps	2	$5,000	$10,000
	Total freight			**$7,100**
	Subtotal			**$244,100**
Installation	**Mechanical equipment installation**			
	Filters	2	$13,000	$26,000
	Pump station 1	2	$2,000	$4,000
	Pump station 2	2	$2,000	$4,000
	Filter backwash pumps	2	$1,500	$3,000

Table 9-16 (Continued)

500,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Piping installation**			
	Piping/supports	1	$98,600	$98,600
	Control valves/instrumentation	1	$17,400	$17,400
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Filtration plant	1	$97,800	$97,800
	Sump 1	1	$22,000	$22,000
	Filter backwash surge basin	1	$22,000	$22,000
	Equipment structural support			
	Pump station 1 platform	1	$7,000	$7,000
	Pump station 2 platform	1	$4,000	$4,000
	Filter backwash pumps	1	$4,000	$4,000
	Buildings			
	Filtration plant	1	$28,000	$28,000
	Electrical and process control			
	Power/equipment	1	$43,600	$43,600
	Control/instrumentation	1	$40,600	$40,600
	Building services	1	$5,800	$5,800
	Subtotal			**$427,800**
Indirect costs	Temporary facilities (1%)			$6,700
	Spare parts (1.5%)			$10,100
	Engineering procurement and contract management (12%)			$80,600
	Commissioning (3%)			$20,200
	Owner team (10%)			$67,200
	Subtotal			**$184,800**
Total costs	Total direct and indirect costs			$856,700
	Contingency (20%)			$171,300
	Total Project Cost			**$1,028,000**

Table 9-16 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Filters	2	$107,500	$215,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$1,500	$3,000
	Filter backwash pumps	2	$9,000	$18,000
	Total freight			**$7,600**
	Subtotal			**$261,600**
Installation	**Mechanical equipment installation**			
	Filters	2	$12,000	$24,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$1,500	$3,000
	Filter backwash pumps	2	$2,000	$4,000
	Piping installation			
	Piping/supports	1	$161,400	$161,400
	Control valves/instrumentation	1	$28,500	$28,500
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Filtration plant	1	$212,300	$212,300
	Sump 1	1	$53,200	$53,200
	Filter backwash surge basin	1	$53,200	$53,200
	Equipment structural support			
	Pump station 1 platform	1	$10,500	$10,500
	Pump station 2 platform	1	$4,000	$4,000
	Filter backwash pumps	1	$8,000	$8,000
	Buildings			
	Filtration plant	1	$60,000	$60,000
	Electrical and process control			
	Power/equipment	1	$68,800	$68,800
	Control/instrumentation	1	$44,400	$44,400
	Building services	1	$12,500	$12,500
	Subtotal			**$752,800**

Table 9-16 (Continued)

2,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Indirect costs	Temporary facilities (1%)			$10,100
	Spare parts (1.5%)			$15,200
	Engineering procurement and contract management (12%)			$121,700
	Commissioning (3%)			$30,400
	Owner team (10%)			$101,400
	Subtotal			**$278,800**
Total costs	Total direct and indirect costs			$1,293,200
	Contingency (20%)			$258,600
	Total Project Cost			**$1,551,800**

7,500,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Filters	8	$107,500	$860,000
	Pump station 1	2	$9,000	$18,000
	Pump station 2	2	$5,000	$10,000
	Filter backwash pumps	2	$9,000	$18,000
	Total freight			**$27,200**
	Subtotal			**$933,200**
Installation	**Mechanical equipment installation**			
	Filters	8	$12,000	$96,000
	Pump station 1	2	$2,500	$5,000
	Pump station 2	2	$2,000	$4,000
	Filter backwash pumps	2	$2,500	$5,000
	Piping installation			
	Piping/supports	1	$258,500	$258,500
	Control valves/instrumentation	1	$45,600	$45,600
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Filtration plant	1	$337,200	$337,200
	Sump 1	1	$53,200	$53,200
	Filter backwash surge basin	1	$53,200	$53,200

Table 9-16 (Continued)

7,500,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation (cont.)	**Equipment structural support**			
	Pump station 1 platform	1	$10,500	$10,500
	Pump station 2 platform	1	$4,000	$4,000
	Filter backwash pumps	1	$8,000	$8,000
	Buildings			
	Filtration plant	1	$95,000	$95,000
	Electrical and process control			
	Power/equipment	1	$130,300	$130,300
	Control/instrumentation	1	$63,500	$63,500
	Building services	1	$19,800	$19,800
	Subtotal			**$1,188,800**
Indirect costs	Temporary facilities (1%)			$21,200
	Spare parts (1.5%)			$31,800
	Engineering procurement and contract management (12%)			$254,600
	Commissioning (3%)			$63,700
	Owner team (10%)			$212,200
	Subtotal			**$583,500**
Total costs	Total direct and indirect costs			$2,705,500
	Contingency (20%)			$541,100
	Total Project Cost			**$32,466,000**

20,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Major equipment	Filters	8	$107,500	$860,000
	Pump station 1	2	$25,000	$50,000
	Pump station 2	2	$5,000	$10,000
	Filter backwash pumps	2	$10,000	$20,000
	Total freight			**$28,200**
	Subtotal			**$968,200**

Table 9-16 (Continued)

20,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Installation	**Mechanical equipment installation**			
	Filters	8	$12,000	$96,000
	Pump station 1	2	$4,000	$8,000
	Pump station 2	2	$2,000	$4,000
	Filter backwash pumps	2	$4,000	$8,000
	Piping installation			
	Piping/supports	1	$417,300	$417,300
	Control valves/instrumentation	1	$73,600	$73,600
	Civil/structural (includes costs associated with site preparation and grading)			
	Equipment foundations			
	Filtration plant	1	$466,700	$466,700
	Sump 1	1	$83,600	$83,600
	Filter backwash surge basin	1	$83,600	$83,600
	Equipment structural support			
	Pump station 1 platform	1	$14,000	$14,000
	Pump station 2 platform	1	$14,000	$14,000
	Filter backwash pumps	1	$10,000	$10,000
	Buildings			
	Filtration plant	1	$132,000	$132,000
	Electrical and process control			
	Power/equipment	1	$177,100	$177,100
	Control/instrumentation	1	$63,500	$63,500
	Building services	1	$27,500	$27,500
	Subtotal			**$1,678,900**
Indirect costs	Temporary facilities (1%)			$26,500
	Spare parts (1.5%)			$39,700
	Engineering procurement and contract management (12%)			$317,600
	Commissioning (3%)			$79,400
	Owner team (10%)			$264,700
	Subtotal			**$727,900**

Table 9-16 (Continued)

20,000,000 gpd				
Category	**Item**	**Quantity**	**Rate**	**Cost**
Total costs	Total direct and indirect costs			$3,375,000
	Contingency (20%)			$675,000
	Total Project Cost			**$4,050,000**

Table 9-17

Summary of Costs for the Cokemaking Subcategory (in millions of 1997 dollars)

Option	Investment Cost	Operating and Maintenance Cost	One-Time Cost
BAT-1	8.0	0.1	0.3
BAT-2	12.4	3.0	0.3
BAT-3	42.3	7.2	0.3
BAT-4	66.5	14.9	0.3
PSES-1	0	0.3	0.2
PSES-2	6.0	1.8	0.2
PSES-3	18.6	3.3	0.2
PSES-4	32.1	5.8	0.2

Table 9-18

Summary of Costs for the Ironmaking Subcategory (in millions of 1997 dollars)

Options	Investment Cost	Operating and Maintenance Cost	One-Time Cost
BAT-1 and PSES-1	25.8	2.7	0.7

Table 9-19

Summary of Costs for the Integrated Steelmaking Subcategory (in millions of 1997 dollars)

Options	Investment Cost	Operating and Maintenance Cost	One-Time Cost
BAT-1 and PSES-1	16.8	2.9	2.1

Table 9-20

Summary of Costs for the Integrated and Stand-Alone Hot Forming Subcategory (in millions of 1997 dollars)

Option	Investment Cost	Operating and Maintenance Cost	One-Time Cost
Carbon and Alloy Segment			
BAT-1	115.3	16.1	1.0
PSES-1	0.3	0.1	0.1
Stainless Segment[a]			
PSES-1	1.1	0.2	0.1

[a]No sites reported direct discharge of wastewater within the Stainless Segment.

Table 9-21

Summary of Costs for the Non-integrated Steelmaking and Hot Forming Subcategory (in millions of 1997 dollars)

Option	Investment Cost	Operating and Maintenance Cost	One-Time Cost
Carbon and Alloy Segment			
BAT-1	18.9	2.0	3.9
PSES-1	2.5	0.4	0.8
Stainless Segment			
BAT-1	0.4	0.1	0.2
BAT-2	3.7	0.6	0.2
PSES-1	0	0	0.4

Table 9-22

Summary of Costs for the Steel Finishing Subcategory (in millions of 1997 dollars)

Option	Investment Cost	Operating and Maintenance Cost	One-Time Cost
Carbon and Alloy Segment			
BAT-1	16.0	2.5	1.6
PSES-1	6.0	1.2	0.8
Stainless Segment			
BAT-1	16.4	(1.1)	0.8
PSES-1	4.0	0.2	0.4

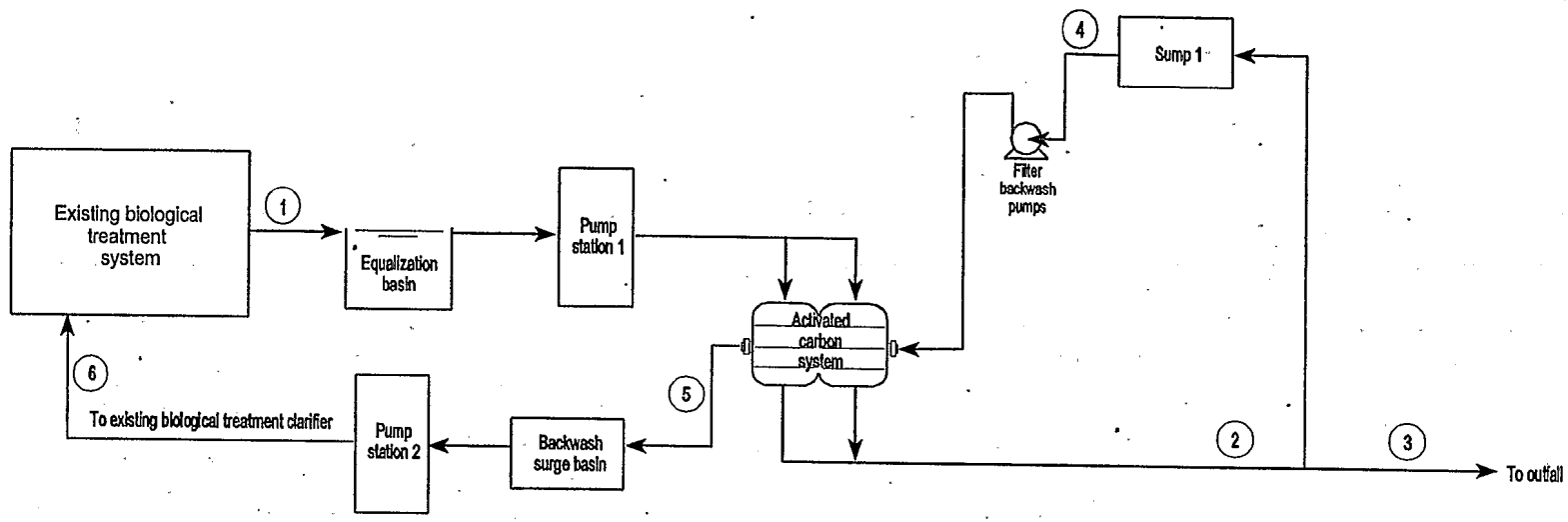
( ) Indicates a cost savings.

Table 9-23

Summary of Costs for the Other Operations Subcategory (in millions of 1997 dollars)

Option	Investment Cost	Operating and Maintenance Cost	One-Time Cost
Direct Reduced Ironmaking Segment			
BPT	[a]	[a]	[a]
Forging Segment			
BPT	0	0	0.1

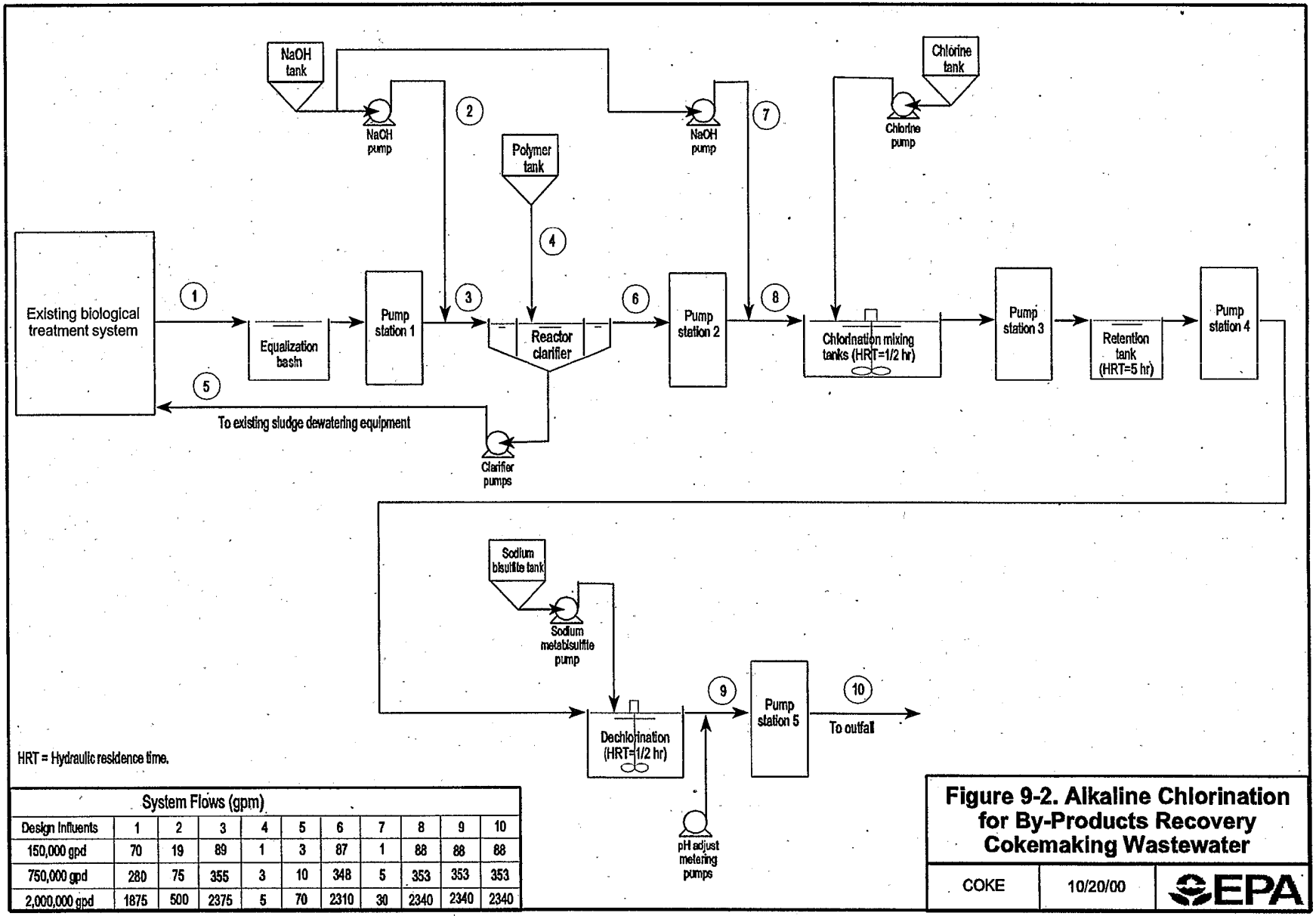
[a]Data aggregation or other masking techniques are insufficient to protect confidential business information.



System Flows (gpm)						
Design Influents	1	2	3	4	5	6
100,000 gpd	70	70	52	9 (avg) 225 (max)	9 (avg) 225 (max)	9
400,000 gpd	280	280	250	15 (avg) 350 (max)	15 (avg) 350 (max)	15
2,700,000 gpd	1875	1875	1625	125 (avg) 1500 (max)	125 (avg) 1500 (max)	125

Figure 9-1. Activated Carbon Treatment for By-Products Recovery Cokemaking Wastewater

GAC	10/27/00	EPA

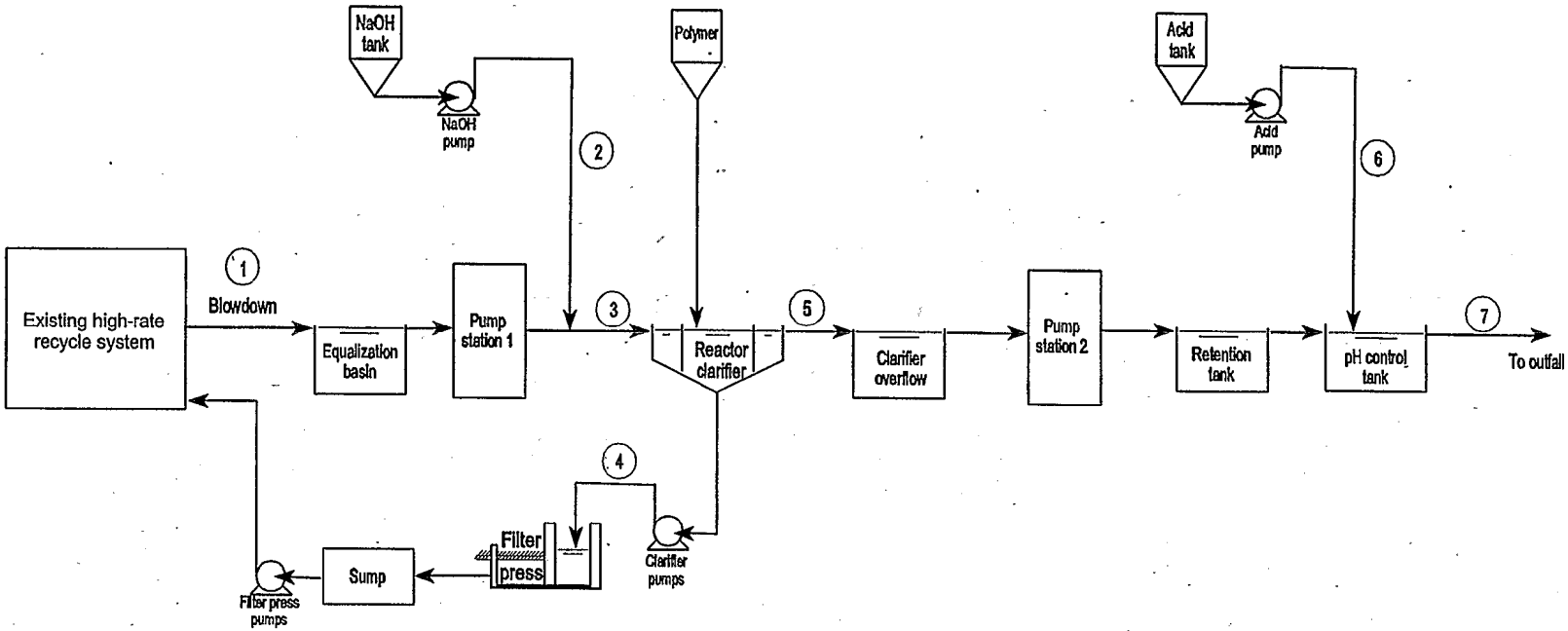


HRT = Hydraulic residence time.

System Flows (gpm)										
Design Influents	1	2	3	4	5	6	7	8	9	10
150,000 gpd	70	19	89	1	3	87	1	88	88	88
750,000 gpd	280	75	355	3	10	348	5	353	353	353
2,000,000 gpd	1875	500	2375	5	70	2310	30	2340	2340	2340

Figure 9-2. Alkaline Chlorination for By-Products Recovery Cokemaking Wastewater

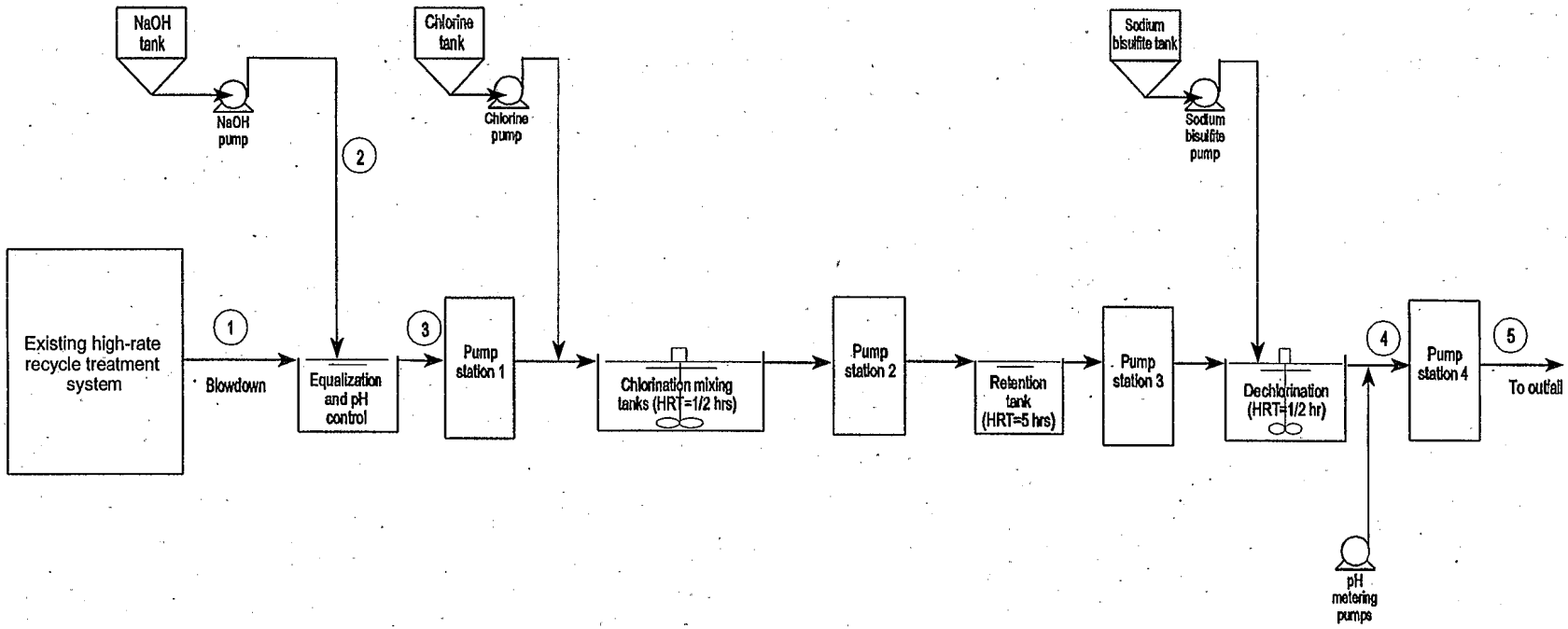
COKE	10/20/00	EPA



System Flows (gpm)							
Design Influents	1	2	3	4	5	6	7
150,000 gpd	105	30	135	5	130	2	132
750,000 gpd	525	140	665	20	645	10	655
2,000,000 gpd	1390	370	1760	40	1720	30	1750

Figure 9-3. Blowdown Metals Precipitation for Ironmaking Wastewater

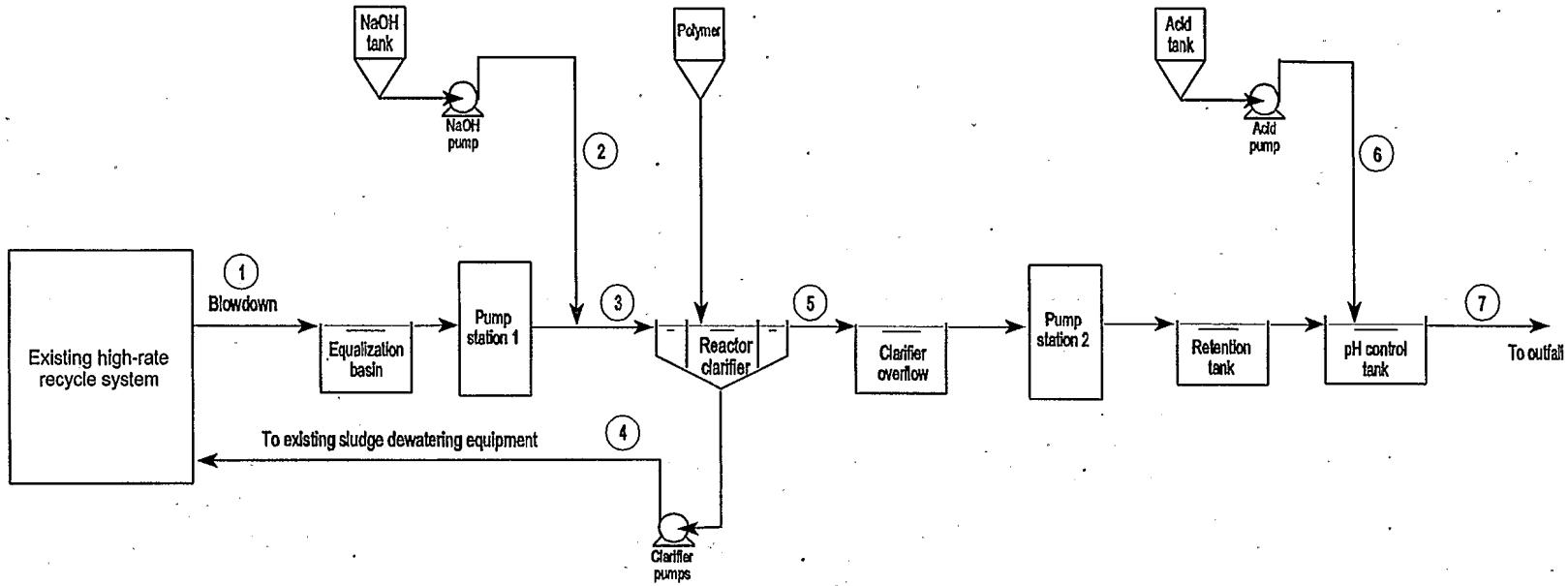
IRNMAK | 10/20/00 | EPA



System Flows (gpm)					
Design Influents	1	2	3	4	5
150,000 gpd	105	5	110	110	110
750,000 gpd	525	10	535	535	535
2,000,000 gpd	1390	25	1415	1415	1415

Figure 9-4. Alkaline Chlorination for Ironmaking Wastewater

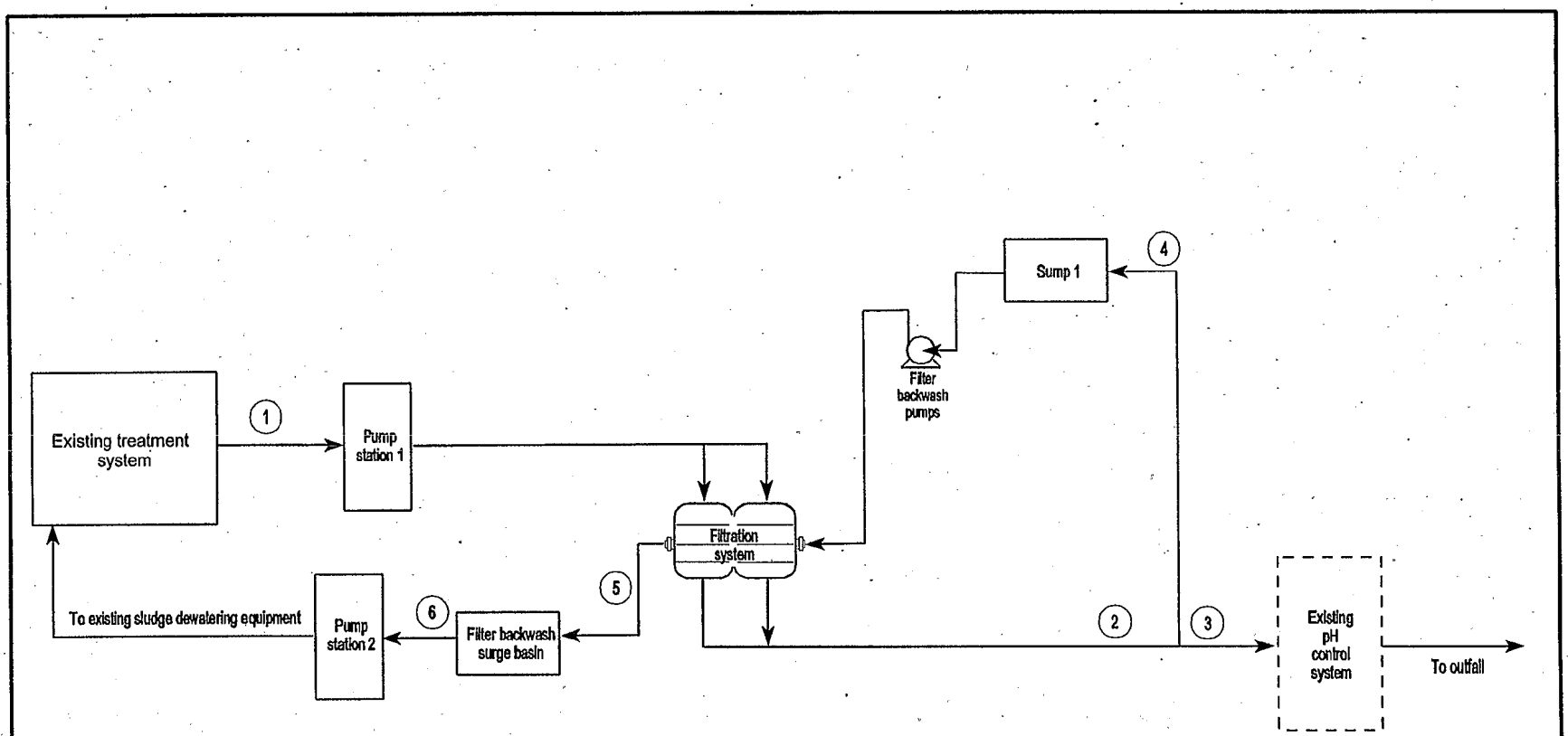
IRNMAK | 10/20/00 | EPA



System Flows (gpm)							
Design Influents	1	2	3	4	5	6	7
150,000 gpd	105	30	135	5	130	2	132
750,000 gpd	525	140	665	20	645	10	655
2,000,000 gpd	1390	370	1760	40	1720	30	1750

Figure 9-5. Blowdown Metals Precipitation for Steelmaking Wastewater

STEEL | 10/20/00 | EPA



System Flows (gpm)						
Design Influents	1	2	3	4	5	6
150,000 gpd	105	105	95	10 (avg) 226 (max)	10 (avg) 226 (max)	10
500,000 gpd	350	350	333	17 (avg) 402 (max)	17 (avg) 402 (max)	17
2,000,000 gpd	1390	1390	1265	125 (avg) 1500 (max)	125 (avg) 1500 (max)	125
7,500,000 gpd	5200	5200	4870	330 (avg) 1500 (max)	330 (avg) 1500 (max)	330
20,000,000 gpd	13900	13900	13230	670 (avg) 3000 (max)	670 (avg) 3000 (max)	670

Figure 9-6. Filtration of Wastewater from All Subcategories

FILT | 10/22/00 | EPA

SECTION 10

POLLUTANT LOADINGS

This section presents annual pollutant loading and removal estimates for the iron and steel industry for each of the regulatory options in each subcategory. EPA estimated the pollutant loadings and removals from iron and steel sites to evaluate the effectiveness of the treatment technologies, to estimate benefits gained from removing pollutants discharged from sites, and to evaluate the cost-effectiveness of the regulatory options in reducing the pollutant loadings. EPA defined baseline and post-compliance pollutant loadings as follows:

- Baseline loadings - Pollutant loadings in iron and steel wastewater being discharged to surface water or through publicly owned treatment works (POTWs) to surface water.

- Post-compliance loadings - Estimated pollutant loadings in iron and steel wastewater after implementation of the proposed rule, also referred to as treated loadings. EPA calculated these loadings assuming that all iron and steel sites would operate wastewater treatment and pollution prevention technologies equivalent to the technology option for which they have been costed.

- Pollutant removals - The difference between baseline loadings and post-compliance loadings for each regulatory option.

EPA estimated baseline and post-compliance pollutant loadings and the expected pollutant removal for each subcategory and segment and each technology option presented in Section 8. This section discusses the methodology that EPA used to estimate pollutant loadings and presents the resultant estimated baseline and treated loadings and pollutant removals as follows:

- Section 10.1 discusses the data sources that EPA used to estimate pollutant loadings and removals;

- Section 10.2 discusses the general methodology EPA used to estimate pollutant loadings, including selecting pollutants considered for loadings estimation and baseline and treatment effectiveness concentrations; and

- Sections 10.3 through 10.9 present the methodology used to estimate pollutant loadings and the resulting pollutant reductions for each regulatory option in each subcategory; and

- Section 10.10 presents the references used in this section.

10.1 Sources and Use of Available Data

EPA used data from several sources to estimate baseline and post-compliance pollutant loadings. These sources included EPA site visits and sampling episodes at iron and steel sites, responses to the Detailed and Short Surveys and the Analytical and Production Survey, and publicly available National Pollutant Discharge Elimination System (NPDES) and pretreatment permit application data. Section 3 discusses data sources used to develop this regulation in detail.

10.1.1 Analytical Data Sources

EPA used flow rate data from the industry surveys. For pollutant concentration data, EPA used industry-provided data from the industry survey and data from EPA's wastewater sampling program. EPA received self-monitoring data with individual data points for 1997 from a select group of sites that received the Analytical and Production Survey. Other sites provided only summary self-monitoring data (a 1997 annual average). EPA used publicly available permit application data where necessary (i.e., if self-monitoring or sampling data did not sufficiently represent operating conditions).

10.1.2 Calculation of Averages from Analytical Data

For each site and pollutant of concern (POC) in the loadings analysis, EPA calculated an average baseline pollutant concentration and an arithmetic long-term average (LTA) concentration, discussed below. For the average baseline concentrations the Agency did not edit the analytical data from EPA sampling episodes, self-monitoring data, or permit application data prior to calculating averages. For the arithmetic LTA, EPA edited data as described in Section 12.

Baseline Analytical Data

To calculate baseline concentrations, if a site provided both individual and summary data for the same pollutant, the Agency used the individual data points instead of the summary data. If a site had sampling data in addition to self-monitoring data for the same pollutant, EPA first averaged the sampling data and self-monitoring data and then averaged the resulting averages. When combining sampling and self-monitoring data averages, EPA did not eliminate any sampling data or self-monitoring data prior to averaging them, even if they were duplicate samples (from the same day and sampling point). If only sampling data were available, EPA averaged the results from the sampling trip. EPA used permit application data if no other data were available.

When sites provided self-monitoring individual data points for 1997, the Agency calculated an arithmetic average of all the data. When sites provided industry self-monitoring summary data (where results were already averaged), the Agency used those numbers. For permit application data, sites monitored multiple times for some pollutants but only one time for other pollutants.

Depending on the data source, the Agency treated pollutant data below the sample detection limit differently. With EPA sampling data, when concentrations were below the sample detection limit, EPA used the reported sample detection limit as the concentration for that pollutant. With individual self-monitoring data, when concentrations were below the sample detection limit, the Agency used what the site reported as the sample detection limit. When sites provided summary data, EPA used the concentrations that the sites submitted, which could have been calculated by any method. Of those sites that submitted summary data, 26 percent used the method detection limit as the concentration for that pollutant; 26 percent used the sample detection limit; 7 percent used one-half the method detection limit; 3 percent used one-half the sample detection limit; and 38 percent used zero. Using zero as the concentration for the pollutant estimated the minimum amount of the pollutant, and using the method or sample detection limit estimated the maximum amount.

Arithmetic LTA Analytical Data

For model effluent pollutant concentrations, EPA calculated 1997 arithmetic LTAs from the same datasets used to calculate the LTAs and variability factors in Section 12. If concentrations of pollutants were below the sample detection limit, EPA used the sample detection limit. The Agency used multiple sites' data for some options. In these cases, EPA first averaged the data for each site, and then averaged the sites averages with each other. EPA edited the data model effluent data sets as discussed in Section 12.

10.2 Methodology

EPA estimated pollutant loadings for all the sites in each subcategory, based on the analytical data and flow rates obtained by EPA using the following equation:

$$\text{Load} = \text{Flow} \times \text{Conc} \times 8.345(10^{-6}) \frac{\text{lbs}}{\text{gal} \cdot (\text{mg/L})} \times \text{SW} \qquad (10\text{-}1)$$

where:

Load	=	Pollutant loading, lbs/yr
Flow	=	Flow rate, gal/yr
Conc	=	Pollutant concentration, mg/L
$8.345(10^{-6})$	=	Conversion factor, lbs/gal and mg/L
SW	=	Survey weight, available in Appendix A of this document.

From the industry surveys, EPA determined which subcategories and segments apply to each site based on the manufacturing operations in place. EPA then estimated pollutant loadings for the entire industry based on the survey weights developed for each facility. For *baseline loadings*, EPA used site-specific analytical and flow data representing each site's treatment in place, as discussed below in 10.2.1. For *treated loadings*, EPA used the data obtained for the treatment options, as discussed below in 10.2.2.

For each site, EPA determined which manufacturing operations in each subcategory and segment generated wastewater and calculated pollutant loadings for each operation. For example, for integrated steelmaking, one site could have one basic oxygen furnace (BOF) and two continuous casting lines. In this case, EPA calculated the flow rate and pollutant concentration for the BOF and casting lines separately and then summed them to calculate the pollutant loading for the site and subcategory.

EPA estimated pollutant loadings for a subset of the POCs identified in Section 7. From the list of POCs, EPA eliminated pollutants that were never found at concentrations above the detection limit in the effluent for any site, by subcategory and segment. EPA used data from the EPA sampling program and self-monitoring data; however, for many POCs (particularly organic compounds), the only available data were from the EPA sampling program.

If a POC was not detected in the baseline effluent at any site, EPA excluded it from the loadings analysis. Table 10-1 lists the pollutants that were never detected in the effluent at any site for each subcategory and segment. Because these pollutants were detected in the untreated wastewater at multiple sites and passed all POC criteria, they remain POCs. While the effluent data reflect current wastewater technology in place, POC criteria were developed with raw wastewater data from EPA's sampling program and associated criteria for source water screening (see Section 7). Because most sites have some technology in place, the baseline effluent data are different from the data used for POC selection.

EPA estimated both baseline and treated pollutant loadings for the iron and steel industry for the base year 1997. The Agency included sites (or operations) that operated during the 1997 calendar year in the cost and loadings analyses, using the following criteria:

- If a site operated at least one day during the 1997 calendar year; and
- If a site (or operation) shut down after 1997.

If a site (or operation) commenced after 1997, EPA did not include the site (or operation).

For some sites, 1997 data did not represent normal operating conditions, and alternate years' data were used according to the sites' choice of representative time. EPA was aware that several sites had operated only part of 1997 because of strikes, shut-downs, or start-ups. For these sites, EPA used production, analytical, and flow rate data from years that the sites indicated were representative of normal operations. If sites installed or significantly altered wastewater treatment systems either during or after 1997, EPA used the data that represented their current wastewater treatment configuration.

EPA was aware of a unique case in which a site's self-monitoring data from 1997 conflicted with self-monitoring data from 1996 by an order of magnitude. EPA contacted the site and, at their direction, used three years of analytical data to better represent the treatment system performance.

Some sites co-treat their wastewater from multiple subcategories, as discussed in Section 9. EPA evaluated entire co-treatment systems to determine what treatment improvements were necessary. For pollutant loadings, EPA had sufficient flow rate and analytical data to calculate loadings and reductions for co-treated wastewaters by subcategory. However, the Agency allocated four sites that co-treat their ironmaking, steelmaking, and/or hot forming wastewaters flow reductions that were not standard for that subcategory, and considered them individually. For these sites, EPA assessed flow reductions for the entire co-treatment system, not just for one subcategory, and determined the flow reduction attainable by each co-treatment system on a case-by-case basis. The Agency then allocated pollutant loadings across subcategories, based on the percentage of the co-treated flow generated by the manufacturing operations.

For indirect discharging options, EPA accounted for treatment at the POTW using the following equation:

$$\text{Load} = (1 - \text{POTW \% Removal}) * (\text{Original Load}) \qquad (10\text{-}2)$$

where:

Original load	=	Pollutant loading from Equation 10-1, in lbs/yr
POTW percent removal	=	Mass-based percent removal, shown in Table 10-2.

The POTW percent removal values are based on data from the Fate of Priority Pollutants in Publicly Owned Treatment Works and National Risk Management Research Laboratory (NRMRL) Treatability Database and are discussed in Section 11 (References 10-1 and 10-2). The baseline and post-compliance pollutant loadings and associated removals for indirect dischargers presented in this section represent removals of pollutants being discharged from POTWs using the above equation.

10.2.1 Baseline Pollutant Loading Calculation

EPA used flow rate and analytical data from each site's industry survey to estimate the baseline loading, site by site and pollutant by pollutant, using Equation 10-3:

$$\text{Site Baseline Load} = \text{Flow} \times \text{Baseline Conc} \times 8.345(10^{-6}) \frac{\text{lbs}}{\text{gal} \cdot (\text{mg/L})} \qquad (10\text{-}3)$$

where:

Site Baseline Load	=	Baseline pollutant load discharged to surface water by a site, in lbs/yr
Site Flow	=	Subcategory-specific process wastewater flow for site, reported in survey, gallons per year
Baseline Conc =	Site baseline concentration, mg/L	
$8.345(10^{-6})$	=	Conversion factor, lbs/gal and mg/L.

In the industry survey, all sites reported flow rates and most sites reported baseline concentration data. Sites reported flow from operations in either gallons per minute or gallons per day, along with the corresponding days per year and hours per day, as necessary. EPA used the flows as reported by the sites. For pollutant concentrations, EPA used the analytical data included with the survey outfall data.

Sites tend to monitor pollutants listed in their permits, and therefore did not monitor all the POCs for which pollutant loads were calculated. For pollutants where site-specific data were not available, EPA transferred data from sites with similar operations and treatment in place. EPA calculated an average baseline concentration for each pollutant in a subcategory to use as a data transfer. Where appropriate, EPA calculated an average baseline concentration for each type of site (e.g., those with biological treatment, metals precipitation, oil skimming). In some cases, EPA calculated an average baseline concentration by discharge type. EPA excluded the analytical data from sites selected as the model treatment sites from the average baseline calculation. Data transfers for each subcategory are discussed later in this section.

For some pollutant parameters, EPA performed a logic check to ensure that average concentrations of pollutants derived from different datasets or data transfers did not violate certain rules. For example, many sites had self-monitoring data for oil and grease (measured as hexane extractable material), or O&G; however, they did not for total petroleum hydrocarbons (measured as silica gel treated hexane extractable material), or TPH. EPA transferred average TPH data to fill the gap. In some cases, the data transfer concentration for TPH was greater than the self-monitoring concentration for O&G, which would be unnatural because TPH is a subset of O&G. In these cases, EPA used the self-monitoring concentration for O&G as the concentration for TPH. The logic checks for data for each site included the following rules:

- Phenol could not have a concentration higher than total phenols;
- Amenable cyanide or weak acid dissociable (WAD) cyanide could not have a concentration higher than total cyanide;
- TPH could not have a concentration higher than O&G; and
- Hexavalent chromium could not have a concentration higher than total chromium.

If a rule was violated, EPA would adjust one concentration, always deferring to the site data. EPA encountered the following data conflicts, and resolved them as shown below.

Conflict	EPA Action
The self-monitoring concentration for a bulk parameter is less than the data transfer concentration for a pollutant within the bulk parameter.	Use the self-monitoring concentration as the baseline concentration for both the bulk parameter and the specific pollutant.
The self-monitoring concentration for a pollutant within a grqup is greater than the data transfer concentration for a bulk parameter.	Use the self-monitoring concentration as the baseline concentration for both the specific pollutant and the bulk parameter.
From the EPA sampling data, the site concentration for total recoverable phenols is less than the site concentration for phenol (no self-monitoring data are available for either pollutant).	The method for phenol is a gas chromatograph/mass spectrometry (GC/MS) method. The method for total recoverable phenols is a colorimetric method (Reference 10-1). The GC/MS is expected to be more accurate than colorimetric; therefore, use the concentration of phenol for both analyses.

For each subcategory and segment, EPA multiplied the pollutant load for each site by the survey weight and estimated the baseline load for each subcategory and segment using the following equation:

$$\text{Baseline Load} = \sum (\text{Site Baseline Load} \times \text{SW}) \qquad (10\text{-}4)$$

where:

Baseline Load	=	Industry baseline pollutant loading for each subcategory, lbs/yr
Site Baseline Load	=	Baseline load as calculated for each site in Equation 10-3, lbs/yr
SW	=	Survey weight, available in Appendix A of this document.

For indirect dischargers, the site's baseline load was adjusted by the POTW percent removal, according to Equation 10-2.

10.2.2 Treated Pollutant Loading Calculation

EPA estimated treated pollutant loadings using model PNFs and arithmetic LTAs representing each option. For each option, EPA selected the model PNF, as discussed in Section 7. For each option, EPA used the methodology for selecting sites, as discussed in Section 9. Model effluent pollutant concentrations were then calculated from the model site(s) data, as discussed in Section 10.1.2.

Section 9 explains how EPA evaluated whether a site performed as well or better than the model treatment technology for an option. EPA based the calculation of treated loadings

on the costing decisions presented in Section 9. If a site performed as well or better than the model site(s), pollutant loadings remained unchanged and no pollutant removals were calculated. If the site did not perform as well as the model site(s), EPA estimated a treated load for the site, based on the reduced PNF and/or upgrade to technology in place.

To improve wastewater treatment, EPA allocated costs to sites for the following scenarios: 1) install or improve wastewater treatment to reduce effluent pollutant concentrations, 2) reduce wastewater flow rates through recycling or in-process controls, or 3) improve wastewater treatment and reduce flow rates. Section 9 discusses decisions on wastewater treatment costs. These decisions directly affected EPA's estimates of treated pollutant loadings. In scenario 1, EPA allocated costs to sites to improve wastewater treatment and set treated pollutant concentrations equal to the option arithmetic LTAs. In scenario 2, EPA allocated costs to sites to reduce wastewater flow rates and set treated flow rates equal to model PNFs. In scenario 3, both pollutant concentrations and flow rates were set equal to the model concentrations and PNFs, respectively.

In some cases with scenario 1, a site's baseline concentration for one pollutant was lower than the arithmetic LTA, but the rest of its pollutant concentrations were higher. In these cases, EPA allocated costs to the site for the necessary treatment technology, and if a site's baseline concentration for a particular pollutant was less than the model concentration or flow rate, EPA deferred to the lower number to calculate the treated load for that pollutant.

When estimating pollutant load reductions associated with model treatment technologies incorporating high-rate recycle (scenario 2), EPA used the following conventions:

(1) For pollutants that are removed or treated in the main recycle loop (e.g., total suspended solids (TSS), O&G, metals in particulate form),the concentrations discharged in the blowdown flow were held constant. The pollutant load reduction was assumed to be proportional to the reduction in flow.

(2) For pollutants that are not removed through a treatment mechanism in the main recycle loop (e.g., ammonia-N in blast furnace recycle systems, dissolved substances), the mass loadings of those pollutants discharged from the main recycle loop were held constant and the concentrations in the reduced blowdown flow were assumed to increase in direct proportion to the decrease in blowdown flow.

The Agency believes this approach is somewhat conservative because it did not account for incidental removals of certain pollutants such as ammonia-N associated with increased recycle.

EPA estimated treated pollutant loadings for each subcategory using the following equation:

$$\text{Treated Load} = \text{PNF} \times \text{PROD} \times \text{DPY} \times \text{CONC} \times 8.345(10^{-6})\frac{\text{lbs}}{\text{gal·mg/L}} \qquad (10\text{-}5)$$

where:

Treated Load	=	Treated pollutant loading discharged to surface water by a site, lbs/yr
PNF	=	Model production normalized flow (PNF), gpt
PROD	=	Average production during 1997[1], tons/day
DPY	=	Number of days of operation in 1997[1], days/yr
CONC	=	Option arithmetic LTA, mg/L
$8.345(10^{-6})$	=	Conversion factor, lbs/gal and mg/L.

For treated pollutant loadings for each option considered, EPA used arithmetic LTAs and model PNFs represented by the model treatment technology. For model treatment system effluent concentrations, EPA used the arithmetic averages discussed in Section 10.1.2. For model PNFs, EPA used the PNFs presented in Section 7. EPA calculated an annual flow based on the PNF (either model PNF or the site PNF, depending on which was lower) and production. EPA used the annual production and days per year reported in the industry survey for 1997[1].

For each technology option considered, EPA could only calculate a pollutant reduction for those POCs that were treated by the option. If the available monitoring data for an option did not demonstrate removal of a POC, then EPA did not calculate a reduction for that POC. For example, treatment technologies in some subcategories were not designed to remove fluoride. For a site that was allocated a flow reduction, filtration, and a cooling tower, EPA did not calculate removal of fluoride. Instead, EPA used the site's baseline loading for fluoride as the post-compliance loading. Subcategory-specific examples are presented later in this section.

After determining a site's treated load, EPA multiplied the site load by the industry survey weight and estimated the treated load for each subcategory using the following equation:

$$\text{Treated Load} = \sum(\text{Site Treated Load} \times \text{SW}) \qquad (10\text{-}6)$$

where:

Treated Load	=	Industry-treated pollutant loading for each subcategory, lbs/yr
Site Treated Load	=	Treated load as calculated for each site in Equation 10-5, lbs/yr
SW	=	Survey weight, available in Appendix A of this document.

[1]For some facilities, 1997 production data did not represent normal operating conditions, and alternate years' data were used, as discussed in Section 10.2.

The site's treated load was adjusted by the POTW percent removal for indirect dischargers, according to Equation 10-2.

10.3 Pollutant Loadings for the Cokemaking Subcategory

EPA estimated the pollutant loadings for 22 by-product cokemaking sites: 14 direct dischargers and eight indirect dischargers. One by-product cokemaking site did not discharge wastewater. Sites with non-recovery cokemaking operations are zero discharge sites; therefore, EPA did not calculate pollutant loadings or removals for these sites. EPA estimated pollutant loadings for 41 of the 71 POCs, because the other POCs were not detected in baseline effluent.

10.3.1 Baseline Pollutant Loadings

EPA estimated baseline loadings for cokemaking using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for the baseline concentrations. All 22 sites in the pollutant loadings analysis had baseline concentration data for ammonia-N. Most sites also monitored for benzo(a)pyrene, biochemical oxygen demand (BOD), total cyanide, total recoverable phenolics, and total suspended solids (TSS). Several sites monitored for arsenic, benzene, and naphthalene. For all POCs other than ammonia, EPA used average baseline pollutant concentrations to fill data gaps.

To estimate average pollutant concentrations, EPA examined technology in place: 13 of the 14 direct dischargers had ammonia stills and biological treatment in place, and one site had an ammonia still followed by physical/chemical treatment (dephenolizer, sand filter, and clarifier). All of the eight indirect dischargers had ammonia stills, but three also had biological treatment. EPA calculated an average baseline pollutant concentration for two types of sites: those with ammonia stills and biological treatment in place and those with just ammonia stills. For many pollutants, particularly many of the priority organic constituents, the only data available were from EPA sampling episodes.

For sites with just ammonia still treatment, EPA averaged ammonia still effluent data from sampling episodes at four cokemaking plants for the average baseline concentration. For sites with ammonia stills and biological treatment, EPA averaged available data, including self-monitoring data for some pollutants and biological treatment effluent sampling data from three cokemaking plants for all pollutants. (The fourth plant with sampling data was selected as one of two model sites, and its sampling and self-monitoring data were excluded from average data calculations). Table 10-3 presents the average baseline pollutant concentrations for both types of sites used for the 39 POCs with calculated loads.

The direct discharger with physical/chemical treatment in place provided summary data for ammonia-N, benzene, benzo(a)pyrene, naphthalene, total cyanide, total recoverable phenols, and total suspended solids. The concentrations of these pollutants were similar or higher than the average concentrations of poorly performing biological treatment sites. For the remainder

of the pollutants, EPA used the data from sites with biological treatment in place because of limited available data.

The wastewater treatment systems at four direct discharging sites have treatment technology in place similar to the BAT-1 model sites (see Section 8 for discussion of the regulatory options). These four sites recently upgraded their biological treatment, but no data were available for the newly enhanced treatment systems. Based on the recent treatment enhancements, EPA assumed the treatment technologies at these sites would perform as well as the BAT model technology. For these sites, EPA did not take credit for any removals as a result of the proposed regulation.

Using the site baseline concentrations and flow rates in Equations 10-3 and 10-4, EPA calculated pollutant loadings for the Cokemaking Subcategory. For indirect dischargers, EPA adjusted the pollutant loadings using POTW percent removals and Equation 10-2.

10.3.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for the Cokemaking Subcategory using the model PNFs and arithmetic LTAs. Loads were estimated for the options presented in Section 8. EPA estimated loading reductions based on the results of the costing analysis in Section 9, for the four BAT model technologies listed in the table below.

BAT Technology Options for By-Product Recovery Cokemaking Segment

Treatment Unit	BAT-1	BAT-2	BAT-3	BAT-4
Tar/oil removal	✔	✔	✔	✔
Equalization/ammonia still feed tank	✔	✔	✔	✔
Free and fixed ammonia still	✔	✔	✔	✔
Temperature control	✔	✔	✔	✔
Cyanide precipitation with sludge dewatering		✔		
Equalization tank	✔	✔	✔	✔
Biological treatment with secondary clarification	✔	✔	✔	✔
Sludge dewatering	✔	✔	✔	✔
Alkaline chlorination (2-stage)			✔	✔
Mixed-media filtration				✔
Granular activated carbon				✔

EPA used the arithmetic LTAs for BAT-1 to estimate treated pollutant loadings. For most pollutants, the treated pollutant loadings for BAT-2, BAT-3, and BAT-4 are the same as BAT-1 because the model technologies are equivalent to BAT-1 with add-on technologies. For example, BAT-2 is equivalent to BAT-1 with the addition of cyanide precipitation. EPA used the arithmetic LTA of the BAT-2 site for total cyanide and used the BAT-1 arithmetic LTA for

the remaining POCs. EPA followed this same procedure for all the options. For BAT-3, EPA used the model arithmetic LTA for total cyanide, ammonia-N, and total recoverable phenols from the BAT-3 model site and used BAT-1 LTAs for all the other POCs. For BAT-4, EPA used the model arithmetic LTAs for mercury and TSS and used BAT-3 LTAs for all other POCs. Table 10-4 lists the arithmetic LTAs used to calculate load for all options for this subcategory.

PSES options for by-product cokemaking are structured similarly to the BAT options. Options were add-on technologies to PSES-1, as shown in the table below.

PSES Technology Options for By-Product Recovery Cokemaking Segment

Treatment Unit	PSES-1	PSES-2	PSES-3	PSES-4
Tar/oil removal	✔	✔	✔	✔
Equalization/ammonia still feed tank	✔	✔	✔	✔
Free and fixed ammonia still	✔	✔	✔	✔
Temperature control			✔	✔
Cyanide precipitation with sludge dewatering		✔		
Equalization tank			✔	✔
Biological treatment with secondary clarification			✔	✔
Sludge dewatering			✔	✔
Alkaline chlorination (2-stage)				✔
Multimedia filtration		✔		

The PSES-3 and PSES-4 options are equivalent to BAT-1 and BAT-3, respectively. For PSES-1 and PSES-2, the data from the model sites demonstrated removal of only the following POCs considered for regulation, though many others are treated.

Option	POCs Treated By the Option
PSES-1	Ammonia-N
	Chemical oxygen demand (COD)
	Total cyanide
PSES-2	Ammonia-N
	Chemical oxygen demand (COD)
	Total cyanide
	Total suspended solids (TSS)

In cases where EPA's data indicates that a POC was not treated by the option, EPA used the site's baseline concentration. Table 10-4 presents the arithmetic LTAs used to calculate loads for all technology options for cokemaking.

EPA used the model PNFs presented in Section 7 for post-compliance flow rates, when sites were identified as above the regulatory PNF. EPA calculated a flow reduction for sites identified in Section 9 as receiving flow reductions. The Agency estimated flow reductions for three direct discharging sites: two for reduced control water volume and one for reduced steam volume at the ammonia still. (EPA assumed the reduced steam volume based on the installation of biological treatment at the site, which would allow for a higher ammonia still effluent concentration from the still and less steam use). For indirect dischargers, EPA did not estimate any flow reductions. The flow reduction for direct dischargers was 1.6 million gallons for the year, a 5 percent reduction.

EPA estimated that the three sites with flow reductions would still achieve the model LTAs. For the two sites with control water flow reductions, EPA determined that the sites would also require enhanced biological treatment, as discussed in Section 9. These sites are expected to meet the arithmetic LTA even with flow reductions, because their treatment configuration would resemble the model sites. The model sites achieve the arithmetic LTAs using control water at volumes equal to or less than the regulatory control water volume.

Similarly, the site with a reduced flow from ammonia still steam is expected to meet the arithmetic LTA. EPA allocated this site costs to install an entire biological treatment system that would resemble the model sites, as discussed in Section 9.

For four sites, EPA used the arithmetic LTAs as the sites' baseline concentrations, based on recent treatment system enhancements. These sites did not require flow reductions or treatment to lower effluent pollutant concentrations at BAT-1. At BAT-2, BAT-3, and BAT-4, these sites were allocated costs for improved treatment to lower pollutant effluent concentrations.

Using the model arithmetic LTAs and PNFs in Equations 10-5 and 10-6, EPA calculated treated pollutant loadings for the Cokemaking Subcategory. For indirect dischargers, EPA adjusted the pollutant loadings using POTW percent removals and Equation 10-2. Pollutant removals were calculated as the difference between the treated and baseline loadings.

The following tables summarize the baseline and post-compliance pollutant loadings and associated removals for the By-Product Recovery Cokemaking Segment:

- Table 10-5 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers;
- Table 10-6 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for indirect dischargers;

- Table 10-7 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers; and

- Table 10-8 - Presents the pollutant removals, in lbs/yr, for all options for indirect dischargers.

10.4 Pollutant Loadings for the Ironmaking Subcategory

EPA estimated loadings for the 15 ironmaking sites that generate and discharge process wastewater. The remaining sites are zero dischargers, because they use dry air pollution control, they use their wastewater to slag quench, or both. One of the sites that discharges its wastewater to slag quench was allocated costs to treat dioxins/furans but was not included in the loadings analysis. In 1997, this site was a zero discharger, but to comply with the proposed regulation, it would have a small, intermittent discharge stream. For wastewater streams from blast furnace operations, EPA estimated pollutant loadings for 25 of the 27 POCs. For those from sintering operations, EPA estimated pollutant loadings for 43 of the 65 POCs.

10.4.1 Baseline Pollutant Loadings

EPA estimated baseline concentrations using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for baseline concentrations. Fourteen of the 15 sites had baseline concentration data (self-monitoring, sampling, or permit application data) for lead, total cyanide, total phenols, TSS, and zinc. Thirteen had baseline concentration data for ammonia-N, and three had data for iron. One site with blast furnace wastewaters did not provide monitoring data, and EPA had no sampling data for that site. EPA used average baseline concentrations to fill data gaps for all POCs that sites did not monitor.

For sintering, EPA used primarily sampling data to fill data gaps. Sampling data were available for one site with sintering operations. EPA used the average POC concentrations of the sampling data as the average baseline concentration for sintering wastewaters.

For blast furnace ironmaking, EPA also used primarily sampling data to fill data gaps. Sampling data were available for two sites. One of the sites is located in Canada, and EPA used the data from this site to estimate average pollutant concentrations because the data are representative of blast furnace ironmaking wastewaters. EPA excluded the Canadian site from the remainder of the loadings analysis because it is outside the scope of this proposed U.S. regulation.

For both direct and indirect dischargers with blast furnace wastewaters, EPA used sampling data from the two sites for the average baseline concentration. Section 10.1.2 describes how EPA calculated the average. Tables 10-9 and 10-10 present sintering and blast furnace average baseline pollutant concentrations, respectively, used for POCs with calculated loads.

The wastewater treatment systems at one direct discharging site has treatment technology in place similar to the BAT-1 arithmetic LTAs, but does not have high-rate recycle in

place. The site recently upgraded treatment for blast furnace wastewaters, but no data were available for this treatment system. Based on the treatment in place, EPA used the baseline data from sites representing model treatment for BAT-1 to estimate the pollutant loadings for this site. The site was still allocated flow reduction technology.

10.4.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for the Ironmaking Subcategory using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. EPA estimated loads for the options presented in Section 8, as summarized in the table below:

Technology Options for Ironmaking Subcategory

Treatment Unit	BAT-1	PSES-1
Clarifier	✔	✔
Sludge dewatering	✔	✔
Cooling tower (blast furnace only)	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Metals precipitation	✔	✔
Alkaline chlorination (2-stage)	✔	
Multimedia filtration	✔	

The model site selected to represent the option technology provided analytical data for ammonia-N, total cyanide, and phenol. For the arithmetic LTAs for the remaining POCs, EPA selected a site that had all other treatment units in place except alkaline chlorination (clarifier, cooling tower, high-rate recycle, metals precipitation, and multimedia filtration). For PSES-1, EPA selected one site to represent the model effluent treatment technology. For the 12 sites with Clean Water Act 301(g) variances for ammonia and phenol discussed in Section 9, EPA used the sites' baseline concentration for these two pollutants to calculate treated loadings. Tables 10-11 and 10-12 present the arithmetic LTAs used to calculate loads for all technology options considered.

The one site that did not provide monitoring data was allocated a flow reduction, but not treatment upgrades because it had sufficient treatment technology in place. EPA used data from the site representing the option for baseline concentrations. These same pollutant concentrations were used to calculate the treated loading but with the lower regulatory PNF.

EPA used the model PNFs presented in Section 7 for post-compliance flow rates but only for sites that were allocated flow reductions in the costing analysis. EPA assessed flow reductions for four direct dischargers with co-treatment systems for ironmaking, steelmaking, and/or hot forming wastewaters based on the flow reduction for the entire co-treatment system and the percentage of the co-treated flow generated by the manufacturing operations. Overall flow reduction was 6 percent.

The following tables summarize the baseline and post-compliance pollutant loadings and associated removals for the Ironmaking Subcategory:

- Table 10-13 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct and indirect dischargers; and
- Table 10-14 - Presents the pollutant removals, in lbs/yr, for all options for direct and indirect dischargers.

10.5 Pollutant Loadings for the Integrated Steelmaking Subcategory

EPA estimated loadings for the 21 discharging sites with integrated steelmaking operations. This subcategory includes the following operations: basic oxygen furnace (BOF) steelmaking, vacuum degassing, and continuous casting. Of the 21 discharging sites, some generate wastewater from all three operations, and some only from continuous casting. EPA considered BOF, vacuum degassing, and continuous casting wastewater streams separately for each site. EPA estimated pollutant loadings for 26 of 28 POCs for the Integrated Steelmaking Subcategory, because the other POCs were not detected in baseline effluent.

10.5.1 Baseline Pollutant Loadings

EPA estimated baseline loadings for the Integrated Steelmaking Subcategory using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for the baseline concentrations. Ten of the 21 sites did not provide monitoring data, and EPA had no sampling data for these sites. The remaining 11 sites all provided self-monitoring data for lead and zinc. Several sites provided self-monitoring data for the following pollutants: aluminum, cadmium, TPH (measured as silica gel treated hexane extractable material (SGT-HEM)), and TSS. For all POCs that sites did not monitor, EPA used average baseline concentrations to fill data gaps.

EPA calculated the average baseline concentration using sampling data and self-monitoring data for the direct dischargers. Except for the pollutants listed in the above paragraph, EPA used sampling data to calculate an average baseline concentration. Sampling data were available for three sites, all with BOF, vacuum degassing, and continuous casting operations. Table 10-15 presents the average baseline pollutant concentrations used to fill data gaps for the POCs with calculated loads.

Two sites, a direct discharger and the indirect discharger, had similar treatment technology in place compared to the model site and are expected to treat pollutants to concentrations similar to the arithmetic LTAs. EPA assumed the treatment technologies at these sites would perform as well as the option technology. For these sites, EPA did not take credit for any removals as a result of the proposed regulation.

10.5.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for integrated steelmaking sites using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. Loads were estimated for the options presented in Section 8: BAT-1 and PSES-1 (where BAT-1 = PSES-1). The table below summarizes the options.

Technology Options for Integrated Steelmaking Subcategory

Treatment Unit	BAT-1	PSES-1
Classifier (BOF only)	✔	✔
Scale pit with oil skimming (continuous casting only)	✔	✔
Clarifier	✔	✔
Sludge dewatering	✔	✔
Multimedia filtration[a] (continuous casting only)	✔	✔
Cooling tower (vacuum degassing and continuous casting)	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Metals precipitation	✔	✔

[a] May be used in recycle circuit or as blowdown treatment.

The available data from the site selected to represent the option did not demonstrate removals of the following POCs in the loadings analysis: ammonia-N, nitrate/nitrite, and phenol. For these POCs, EPA used the site's baseline concentration for the post-compliance loading calculation. For all other POCs, the treatment train was expected to provide treatment. Table 10-16 presents the proposed arithmetic LTAs used to calculate loads for the Integrated Steelmaking Subcategory.

EPA used the model PNFs presented in Section 7 for post-compliance flow rates but only for sites that were allocated flow reductions in Section 9. Seventeen direct dischargers were allocated flow reductions. EPA assessed flow reductions for four direct dischargers with co-treatment systems for ironmaking, steelmaking, and/or hot forming wastewaters based on the

flow reduction for the entire co-treatment system and the percentage of the co-treated flow generated by the manufacturing operations. The overall flow reduction was 83 percent.

The following tables summarize the baseline and post-compliance pollutant loadings and associated removals for the Integrated Steelmaking Subcategory:

- Table 10-17 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct and indirect dischargers; and
- Table 10-18 - Presents the pollutant removals, in lbs/yr, for all options for direct and indirect dischargers.

10.6 Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory

EPA estimated loadings for the 51 carbon and alloy steel and three stainless steel sites that generate and discharge process wastewater. Loads calculations were based on data from the surveyed sites: 36 carbon and alloy steel and two stainless steel. For carbon and alloy steel sites, 32 surveyed sites discharge directly and one site discharges indirectly. For stainless steel sites, two surveyed sites discharge indirectly. EPA estimated pollutant loadings for all POCs for the Carbon and Alloy Steel Segment and all POCs for the Stainless Steel Segment.

10.6.1 Baseline Pollutant Loadings

EPA estimated baseline loadings for integrated and stand-alone hot forming sites using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for the baseline concentrations. Twenty-four of the sites did not provide monitoring data, and EPA had no sampling data for these sites. Neither of the two stainless sites provided analytical data. Fourteen carbon and alloy steel sites provided self-monitoring data: one indirect discharger and 13 direct dischargers. Most of the sites monitored for TSS and COD; several monitored for iron, lead, and total recoverable phenolics. For all POCs that sites did not monitor, EPA used average baseline concentrations to fill data gaps.

EPA calculated the average baseline concentration using sampling data and self-monitoring data for the direct dischargers. Except for COD, TSS, and several metals listed in the above paragraph, EPA used sampling data to calculate an average baseline concentration. Sampling data were available for four sites: three direct discharging carbon and alloy steel sites and one direct discharging specialty site. Tables 10-19 and 10-20 present the average baseline pollutant concentrations used to fill data gaps for the POCs with calculated loads for the Carbon and Alloy Steel and Stainless Steel Segments, respectively.

One of the sampled sites is located in Canada, and EPA used the data from the Canadian site to estimate average pollutant concentrations because it represents hot forming wastewater characteristics. The site was not included in the loadings analysis, because it is outside the scope of this proposed U.S. regulation.

10.6.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for integrated and stand-alone hot forming sites using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. Loads were estimated for the options presented in Section 8: BAT-1 and PSES-1 (where BAT-1 = PSES-1) for both carbon and alloy steel and stainless steel. The model technology for stainless steel in the Integrated and Stand-Alone Hot Forming Subcategory is identical to non-integrated steelmaking and hot forming for stainless steel. EPA transferred the stainless steel arithmetic LTAs from non-integrated steelmaking and hot forming. The table below summarizes the options.

Technology Options for Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel and Stainless Steel Segments

Treatment Unit	BAT-1	PSES-1
Scale pit with oil skimming	✔	✔
Roughing clarifier with oil removal	✔	✔
Sludge dewatering	✔	✔
Cooling tower	✔	✔
Multimedia filtration[a]	✔	✔
High-rate recycle	✔	✔
Blowdown treatment		
Multimedia filtration[a]	✔	✔

[a] May be used in recycle circuit or as blowdown treatment.

For carbon and alloy steel options BAT-1 and PSES-1, the available data did not demonstrate removals of ammonia-N or fluoride. For stainless steel options BAT-1 and PSES-1, the available data did not demonstrate removal of fluoride. EPA used the site's baseline concentration for these POCs for the post-compliance loading calculation. For all other POCs, the treatment train was expected to provide treatment and arithmetic LTAs were used. Tables 10-21 and 10-22 present the arithmetic LTAs used to calculate loads for carbon and alloy steel and stainless steel, respectively, for all technology options considered.

EPA used the model PNFs presented in Section 7 for post-compliance flow rates, but only for sites allocated a flow reduction. For carbon and alloy steel sites, direct dischargers were allocated an overall flow reduction of 84 percent, and indirect dischargers were allocated an overall flow reduction of 74 percent. Flow reductions for four of the direct dischargers are from sites with co-treatment systems for ironmaking, steelmaking, and/or hot forming wastewaters. For these four sites, EPA estimated a flow reduction for the entire co-treatment system and then allocated the subcategory-specific portion of the reduction based on the flow generated by the

manufacturing operations. EPA allocated the indirect stainless steel dischargers an overall flow reduction of 90 percent.

The following tables summarize the baseline and post-compliance pollutant loadings and associated removals for the Integrated and Stand-Alone Hot Forming Subcategory:

- Table 10-23 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;
- Table 10-24 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;
- Table 10-25 - Presents the baseline and post-compliance loadings, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment;
- Table 10-26 - Presents the baseline and post-compliance loadings, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment;
- Table 10-27 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;
- Table 10-28 - presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;
- Table 10-29 - presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment; and
- Table 10-30 - presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment.

10.7 Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory

EPA estimated loadings for the 54 carbon and alloy steel and 8 stainless steel sites that generate and discharge process wastewater from non-integrated operations. The loads were based on data from sites that responded to the industry survey: 41 carbon and alloy and eight stainless steel. Thirty-one surveyed carbon and alloy steel sites discharge directly and 10 discharge indirectly. Five surveyed stainless steel sites discharge directly and three discharge indirectly. EPA estimated pollutant loadings for the 10 POCs for the Carbon and Alloy Steel Segment and 21 of the 22 POCs for the Stainless Steel Segment.

10.7.1 Baseline Pollutant Loadings

EPA estimated baseline loadings for non-integrated steelmaking and hot forming sites using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for the baseline concentrations. Twenty-eight of the surveyed sites did not provide monitoring data, and EPA had no sampling data for these sites. Fifteen carbon and alloy steel and six stainless steel sites provided analytical data. Most of the sites monitored for chromium, copper, TPH (measured as SGT-HEM), iron, nickel, lead, and zinc. Several monitored for aluminum, antimony, and molybdenum. For all POCs that sites did not monitor, EPA used average baseline concentrations to fill data gaps.

EPA calculated the average baseline concentration using sampling data and self-monitoring data for the direct dischargers. Except for the pollutants listed in the above paragraph, EPA used sampling data to calculate an average baseline concentration. For the Carbon and Alloy Steel Segment, EPA used data from one direct discharging site. For the Stainless Steel Segment, EPA used sampling data from two direct discharging specialty sites. Tables 10-31 and 10-32 present the average baseline pollutant concentrations used to fill data gaps for the POCs with calculated loads for carbon and alloy steel and stainless steel, respectively.

10.7.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for non-integrated steelmaking and hot forming sites using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. Pollutant loads were estimated for the options presented in Section 8 shown in the table below.

Technology Options for Non-Integrated Steelmaking and Hot Forming Carbon and Alloy Steel and Stainless Steel Segments

Treatment Unit	BAT-1	BAT-2	PSES-1
Scale pit with oil skimming (continuous casting and hot forming only)	✔	✔	✔
Clarifier	✔	✔	✔
Sludge dewatering	✔	✔	✔
Cooling tower	✔	✔	✔
Multimedia filtration[a]	✔	✔	✔
High-rate recycle	✔	✔	✔
Blowdown treatment			
Metals precipitation[a,b]		✔	
Multimedia filtration[a]	✔	✔	✔

[a]May be used in recycle circuit or as blowdown treatment.
[b]Applies to Stainless Steel Segment only.

For both the Carbon and Alloy Steel and Stainless Steel Segments, BAT-1 = PSES-1. For carbon and alloy steel options BAT-1 and PSES-1, the available data did not demonstrate removal of ammonia-N. For stainless steel BAT-1, BAT-2, and PSES-1, available data did not demonstrate removals of the following POCs: ammonia-N, nitrate/nitrite, and fluoride. For these POCs, the site's baseline concentration was used for the post-compliance loading calculation. For all other POCs, the treatment train was expected to provide treatment. For stainless steel, BAT-2 = BAT-1 plus metals precipitation. The BAT-2 model technology did not achieve significantly better effluent quality based on the available data, and removals calculated over BAT-1 are too small to be reflected in the aggregate loads tables in this section. Tables 10-33 and 10-34 present the arithmetic LTAs used to calculate loads for the Carbon and Alloy Steel and Stainless Steel Segments, respectively, for all technology options considered.

For carbon and alloy steel sites, the following overall flow reductions were achieved: 90 percent for direct dischargers, and 32 percent for indirect dischargers. For stainless steel sites, the following overall flow reductions were achieved: 52 percent for direct dischargers, and 89 percent for indirect dischargers.

The following tables summarize the baseline and post-compliance pollutant loadings and associated removals for the Non-Integrated Steelmaking and Hot Forming Subcategory:

- Table 10-35 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;
- Table 10-36 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;
- Table 10-37 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment;
- Table 10-38 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment;
- Table 10-39 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;
- Table 10-40 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;

- Table 10-41 - Presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment; and

- Table 10-42 - Presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment.

10.8 Pollutant Loadings for the Steel Finishing Subcategory

EPA estimated loadings for the 114 sites that generate and discharge process wastewater from steel finishing operations. Loads were based on the 93 sites that responded to the industry survey: 66 carbon and alloy steel and 27 stainless steel. Forty-three surveyed carbon and alloy steel sites discharge directly and 23 discharge indirectly. Nineteen surveyed stainless steel sites discharge directly and 8 discharge indirectly. For each site, EPA considered process lines separately, including the following operations: acid pickling, alkaline cleaning, annealing, electroplating, hot dip cleaning, and cold forming. EPA estimated pollutant loadings for 30 POCs for the Carbon and Alloy Steel Segment and 35 POCs for the Stainless Steel Segment.

10.8.1 Baseline Pollutant Loadings

EPA estimated baseline loadings for steel finishing sites using the flow rates reported in the industry survey and used available site data (self-monitoring, sampling, or permit application data) for the baseline concentrations. Thirty-nine surveyed sites provided data representative of steel finishing wastewaters: 18 direct dischargers for the Carbon and Alloy Steel Segment; nine direct dischargers for the Stainless Steel Segment; 10 indirect dischargers for the Carbon and Alloy Steel Segment; and two indirect dischargers for the Stainless Steel Segment.

To fill data gaps, EPA calculated an average baseline concentration with sampling and self-monitoring data. EPA calculated averages for each segment, type of operation (cold rolling, alkaline cleaning, acid pickling, etc.), and discharge type. EPA had sampling data for three carbon and alloy steel direct dischargers, one carbon and alloy steel indirect discharger, and two stainless steel direct dischargers. Tables 10-43 and 10-44 present the average baseline pollutant concentrations for Carbon and Alloy Steel and Stainless Steel Segments, respectively, used for data transfers for the POCs with calculated loads.

10.8.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for steel finishing using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. Loads were estimated for the options presented in Section 8, as shown in the table below.

Technology Options for Steel Finishing Subcategory Carbon and Alloy Steel and Stainless Steel Segments

Treatment Unit	BAT-1	PSES-1
In-Process Controls		
Countercurrent rinses	✔	✔
Recycle of fume scrubber water	✔	✔
Acid purification units (stainless steel only)	✔	✔
Wastewater Treatment		
Diversion tank	✔	✔
Oil removal	✔	✔
Hydraulic and waste loading equalization	✔	✔
Hexavalent chromium reduction	✔	✔
Multiple-stage pH control for metals precipitation	✔	✔
Clarification	✔	✔
Sludge dewatering	✔	✔

EPA selected two sites to represent the BAT-1 and PSES-1 options for the Carbon and Alloy Steel Segment and one site to represent BAT-1 and PSES-1 options for the Stainless Steel Segment. For steel finishing technology options, available data did not demonstrate removals of the following POCs in the loadings analysis, as shown below.

Segment	Option	Pollutants Treated By the Option
Carbon and Alloy Steel	BAT-1 and PSES-1	Acetone
		alpha-Terpineol
		Ammonia-N
		Bis(2-ethylhexyl) phthalate
		Fluoride
		n-Dodecane
		n-Hexadecane
		Nitrate/nitrite
		Total phenols

Segment	Option	Pollutants Treated By the Option
Stainless Steel	BAT-1 and PSES-1	Acetone
		Ammonia-N
		Hexanoic acid
		n-Dodecane
		n-Hexadecane
		Total cyanide
		Total phenols

For these POCs, the site's baseline concentration was used for the post-compliance loading calculation. For all other POCs, the arithmetic LTAs were used. Tables 10-45 and 10-46 present the arithmetic LTAs used to calculate loads for the Carbon and Alloy Steel and Stainless Steel Segments, respectively, for all technology options considered.

EPA estimated that the following overall flow reductions could be achieved for carbon and alloy steel sites: 59 percent for direct dischargers, and 30 percent for indirect dischargers. For stainless steel sites, the following overall flow reductions were achieved: 47 percent for direct dischargers, and 23 percent for indirect dischargers.

The following tables summarize the baseline and post-compliance pollutant loadings and associated pollutant removals for the Steel Finishing Subcategory:

- Table 10-47 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;
- Table 10-48 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;
- Table 10-49 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment;
- Table 10-50 - Presents the baseline and post-compliance pollutant loadings, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment;
- Table 10-51 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Carbon and Alloy Steel Segment;

- Table 10-52 - Presents the pollutant removals, in lbs/yr, for all options for direct dischargers in the Stainless Steel Segment;
- Table 10-53 - Presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Carbon and Alloy Steel Segment; and
- Table 10-54 - Presents the pollutant removals, in lbs/yr, for all options for indirect dischargers in the Stainless Steel Segment.

10.9 Pollutant Loadings for the Other Operations Subcategory

EPA estimated loadings for the two DRI sites and eight forging sites that generate and discharge process wastewater. One DRI site discharges directly and one discharges indirectly. Five forging sites discharge directly and three discharge indirectly.

EPA did not have sufficient monitoring data to estimate pollutant loadings for many of the POCs for the DRI Segment. Based on available data, EPA only had data to estimate loadings for the three pollutants, aluminum, iron, and total suspended solids, for DRI sites. For forging sites, EPA only had data to estimate loadings for O&G as HEM.

The only pollutant loadings EPA calculated for forging indirect dischargers were for O&G as HEM, which is a conventional pollutant. Because POTWs are designed to treat conventional pollutants, the removal of O&G as HEM is incidental, and BPT limits do not apply to indirect dischargers. Pollutant loadings and removals for the indirect dischargers in the forging segment are not presented.

10.9.1 Baseline Pollutant Loadings

EPA used site-specific data where available for baseline concentrations. For POCs that sites did not monitor, EPA used the average of available baseline concentration data. Both DRI sites provided data for the POCs for which loads were calculated, and no average baseline concentration was calculated. EPA determined the average baseline concentration from the three forging sites that provided data. Table 10-55 presents the average forging baseline pollutant concentrations for the POCs for which loads were calculated.

10.9.2 Treated Pollutant Loadings

EPA estimated treated pollutant loadings for the Other Operations Subcategory using the model PNFs and arithmetic LTAs. Loadings reductions were based on the results of the costing analysis in Section 9. Loads were estimated for the options presented in Section 8 as shown below.

Technology Options for DRI Segment

Treatment Unit	BPT
Classifier	✔
Clarifier	✔
Cooling tower	✔
High-rate recycle	✔
Blowdown treatment	
Multimedia filtration	✔

Technology Options for Forging Segment

Treatment Unit	BPT
High-rate recycle	✔
Blowdown treatment	
Oil/water separator	✔

For DRI, EPA selected one site to represent the model effluent treatment technology. For forging, EPA transferred an arithmetic average from the integrated and stand-alone hot forming subcategory carbon and alloy segment. Tables 10-56 and 10-57 present the arithmetic LTAs used to calculate BPT loads for the DRI and Forging Segments, respectively.

The pollutant loadings and associated removals for DRI are not shown because they contain confidential business information. Table 10-58 presents baseline and treated pollutant loadings for forging direct dischargers; Table 10-59 presents removals. EPA did not present loadings for the forging indirect discharging sites, because O&G does not pass through.

10.10 References

10-1 U.S. Environmental Protection Agency. Fate of Priority Pollutants in Publicly Owned Treatment Works. EPA 440/1-82/303. Washington, D.C., September 1982.

10-2 U.S. Environmental Protection Agency. National Risk Management Research Laboratory (NRMRL) Treatability Database Version 5.0. Cincinnati, OH, 1994.

10-3 American Public Health Association, American Water Works Association, and Water Environment Federation. Standard Methods for the Examination of Water and Wastewater 19th Edition, Washington, D.C., 1995.

Table 10-1

Pollutants of Concern Not Detected in Effluent at Any Site

Subcategory	Operation	Type	Pollutant
Cokemaking	By-Product Cokemaking	Bulk conventional/ nonconventional pollutants	Silica gel treated hexane extractable material (SGT-HEM)
		Priority and nonconventional volatile organic constituents	Carbon disulfide
			1,2-Dichloroethane
			Ethylbenzene
			m-Xylene
			m- + p-Xylene
			o-Xylene
			o- + p-Xylene
		Priority and nonconventional semivolatile organic constituents	Acenaphthene
			Acenaphthylene
			Anthracene
			Benzidine
			2,3-benzofluorene
			Benzo(ghi)perylene
			Biphenyl
			2-Butanone
			Carbazole
			Dibenzothiophene
			Fluorene
			n-Hexadecane
			Indeno(1,2,3-cd)pyrene
			4,5-Methylene phenanthrene
			1-Methylphenanthrene
			alpha-Naphthylamine
			beta-Naphthylamine
			Perylene

Table 10-1 (Continued)

Subcategory	Operation	Type	Pollutant
Cokemaking (cont.)	By-Product Cokemaking (cont.)	Priority and nonconventional semivolatile organic constituents (cont.)	2-Picoline
			Styrene
			Thianaphthene
			Toluene
	Nonrecovery Cokemaking	NA	NA
Ironmaking	Blast Furnace Ironmaking	Bulk conventional/ nonconventional pollutants	Silica gel treated hexane extractable material (SGT-HEM)
		Dioxins and furans	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
	Sintering	Bulk conventional/ nonconventional pollutants	Silica gel treated hexane extractable material (SGT-HEM)
		Priority and nonconventional metals	Silver
		Priority and nonconventional volatile organic constituents	Benzo(a)anthracene
			Benzo(b)fluoranthene
			Benzo(k)fluoranthene
			Benzo(a)pyrene
			Chrysene
			n-Docosane
			n-Eicosane
			n-Hexadecane
			n-Octadecane
			Pyrene
			n-Tetracosane
		Dioxins and furans	1,2,3,4,7,8-Heptachlorodibenzo-p-dioxin
			1,2,3,4,7,8,9-Heptachlorodibenzofuran
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
			1,2,3,7,8,9-Hexachlorodibenzofuran
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin

Table 10-1 (Continued)

Subcategory	Operation	Type	Pollutant
Ironmaking (cont.)	Sintering (cont.)	Dioxins and furans (cont.)	Octachlorodibenzo-p-dioxin
			Octachlorodibenzofuran
Integrated Steelmaking	NA	Priority and nonconventional metals	Beryllium
			Nickel
Integrated and Stand-Alone Hot Forming	Carbon and Alloy Steel	NA	NA
	Stainless Steel	NA	NA
Non-Integrated Steelmaking and Hot Forming	Carbon and Alloy Steel	NA	NA
Non-integrated steelmaking and hot forming	Stainless Steel	Priority and nonconventional volatile organic constituents	Tribromomethane
Finishing	Carbon and Alloy Steel	Priority and nonconventional metals	Selenium
		Priority and nonconventional volatile organic constituents	1,1,1-Trichloroethane
		Priority and nonconventional semivolatile organic constituents	Benzoic acid
			N,N-Dimethylformamide
			n-Eicosane
			n-Octadecane
			n-Tetradecane
	Stainless Steel	Priority and nonconventional metals	Cadmium
			Selenium
			Vanadium
		Priority and nonconventional volatile organic constituents	Ethylbenzene
			Toluene
			m-Xylene
			o- + p-Xylene

Table 10-1 (Continued)

Subcategory	Operation	Type	Pollutant
Finishing (cont.)	Stainless Steel (cont.)	Priority and nonconventional semivolatile organic constituents (cont.)	Benzoic acid
			2,6-Di-tert-butyl-p-benzoquinone
			n-Docosane
			n-Eicosane
			Naphthalene
			n-Octadecane
			2-Methylnaphthalene
			Phenol
			n-Tetracosane
			n-Tetradecane
Other Operations	DRI	Priority and nonconventional metals	Titanium

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

NA- No POCs were excluded for this segment.

Table 10-2

POTW Percent Removal Efficiency

Pollutant	CAS Number[a]	Percent Removal	Data Source
Conventional and Classic Pollutants			
Amenable cyanide	C025	93%	Transfer from WAD cyanide
Ammonia-N (NH3-N)	7664417	39%	50-POTW Study - data >10 × ML
BOD 5-day carbonaceous	C002	91%	Transfer from BOD_5 (50-POTW Study - data >10 × ML)
Chemical oxygen demand (COD)	C004	81%	50-POTW Study - data >10 × ML
Fluoride	16984488	54%	NRMRL Treatability Database (all wastewaters)
Hexane extractable material (HEM)	C036	87%	Used O&G percent removal (50-POTW Study - data >10 × ML)
Nitrate/nitrite (NO2 + NO3-N)	C005	90%	Transfer from TKN
Silica gel treated hexane extractable material (SGT-HEM)	C037	87%	Used O&G percent removal (50-POTW Study - data >10 × ML)
Thiocyanate	302045	70%	Transfer from total cyanide
Total cyanide	57125	70%	50-POTW Study - data >10 × ML
Total Kjeldahl nitrogen (TKN)	C021	90%	Based on data from POTWs receiving iron and steel wastewater
Total organic carbon (TOC)	C012	70%	50-POTW Study - data >10 × ML
Total phenols	C020	77%	50-POTW Study - data >10 × ML
Total suspended solids (TSS)	C009	90%	50-POTW Study - data >10 × ML
Weak acid dissociable cyanide	C042	93%	Based on data from POTW receiving iron and steel wastewater
Metals			
Aluminum	7429905	91%	50-POTW Study - data >10 × ML
Antimony	7440360	67%	50-POTW Study - data >2 × ML
Arsenic	7440382	66%	50-POTW Study - data >2 × ML
Barium	7440393	55%	50-POTW Study - data >2 × ML
Beryllium	7440417	61%	NRMRL Treatability Database (industrial wastewater)
Boron	7440428	24%	50-POTW Study - data >2 × ML
Cadmium	7440439	90%	50-POTW Study - data >10 × ML
Chromium	7440473	80%	50-POTW Study - data >10 × ML
Chromium, hexavalent	18540299	6%	NRMRL Treatability Database (all wastewater)
Cobalt	7440484	10%	50-POTW Study - data >2 × ML
Copper	7440508	84%	50-POTW Study - data >10 × ML
Iron	7439896	82%	50-POTW Study - data >10 × ML
Lead	7439921	77%	50-POTW Study - data >10 × ML
Magnesium	7439954	14%	50-POTW Study - data >10 × ML
Manganese	7439965	36%	50-POTW Study - data >10 × ML

Table 10-2 (Continued)

Pollutant	CAS Number[a]	Percent Removal	Data Source
Metals (continued)			
Mercury	7439976	90%	50-POTW Study - data >10 × ML
Molybdenum	7439987	19%	50-POTW Study - data >10 × ML
Nickel	7440020	51%	50-POTW Study - data >10 × ML
Selenium	7782492	34%	NRMRL Treatability Database (domestic wastewater)
Silver	7440224	88%	50-POTW Study - data >10 × ML
Thallium	7440280	54%	NRMRL Treatability Database (all wastewater)
Tin	7440315	43%	50-POTW Study - data >2 × ML
Titanium	7440326	92%	50-POTW Study - data >10 × ML
Vanadium	7440622	8%	50-POTW Study - data >2 × ML
Zinc	7440666	79%	50-POTW Study - data >10 × ML
Organic Pollutants			
2,4-Dimethylphenol	105679	51%	50-POTW Study - data >2 × ML
2-Methylnaphthalene	91576	28%	NRMRL Treatability Database (industrial wastewater)
2-Phenylnaphthalene	612942	85%	Centralized Water Treaters (CWT) Project - no source listed
alpha-Terpineol	98555	94%	NRMRL Treatability Database (industrial wastewater)
Acetone	67641	84%	NRMRL Treatability Database (all wastewater)
Aniline	62533	93%	NRMRL Treatability Database (all wastewater)
Benzene	71432	95%	50-POTW Study - data >10 × ML
Benzo(a)anthracene	56553	98%	NRMRL Treatability Database (domestic wastewater)
Benzo(a)pyrene	50328	95%	NRMRL Treatability Database (all wastewater)
Benzo(b)fluoranthene	205992	95%	NRMRL Treatability Database (all wastewater)
Benzo(k)fluoranthene	207089	95%	NRMRL Treatability Database (all wastewater)
Benzyl alcohol	100516	78%	NRMRL Treatability Database (all wastewater)
Bis(2-ethylhexyl) phthalate	117817	60%	50-POTW Study - data >10 × ML
Carbazole	86748	62%	CWT Project: Generic Removal Group: Anilines
Chrysene	218019	97%	NRMRL Treatability Database (domestic wastewater)
Dibenzofuran	132649	98%	NRMRL Treatability Database (all wastewater)
Fluoranthene	206440	42%	50-POTW Study - data >2 × ML
Hexanoic acid	142621	84%	NRMRL Treatability Database (all wastewater)
n-Dodecane	112403	95%	NRMRL Treatability Database (industrial wastewater)
n-Eicosane	112958	92%	NRMRL Treatability Database (industrial wastewater)
n-Hexadecane	544763	71%	CWT Project: Generic Removal Group: n-Pariffins
n-Octadecane	593453	71%	CWT Project: Generic Removal Group: n-Pariffins
Naphthalene	91203	95%	50-POTW Study - data >10 × ML
o-Cresol	95487	53%	NRMRL Treatability Database (industrial wastewater)

Table 10-2 (Continued)

Pollutant	CAS Number[a]	Percent Removal	Data Source
Organic Pollutants (continued)			
o-Toluidine	95534	93%	Transfer from aniline
p-Cresol	106445	72%	NRMRL Treatability Database (industrial wastewater)
Phenanthrene	85018	95%	50-POTW Study - data >10 × ML
Phenol	108952	95%	50-POTW Study - data >10 × ML
Pyrene	129000	84%	NRMRL Treatability Database (domestic wastewater)
Pyridine	110861	95%	NRMRL Treatability Database (industrial wastewater)
Dioxins/Furans			
2,3,7,8-TCDF	51207319	83%	Transfer from 1,2,3,4,6,7,8-HPCDF (Source: NRMRL)

[a]CAS Number denotes Chemical Abstract Service Number.

Sources: U.S. EPA's Fate of Priority Pollutants in Publicly Owned Treatment Works and U.S. EPA's NRMRL Treatability Database (References 10-1 and 10-2).

Table 10-3

Average Baseline Pollutant Concentrations Used for Data Transfers in the Cokemaking Subcategory By-Product Cokemaking Segment

Pollutant of Concern	Ammonia Still Treatment Effluent Concentration (mg/L)	Biological Treatment Plant Effluent Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids	105	46.1
Hexane extractable material (HEM)	21.8	5.04
Ammonia-N	195	49.1
Nitrate/nitrite	0.67	41.5
Thiocyanate	256	8.44
Total cyanide	3.55	5.12
Amenable cyanide	1.59	1.26
Weak acid dissociable (WAD) cyanide	0.975	0.081
Total phenols	270	0.176
5-day (carbonaceous) biochemical oxygen demand (BOD_5)	1400	66.4
Chemical oxygen demand (COD)	2640	437
Total organic carbon (TOC)	798	36.6
Nonconventional Metals		
Boron	0.376	0.253
Priority Metals		
Arsenic	0.0497	0.0155
Mercury	0.002	0.000270
Selenium	0.827	0.476
Nonconventional Organic Constituents		
Acetone	0.0547	0.0506
2-Methylnaphthalene	0.0336	0.0147
2-Phenylnaphthalene	0.0677	0.0102
Aniline	2.93	0.0102
Dibenzofuran	0.0338	0.0101
n-Eicosane	0.191	0.0101
n-Octadecane	0.385	0.0101
o-Cresol	12.3	0.012

Table 10-3 (Continued)

Pollutant of Concern	Ammonia Still Treatment Effluent Concentration (mg/L)	Biological Treatment Plant Effluent Concentration (mg/L)
Nonconventional Organics (continued)		
o-Toluidine	0.276	0.0101
p-Cresol	71.4	0.0102
Pyridine	0.159	0.0103
Priority Organics Constituents		
Benzene	0.0125	0.00549
Benzo(a)anthracene	0.0687	0.0101
Benzo(a)pyrene	0.0683	0.00860
Benzo(b)fluoranthene	0.0611	0.00806
Benzo(k)fluoranthene	0.0429	0.00756
Chrysene	0.0756	0.0103
Fluoranthene	0.0835	0.0101
Naphthalene	0.06	0.00763
Phenanthrene	0.0554	0.0101
Pyrene	0.066	0.0101
Phenol	158	0.0319
2,4-Dimethylphenol	1.77	0.0101

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-4

Proposed Arithmetic Long-Term Averages for the Cokemaking Subcategory By-Product Cokemaking Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1, BAT-2, BAT-3	96.1
	BAT-4	5.65
	PSES-1	a
	PSES-2	55.1
	PSES-3, PSES-4	96.1
Hexane extractable material (HEM)	BAT-1, BAT-2, BAT-3, BAT-4	6.72
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	6.72
Ammonia-N	BAT-1, BAT-2	2.57
	BAT-3, BAT-4	0.278
	PSES-1	36.04
	PSES-2	36.04
	PSES-3, PSES-4	2.57
Nitrate/nitrite	BAT-1, BAT-2, BAT-3, BAT-4	166
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	166
Thiocyanate	BAT-1, BAT-2, BAT-3, BAT-4	0.733
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.733
Total cyanide	BAT-1	5.17
	BAT-2	2.26
	BAT-3, BAT-4	1.30
	PSES-1	6.22
	PSES-2, PSES-3	5.17
	PSES-4	1.3
Amenable cyanide	BAT-1, BAT-2, BAT-3, BAT-4	0.977
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.977

Table 10-4 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants (continued)		
Weak acid dissociable (WAD) cyanide	BAT-1, BAT-2, BAT-3, BAT-4	5.17
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	5.17
Total phenols	BAT-1, BAT-2	0.0629
	BAT-3, BAT-4	0.0376
	PSES-1	a
	PSES-2	a
	PSES-3	0.0629
	PSES-3	0.0376
5-day (carbonaceous) biochemical oxygen demand (BOD_5)	BAT-1, BAT-2, BAT-3, BAT-4	86.5
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	86.5
Chemical oxygen demand (COD)	BAT-1, BAT-2, BAT-3, BAT-4	33.1
	PSES-1	304
	PSES-2	304
	PSES-3, PSES-4	86.5
Total organic carbon (TOC)	BAT-1, BAT-2, BAT-3, BAT-4	15.3
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	15.3
Nonconventional Metals		
Boron	BAT-1, BAT-2, BAT-3, BAT-4	0.5
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.5
Priority Metals		
Arsenic	BAT-1, BAT-2, BAT-3, BAT-4	0.00753
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.00753
Mercury	BAT-1, BAT-2, BAT-3	0.00025
	BAT-4	0.00018
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.00025

Table 10-4 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Priority Metals (continued)		
Selenium	BAT-1, BAT-2, BAT-3, BAT-4	0.109
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.109
Nonconventional Organic Constituents		
Acetone	BAT-1, BAT-2, BAT-3, BAT-4	0.05
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.05
2-Methylnaphthalene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
2-Phenylnaphthalene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Aniline	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Dibenzofuran	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
n-Eicosane	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
n-Octadecane	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
o-Cresol	BAT-1, BAT-2, BAT-3, BAT-4	0.0152
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0152

Table 10-4 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Organic Constituents (continued)		
o-Toluidine	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
p-Cresol	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Pyridine	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Priority Organic Constituents		
Benzene	BAT-1	0.00183
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.00183
Benzo(a)anthracene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Benzo(a)pyrene	BAT-1, BAT-2, BAT-3, BAT-4	0.0076
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0076
Benzo(b)fluoranthene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Benzo(k)fluoranthene	B BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Chrysene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101

Table 10-4 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Priority Organic Constituents (continued)		
Fluoranthene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Naphthalene	BAT-1, BAT-2, BAT-3, BAT-4	0.0121
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0121
Phenanthrene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Pyrene	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101
Phenol	BAT-1, BAT-2, BAT-3, BAT-4	0.0376
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0376
2,4-Dimethylphenol	BAT-1, BAT-2, BAT-3, BAT-4	0.0101
	PSES-1	a
	PSES-2	a
	PSES-3, PSES-4	0.0101

[a]Data for PSES-1 and PSES-2 model sites did not demonstrate removal of these pollutants. For the treated pollutant loading, EPA used the sites baseline effluent concentrations.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-5

Summary of Baseline and Post-Compliance Pollutant Loadings for the By-Product Cokemaking Segment Direct Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)			
		BAT-1	BAT-2	BAT-3	BAT-4
Total conventionals	2,310,000	2,100,000	2,100,000	2,100,000	1,630,000
Total priority metals	7,900	5,420	5,420	5,420	5,420
Total nonconventional metals	7,710	7,520	7,520	7,520	7,520
Total nonconventional organic constituents	3,500	3,360	3,360	3,360	3,360
Total priority organic constituents	4,880	4,750	4,750	4,750	4,750
Total nonconventional other	2,710,000	2,320,000	2,320,000	2,290,000	2,290,000
Total cyanide	61,400	56,800	43,300	21,200	21,200
Chemical oxygen demand (COD)	4,660,000	2,050,000	2,050,000	2,050,000	2,050,000
Total organic carbon (TOC)	448,000	300,000	300,000	300,000	300,000
Total phenols	1,630	863	863	617	617

Table 10-6

Summary of Baseline and Post-Compliance Pollutant Loadings for the By-Product Cokemaking Segment Indirect Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)			
		PSES-1	PSES-2	PSES-3	PSES-4
Total conventionals	392,000	392,000	374,000	57,400	57,400
Total priority metals	2,230	2,230	2,230	309	309
Total nonconventional metals	1,110	1,110	1,110	1,050	1,050
Total nonconventional organic constituents	70,000	70,000	70,000	112	112
Total priority organic constituents	20,100	20,100	20,100	72.0	72.0
Total nonconventional other	460,000	279,000	285,000	14,500	8,700
Total cyanide	7,240	4,450	2,430	4,030	1,380
Chemical oxygen demand (COD)	1,490,000	794,000	652,000	68,200	68,200
Total organic carbon (TOC)	658,000	658,000	658,000	19,100	19,100
Total phenols	158,000	158,000	158,000	47.0	31.0

Table 10-7

Summary of Pollutant Removals for the By-Product Cokemaking Segment Direct Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)			
	BAT-1	BAT-2	BAT-3	BAT-4
Total conventionals	206,000	206,000	206,000	676,00
Total priority metals	2,480	2,480	2,480	2,480
Total nonconventional metals	191	191	191	191
Total nonconventional organic constituents	141	141	141	141
Total priority organic constituents	130	130	130	130
Total nonconventional other	388,000	388,000	422,000	422,000
Total cyanide	4,590	18,100	40,200	40,200
Chemical oxygen demand (COD)	2,620,000	2,620,000	2,620,000	2,620,000
Total organic carbon (TOC)	148,000	148,000	148,000	148,000
Total phenols	764	764	1,010	1,010

Table 10-8

Summary of Pollutant Removals for the By-Product Cokemaking Subcategory Indirect Dischargers

Pollutant Name	Pollutant Removals, lbs/yr			
	PSES-1	PSES-2	PSES-3	PSES-4
Total priority metals	-	-	1,920	1,920
Total nonconventional metals	-	-	57	57
Total nonconventional organic constituents	-	-	69,800	69,800
Total priority organic constituents	-	-	20,000	20,000
Total nonconventional other	182,000	175,000	446,000	452,000
Total cyanide	2,790	4,820	3,210	5,870
Chemical oxygen demand (COD)	692,000	834,000	1,420,000	1,420,000
Total organic carbon (TOC)	-	-	639,000	639,000
Total phenols	-	-	158,000	158,000

Table 10-9

Average Baseline Pollutant Concentrations for the Ironmaking Subcategory Sintering Segment

Pollutant of Concern	Type of Discharge[a]	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct	35.4
Hexane extractable material (HEM)	Direct	6.03
Total Kjeldahl nitrogen (TKN)	Direct	45.9
Ammonia-N	Direct	46.1
Nitrate/nitrite	Direct	3.02
Thiocyanate	Direct	0.204
Total cyanide	Direct	0.0568
Amenable cyanide	Direct	0.0342
Weak acid dissociable (WAD) cyanide	Direct	0.0212
Total phenols	Direct	0.0912
Chemical oxygen demand (COD)	Direct	79.7
Total organic carbon (TOC)	Direct	17
Fluoride	Direct	25.3
Nonconventional Metals		
Aluminum	Direct	1.18
Boron	Direct	1.49
Iron	Direct	1.47
Magnesium	Direct	45.2
Manganese	Direct	4.83
Titanium	Direct	0.0178
Priority Metals		
Arsenic	Direct	0.0229
Cadmium	Direct	0.0345
Chromium	Direct	0.00444
Copper	Direct	0.0829
Lead	Direct	0.229

Table 10-9 (Continued)

Pollutant of Concern	Type of Discharge[a]	Average Baseline Concentration (mg/L)
Priority Metals (continued)		
Mercury	Direct	0.00047
Selenium	Direct	0.068
Thallium	Direct	0.754
Zinc	Direct	0.505
Nonconventional Organic Constituents		
o-Cresol	Direct	0.0137
p-Cresol	Direct	0.017
Pyridine	Direct	0.176
1,2,3,4,6,7,8-Heptachlorodibenzofuran	Direct	1.99E-07
1,2,3,4,7,8-Hexachlorodibenzofuran	Direct	1.38E-07
1,2,3,6,7,8-Hexachlorodibenzofuran	Direct	1.15E-07
1,2,3,7,8-Pentachlorodibenzofuran	Direct	1.33E-07
2,3,4,6,7,8-Hexachlorodibenzofuran	Direct	8.60E-08
2,3,4,7,8-Pentachlorodibenzofuran	Direct	2.04E-07
2,3,7,8-Tetrachlorodibenzofuran	Direct	1.53E-07
Priority Organic Constituents		
Fluoranthene	Direct	0.0146
Phenanthrene	Direct	0.0201
Phenol	Direct	0.0324
2,4-Dimethylphenol	Direct	0.0309
4-Nitrophenol	Direct	0.366

[a]The sintering segment only included direct dischargers; therefore, EPA did not calculate an average baseline pollutant concentration for indirect dischargers.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-10

Average Baseline Pollutant Concentrations for the Ironmaking Subcategory Blast Furnace Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct	40.7
	Indirect	40.7
Hexane extractable material (HEM)	Direct	5.54
	Indirect	5.54
Total Kjeldahl nitrogen (TKN)	Direct	112
	Indirect	112
Ammonia-N	Direct	65.5
	Indirect	35.7
Nitrate/nitrite	Direct	2.45
	Indirect	2.45
Thiocyanate	Direct	0.148
	Indirect	0.148
Total cyanide	Direct	0.658
	Indirect	0.26
Amenable cyanide	Direct	0.0304
	Indirect	0.0304
Weak acid dissociable (WAD) cyanide	Direct	0.0150
	Indirect	0.0150
Chemical oxygen demand (COD)	Direct	274
	Indirect	274
Total organic carbon (TOC)	Direct	12.6
	Indirect	12.6
Fluoride	Direct	9.89
	Indirect	9.89

Table 10-10 (Continued)

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals		
Aluminum	Direct	0.171
	Indirect	0.171
Boron	Direct	1.21
	Indirect	1.21
Iron	Direct	4.29
	Indirect	4.29
Magnesium	Direct	59.5
	Indirect	59.5
Manganese	Direct	1.76
	Indirect	1.76
Molybdenum	Direct	0.0408
	Indirect	0.0408
Titanium	Direct	0.00380
	Indirect	0.00380
Priority Metals		
Chromium	Direct	0.00691
	Indirect	0.00691
Copper	Direct	0.00654
	Indirect	0.00654
Lead	Direct	0.0528
	Indirect	0.1
Nickel	Direct	0.0214
	Indirect	0.0214
Selenium	Direct	0.003
	Indirect	0.003
Zinc	Direct	0.967
	Indirect	0.08

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-11

Proposed Arithmetic Long-Term Averages for the Ironmaking Subcategory Sintering Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1	18.7
	PSES-1	18.7
Hexane extractable material (HEM)	BAT-1	5.85
	PSES-1	5.85
Total Kjeldahl nitrogen (TKN)	BAT-1	65.7
	PSES-1	65.7
Ammonia-N	BAT-1	0.278
	PSES-1	70.5
Nitrate/nitrite	BAT-1	7.31
	PSES-1	7.31
Thiocyanate	BAT-1	0.118
	PSES-1	0.118
Total cyanide	BAT-1	1.3
	PSES-1	0.0725
Amenable cyanide	BAT-1	0.0244
	PSES-1	0.0244
Weak acid dissociable (WAD) cyanide	BAT-1	0.0171
	PSES-1	0.0171
Total phenols	BAT-1	0.01
	PSES-1	0.01
Chemical oxygen demand (COD)	BAT-1	42.9
	PSES-1	42.9
Total organic carbon (TOC)	BAT-1	13.2
	PSES-1	13.2
Fluoride	BAT-1	14
	PSES-1	14

Table 10-11 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Metals		
Aluminum	BAT-1	0.586
	PSES-1	0.586
Boron	BAT-1	0.365
	PSES-1	0.365
Iron	BAT-1	2.58
	PSES-1	2.58
Magnesium	BAT-1	27.1
	PSES-1	27.1
Manganese	BAT-1	0.308
	PSES-1	0.308
Titanium	BAT-1	0.0016
	PSES-1	0.0016
Priority Metals		
Arsenic	BAT-1	0.0046
	PSES-1	0.0046
Cadmium	BAT-1	0.00636
	PSES-1	0.00636
Chromium	BAT-1	0.0149
	PSES-1	0.0149
Copper	BAT-1	0.0084
	PSES-1	0.0084
Lead	BAT-1	0.00338
	PSES-1	0.0169
Mercury	BAT-1	0.000223
	PSES-1	0.000223
Selenium	BAT-1	0.0075
	PSES-1	0.0075
Thallium	BAT-1	0.0578
	PSES-1	0.0578

Table 10-11 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Priority Metals (continued)		
Zinc	BAT-1	0.037
	PSES-1	0.422
Fluoranthene	BAT-1	0.01
	PSES-1	0.01
Nonconventional Organic Constituents		
o-Cresol	BAT-1	0.01
	PSES-1	0.01
p-Cresol	BAT-1	0.01
	PSES-1	0.01
1,2,3,4,6,7,8-Heptachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
1,2,3,4,7,8-Hexachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
1,2,3,6,7,8-Hexachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
2,3,4,6,7,8-Hexachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
1,2,3,7,8-Pentachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
2,3,4,7,8-Pentachlorodibenzofuran	BAT-1	5E-08
	PSES-1	5E-08
2,3,7,8-Tetrachlorodibenzofuran	BAT-1	1E-08
	PSES-1	1E-08

Table 10-11 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Priority Organic Constituents		
Phenanthrene	BAT-1	0.01
	PSES-1	0.01
Pyridine	BAT-1	0.0193
	PSES-1	0.0193
Phenol	BAT-1	0.01
	PSES-1	0.01
2,4-Dimethylphenol	BAT-1	0.01
	PSES-1	0.01
4-Nitrophenol	BAT-1	0.05
	PSES-1	0.05

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-12

Proposed Arithmetic Long-Term Averages for the Ironmaking Subcategory Blast Furnace Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1	18.7
	PSES-1	18.7
Hexane extractable material (HEM)	BAT-1	5.85
	PSES-1	5.85
Total Kjeldahl nitrogen (TKN)	BAT-1	65.7
	PSES-1	65.7
Ammonia-N	BAT-1	0.278
	PSES-1	70.5
Nitrate/nitrite	BAT-1	7.31
	PSES-1	7.31
Thiocyanate	BAT-1	0.118
	PSES-1	0.118
Total cyanide	BAT-1	1.3
	PSES-1	0.0725
Amenable cyanide	BAT-1	0.0244
	PSES-1	0.0244
Weak acid dissociable (WAD) cyanide	BAT-1	0.0171
	PSES-1	0.0171
Chemical oxygen demand (COD)	BAT-1	42.9
	PSES-1	42.9
Total organic carbon (TOC)	BAT-1	13.2
	PSES-1	13.2
Fluoride	BAT-1	14
	PSES-1	14

Table 10-12 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Metals		
Aluminum	BAT-1	0.586
	PSES-1	0.586
Boron	BAT-1	0.365
	PSES-1	0.365
Iron	BAT-1	2.58
	PSES-1	2.58
Magnesium	BAT-1	27.1
	PSES-1	27.1
Manganese	BAT-1	0.308
	PSES-1	0.308
Molybdenum	BAT-1	0.0386
	PSES-1	0.0386
Titanium	BAT-1	0.0016
	PSES-1	0.0016
Priority Metals		
Chromium	BAT-1	0.0149
	PSES-1	0.0149
Copper	BAT-1	0.0084
	PSES-1	0.0084
Lead	BAT-1	0.00338
	PSES-1	0.0169
Nickel	BAT-1	0.016
	PSES-1	0.016
Selenium	BAT-1	0.0075
	PSES-1	0.0075
Zinc	BAT-1	0.037
	PSES-1	0.422

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-13

Summary of Baseline and Post-Compliance Pollutant Loadings for the Ironmaking Subcategory Direct and Indirect Dischargers

Pollutant Group	Baseline Load (lbs/yr) [a]	Treated Load Discharged to Surface Water at BAT-1 and PSES-1 (lbs/yr)[a]
Total conventionals	2,430,000	172,000
Total priority metals	17,400	741
Total nonconventional metals	3,250,000	252,000
Total nonconventional organic constituents	477	115
Total priority organic constituents	1,060	320
Total nonconventional other	1,880,000	1,310,000
Total cyanide	9,550	3,300
Chemical oxygen demand (COD)	12,300,000	474,000
Total organic carbon (TOC)	705,000	94,000
Total phenols	216	216
Total dioxins/furans	0.00268	0.000908
Total Kjeldahl nitrogen (TKN)	5,360,000	453,000

[a]Data aggregated to protect confidential business information.

Table 10-14

Summary of Pollutant Removals for the Ironmaking Subcategory Direct and Indirect Dischargers

Pollutant Name	Pollutant Removals (lbs/yr)
	BAT-1 and PSES-1[a]
Total conventionals	2,260,000
Total priority metals	16,700
Total nonconventional metals	2,990,000
Total nonconventional organic constituents	362
Total priority organic constituents	741
Total nonconventional other	564,000
Total cyanide	6,250
Chemical oxygen demand (COD)	11,700,000
Total organic carbon (TOC)	611,000
Total phenols	-
Total dioxins/furans	0.00178
Total Kjeldahl nitrogen (TKN)	4,900,000

[a]Data aggregated to protect confidential business information.

Table 10-15

Average Baseline Pollutant Concentrations for the Integrated Steelmaking Subcategory

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct, Indirect	24.0
Hexane extractable material (HEM)	Direct, Indirect	5.29
Silica gel treated hexane extractable material (SGT-HEM)	Direct, Indirect	5.29
Ammonia-N	Direct, Indirect	0.549
Nitrate/nitrite	Direct, Indirect	0.670
Chemical oxygen demand (COD)	Direct, Indirect	26.8
Total organic carbon (TOC)	Direct, Indirect	8.46
Fluoride	Direct, Indirect	23.7
Nonconventional Metals		
Aluminum	Direct, Indirect	1.49
Cobalt	Direct, Indirect	0.0101
Iron	Direct, Indirect	7.59
Magnesium	Direct, Indirect	6.07
Manganese	Direct, Indirect	0.400
Molybdenum	Direct, Indirect	0.326
Tin	Direct, Indirect	0.00932
Titanium	Direct, Indirect	0.00702
Priority Metals		
Antimony	Direct, Indirect	0.0147
Cadmium	Direct, Indirect	0.00690
Chromium	Direct, Indirect	0.00986
Copper	Direct, Indirect	0.0212
Lead	Direct, Indirect	0.0972
Mercury	Direct, Indirect	0.000204
Silver	Direct, Indirect	0.00652
Zinc	Direct, Indirect	1.36

Table 10-15 (Continued)

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Organic Constituents		
Phenol	Direct, Indirect	0.0316

[a]Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-16

Proposed Arithmetic Long-Term Averages for the Integrated Steelmaking Subcategory

Pollutant of Concern	Option	Model Effluent Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1	7.35
	PSES-1	7.35
Hexane extractable material (HEM)	BAT-1	6.10
	PSES-1	6.10
Silica gel treated hexane extractable material (SGT-HEM)	BAT-1	5.89
	PSES-1	5.89
Total organic carbon (TOC)	BAT-1	9.60
	PSES-1	9.60
Ammonia-N	BAT-1	0.142
	PSES-1	0.142
Nitrate/nitrite	BAT-1	1.76
	PSES-1	1.76
Chemical oxygen demand (COD)	BAT-1	30.9
	PSES-1	30.9
Fluoride	BAT-1	24.4
	PSES-1	24.4
Nonconventional Metals		
Aluminum	BAT-1	0.292
	PSES-1	0.292
Cobalt	BAT-1	0.0105
	PSES-1	0.0105
Iron	BAT-1	1.57
	PSES-1	1.57
Magnesium	BAT-1	57.8
	PSES-1	57.8
Manganese	BAT-1	0.0965
	PSES-1	0.0965
Molybdenum	BAT-1	0.456
	PSES-1	0.456

Table 10-16 (Continued)

Pollutant of Concern	Option	Model Effluent Concentration (mg/L)
Nonconventional Metals (continued)		
Tin	BAT-1	0.00416
	PSES-1	0.00416
Vanadium	BAT-1	0.0154
	PSES-1	0.0154
Priority Metals		
Antimony	BAT-1	0.0799
	PSES-1	0.0799
Cadmium	BAT-1	0.001
	PSES-1	0.001
Chromium	BAT-1	0.0122
	PSES-1	0.0122
Copper	BAT-1	0.0104
	PSES-1	0.0104
Lead	BAT-1	0.0141
	PSES-1	0.0141
Mercury	BAT-1	0.0002
	PSES-1	0.0002
Silver	BAT-1	0.00508
	PSES-1	0.00508
Zinc	BAT-1	0.0932
	PSES-1	0.0932
Priority Organic Constituents		
Phenol	BAT-1	0.01
	PSES-1	0.01

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-17

Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated Steelmaking Subcategory Direct and Indirect Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1 and PSES-1[a]
Total conventionals	2,500,000	650,000
Total priority metals	107,000	15,000
Total nonconventional metals	2,990,000	528,000
Total priority organic constituents	2,850	2,850
Total nonconventional other	3,120,000	1,600,000
Chemical oxygen demand (COD)	3,370,000	648,000
Total organic carbon (TOC)	975,000	189,000
Silica gel treated hexane extractable material (SGT-HEM)	588,000	360,000

[a]Data aggregated to protect confidential business information.

Table 10-18

Summary of Pollutant Removals for the Integrated Steelmaking Subcategory Direct and Indirect Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1 and PSES-1[a]
Total conventionals	1,850,000
Total priority metals	92,300
Total nonconventional metals	2,470,000
Total priority organic constituents	-
Total nonconventional other	1,520,000
Chemical oxygen demand (COD)	2,720,000
Total organic carbon (TOC)	786,000
Silica gel treated hexane extractable material (SGT-HEM)	228,000

[a]Data aggregated to protect confidential business information.

Table 10-19

Average Baseline Pollutant Concentrations for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct	42.4
	Indirect	516
Hexane extractable material (HEM)	Direct	6.04
	Indirect	6.04
Silica gel treated hexane extractable material (SGT-HEM)	Direct	6.04
	Indirect	6.04
Ammonia-N	Direct	0.77
	Indirect	0.77
Chemical oxygen demand (COD)	Direct	77.7
	Indirect	77.7
Fluoride	Direct	6.40
	Indirect	6.40
Nonconventional Metals		
Iron	Direct	7.06
	Indirect	36.4
Manganese	Direct	0.0877
	Indirect	0.0877
Molybdenum	Direct	0.0313
	Indirect	0.0313
Priority Metals		
Lead	Direct	0.0287
	Indirect	0.004
Zinc	Direct	0.0551
	Indirect	0.087

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-20

Average Baseline Pollutant Concentrations for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct	42.4
	Indirect	516
Hexane extractable material (HEM)	Direct	6.04
	Indirect	6.04
Silica gel treated hexane extractable material (SGT-HEM)	Direct	6.04
	Indirect	6.04
Chemical oxygen demand (COD)	Direct	77.7
	Indirect	77.7
Total organic carbon (TOC)	Direct	23.3
	Indirect	23.3
Fluoride	Direct	6.40
	Indirect	6.40
Nonconventional Metals		
Iron	Direct	7.06
	Indirect	36.4
Manganese	Direct	0.0877
	Indirect	0.0877
Molybdenum	Direct	0.0313
	Indirect	0.0313
Titanium	Direct	0.00092
	Indirect	0.00092
Priority Metals		
Antimony	Direct	0.0360
	Indirect	0.0360
Chromium	Direct	0.0104
	Indirect	0.027
Copper	Direct	0.0122
	Indirect	0.3

Table 10-20 (Continued)

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Metals (continued)		
Nickel	Direct	0.0847
	Indirect	0.138
Zinc	Direct	0.0551
	Indirect	0.087

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-21

Proposed Arithmetic Long-Term Averages for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Option	Model Effluent Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1, PSES-1	12.3
Hexane extractable material (HEM)	BAT-1, PSES-1	6.56
Silica gel treated hexane extractable material (SGT-HEM)	BAT-1, PSES-1	5.69
Ammonia-N	BAT-1, PSES-1	0.615
Chemical oxygen demand (COD)	BAT-1, PSES-1	36.5
Fluoride	BAT-1, PSES-1	1.33
Nonconventional Metals		
Iron	BAT-1, PSES-1	2.45
Manganese	BAT-1, PSES-1	0.0308
Molybdenum	BAT-1, PSES-1	0.0890
Priority Metals		
Lead	BAT-1, PSES-1	0.0120
Zinc	BAT-1, PSES-1	0.0874

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-22

Proposed Arithmetic Long-Term Averages for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1, PSES-1	7.14
Hexane extractable material (HEM)	BAT-1, PSES-1	8.78
Silica gel treated hexane extractable material (SGT-HEM)	BAT-1, PSES-1	7.13
Chemical oxygen demand (COD)	BAT-1, PSES-1	44.6
Total organic carbon (TOC)	BAT-1, PSES-1	11.2
Fluoride	BAT-1, PSES-1	14.9
Nonconventional Metals		
Iron	BAT-1, PSES-1	0.658
Manganese	BAT-1, PSES-1	0.0492
Molybdenum	BAT-1, PSES-1	1.23
Titanium	BAT-1, PSES-1	0.009
Priority Metals		
Antimony	BAT-1, PSES-1	0.26
Chromium	BAT-1, PSES-1	0.0255
Copper	BAT-1, PSES-1	0.00904
Nickel	BAT-1, PSES-1	0.151
Zinc	BAT-1, PSES-1	0.071

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-23

Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1
Total conventionals	26,400,000	4,830,000
Total priority metals	73,200	8,610
Total nonconventional metals	5,760,000	625,000
Total nonconventional other	6,530,000	6,530,000
Chemical oxygen demand (COD)	60,200,000	6,930,000
Silica gel treated hexane extractable material (SGT-HEM)	5,690,000	840,000

Table 10-24

Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1
Chemical oxygen demand (COD)	0	0
Silica gel treated hexane extractable material (SGT-HEM)	0	0
Total nonconventional metals	0	0
Total nonconventional other	0	0
Total organic carbon (TOC)	0	0
Total priority metals	0	0

[a]In 1997, no sites with integrated or stand-alone hot forming operations discharged directly.

Table 10-25

Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		PSES-1
Total priority and nonconventional pollutants	37,700	17,300

[a]Data are aggregated to protect confidential business information.

Table 10-26

Summary of Baseline and Post-Compliance Pollutant Loadings for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		PSES-1
Total priority and nonconventional pollutants	1,380	449

[a]Data are aggregated to protect confidential business information.

Table 10-27

Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1
Total conventionals	21,600,000
Total priority metals	64,600
Total nonconventional metals	5,140,000
Total nonconventional other	0
Chemical oxygen demand (COD)	53,300,000
Silica gel treated hexane extractable material (SGT-HEM)	4,850,000

Table 10-28

Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1
Total conventionals	0
Total priority metals	0
Total nonconventional metals	0
Total nonconventional other	0
Chemical oxygen demand (COD)	0
Silica gel treated hexane extractable material (SGT-HEM)	0

[a]In 1997, no sites with integrated or stand-alone hot forming operations discharged directly.

Table 10-29

Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	PSES-1
Total priority and nonconventional pollutants	20,400

[a]Data are aggregated to protect confidential business information.

Table 10-30

Summary of Pollutant Removals for the Integrated and Stand-Alone Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Pollutant Removals, lbs/yr
	PSES-1
Total priority and nonconventional pollutants	930

[a]Data are aggregated to protect confidential business information.

Table 10-31

Average Baseline Pollutant Concentrations for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct	24.5
	Indirect	24.0
Ammonia-N	Direct	1
	Indirect	1
Hexane extractable material (HEM)	Direct	7.52
	Indirect	22.4
Silica gel treated hexane extractable material (SGT-HEM)	Direct	5.52
	Indirect	5.52
Chemical oxygen demand (COD)	Direct	24.5
	Indirect	61
Total organic carbon (TOC)	Direct	5
	Indirect	5
Nonconventional Metals		
Iron	Direct	2.35
	Indirect	2.14
Manganese	Direct	0.0670
	Indirect	0.0670
Priority Metals		
Lead	Direct	0.001
	Indirect	0.0275
Zinc	Direct	0.896
	Indirect	0.129

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-32

Average Baseline Pollutant Concentrations for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	Direct, Indirect	122
Hexane extractable material (HEM)	Direct, Indirect	56
Silica gel treated hexane extractable material (SGT-HEM)	Direct, Indirect	12.7
Ammonia-N	Direct, Indirect	1
Nitrate/nitrite	Direct, Indirect	0.132
Chemical oxygen demand (COD)	Direct, Indirect	306
Total organic carbon (TOC)	Direct, Indirect	75.6
Fluoride	Direct, Indirect	0.77
Nonconventional Metals		
Aluminum	Direct, Indirect	0.413
Boron	Direct, Indirect	0.691
Hexavalent chromium	Direct, Indirect	0.0165
Iron	Direct, Indirect	9.29
Manganese	Direct, Indirect	0.926
Molybdenum	Direct, Indirect	10.2
Titanium	Direct, Indirect	0.00603
Priority Metals		
Antimony	Direct, Indirect	0.0215
Chromium	Direct, Indirect	0.148
Copper	Direct, Indirect	0.15
Lead	Direct, Indirect	0.006
Nickel	Direct, Indirect	1.83
Total organic carbon (TOC)	Direct, Indirect	75.6
Zinc	Direct, Indirect	4.75

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-33

Proposed Arithmetic Long-Term Averages for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1, PSES-1	7.18
Hexane extractable material (HEM)	BAT-1, PSES-1	2.47
Silica gel treated hexane extractable material (SGT-HEM)	BAT-1, PSES-1	2.47
Ammonia-N	BAT-1, PSES-1	0.66
Chemical oxygen demand (COD)	BAT-1, PSES-1	57
Total organic carbon (TOC)	BAT-1, PSES-1	11
Nonconventional Metals		
Iron	BAT-1, PSES-1	1.3
Manganese	BAT-1, PSES-1	0.82
Priority Metals		
Lead	BAT-1, PSES-1	0.001
Zinc	BAT-1, PSES-1	0.0316

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-34

Proposed Arithmetic Long-Term Averages for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants		
Total suspended solids (TSS)	BAT-1, PSES-1	6.36
	BAT-2	6.36
Hexane extractable material (HEM)	BAT-1, PSES-1	8.78
	BAT-2	6.04
Silica gel treated hexane extractable material (SGT-HEM)	BAT-1, PSES-1	7.13
	BAT-2	5.78
Ammonia-N	BAT-1, PSES-1	0.2
	BAT-2	0.2
Nitrate/nitrite	BAT-1, PSES-1	0.0571
	BAT-2	0.0571
Chemical oxygen demand (COD)	BAT-1, PSES-1	44.6
	BAT-2	44.6
Total organic carbon (TOC)	BAT-1, PSES-1	11.2
	BAT-2	11.2
Fluoride	BAT-1, PSES-1	14.9
	BAT-2	14.9
Nonconventional Metals		
Aluminum	BAT-1, PSES-1	0.109
	BAT-2	0.109
Boron	BAT-1, PSES-1	0.292
	BAT-2	0.292
Hexavalent chromium	BAT-1, PSES-1	0.0164
	BAT-2	0.0164
Iron	BAT-1, PSES-1	0.558
	BAT-2	0.558
Manganese	BAT-1, PSES-1	0.0492
	BAT-2	0.0492
Molybdenum	BAT-1, PSES-1	1.23
	BAT-2	1.23

Table 10-34 (Continued)

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Metals (continued)		
Titanium	BAT-1, PSES-1	0.009
	BAT-2	0.005
Priority Metals		
Antimony	BAT-1, PSES-1	0.255
	BAT-2	0.0170
Chromium	BAT-1, PSES-1	0.0255
	BAT-2	0.0255
Copper	BAT-1, PSES-1	0.00904
	BAT-2	0.00904
Lead	BAT-1, PSES-1	0.0143
	BAT-2	0.002
Nickel	BAT-1, PSES-1	0.151
	BAT-2	0.151
Zinc	BAT-1, PSES-1	0.0846
	BAT-2	0.0846

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-35

Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1
Chemical oxygen demand (COD)	3,690,000	353,000
Silica gel treated hexane extractable material (SGT-HEM)	531,000	37,000
Total conventionals	2,780,000	167,000
Total nonconventional metals	267,000	22,100
Total nonconventional other	99,500	99,500
Total organic carbon (TOC)	743,000	71,500
Total priority metals	102,000	2,630

Table 10-36

Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to surface Water (lbs/yr)	
		BAT-1	BAT-2
Total conventionals	18,200	79,300	79,300
Total priority and nonconventional pollutants	52,800	35,100	35,100

[a]Data are aggregated to protect confidential business information.

Table 10-37

Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		PSES-1
Total priority and nonconventional pollutants	3,110	2,100

[a]Data are aggregated to protect confidential business information.

Table 10-38

Summary of Baseline and Post-Compliance Pollutant Loadings for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		PSES-1
Total priority and nonconventional pollutants	13,900	2,300

[a]Data are aggregated to protect confidential business information.

Table 10-39

Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Direct Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1
Total conventionals	2,610,000
Total priority metals	99,500
Total nonconventional metals	244,000
Total nonconventional other	0
Chemical oxygen demand (COD)	3,340,000
Total organic carbon (TOC)	671,000
Silica gel treated hexane extractable material (SGT-HEM)	494,000

Table 10-40

Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)	
	BAT-1	BAT-2
Total conventionals	103,000	103,000
Total priority and nonconventional pollutants	17,700	17,700

[a]Data are aggregated to protect confidential business information.

Table 10-41

Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Carbon and Alloy Steel Segment Indirect Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	PSES-1
Total priority and nonconventional pollutants	1,010

[a]Data are aggregated to protect confidential business information.

Table 10-42

Summary of Pollutant Removals for the Non-Integrated Steelmaking and Hot Forming Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	PSES-1
Total priority metals	11,600

[a]Data are aggregated to protect confidential business information.

Table 10-43

Average Baseline Pollutant Concentrations for the Steel Finishing Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants			
Total suspended solids (TSS)	Acid pickling	Direct	20.2
		Indirect	38.1
	Alkaline cleaning	Direct	19.8
		Indirect	48.7
	Annealing	Direct	27.9
		Indirect	27.9
	Cold forming	Direct	14.5
		Indirect	53.6
	Electroplating	Direct	8.18
		Indirect	31.7
	Hot Dip coating	Direct	6.49
		Indirect	6.49
Hexane extractable material (HEM)	Acid pickling	Direct	4.70
		Indirect	11.3
	Alkaline cleaning	Direct	17.8
		Indirect	17.8
	Annealing	Direct	7.89
		Indirect	7.89
	Cold forming	Direct	12.8
		Indirect	11.3
	Electroplating	Direct	4.7
		Indirect	5.59
	Hot dip coating	Direct	4.7
		Indirect	5.59
Silica gel treated hexane extractable material (SGT-HEM)	Acid pickling	Direct	4.7
		Indirect	6.03
	Alkaline cleaning	Direct	6
		Indirect	6
	Annealing	Direct	6.37
		Indirect	6.37

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants (continued)			
Silica gel treated hexane extractable material (SGT-HEM) (cont.)	Cold forming	Direct	6
		Indirect	6.03
	Electroplating	Direct	4.7
		Indirect	5.59
	Hot dip coating	Direct	4.7
		Indirect	5.59
Ammonia-N	Acid pickling	Direct	0.912
		Indirect	1.4
	Alkaline cleaning	Direct	0.382
		Indirect	1.8
	Annealing	Direct	31.9
		Indirect	31.9
	Cold forming	Direct	0.382
		Indirect	1.4
	Electroplating	Direct	0.912
		Indirect	1.4
	Hot dip coating	Direct	5.85
		Indirect	5.85
Nitrate/nitrite	Acid pickling	Direct	0.214
		Indirect	0.0934
	Alkaline cleaning	Direct	1.3
		Indirect	1.3
	Annealing	Direct	710
		Indirect	710
	Cold forming	Direct	1.3
		Indirect	0.0934
	Electroplating	Direct	0.214
		Indirect	0.128
	Hot dip coating	Direct	3.04
		Indirect	3.04
Total Phenols	Acid pickling	Direct	0.144
		Indirect	0.389
	Alkaline cleaning	Direct	0.181
		Indirect	0.181
	Annealing	Direct	0.0525
		Indirect	0.0525

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants (continued)			
Total Phenols (cont.)	Cold forming	Direct	0.150
		Indirect	0.389
	Electroplating	Direct	0.172
		Indirect	0.005
	Hot dip coating	Direct	0.191
		Indirect	0.191
Chemical oxygen demand (COD)	Acid pickling	Direct	39.9
		Indirect	211
	Alkaline cleaning	Direct	272
		Indirect	272
	Annealing	Direct	58.0
		Indirect	58.0
	Cold forming	Direct	272
		Indirect	211
	Electroplating	Direct	39.9
		Indirect	50.2
	Hot dip coating	Direct	39.9
		Indirect	50.2
Total organic carbon (TOC)	Acid pickling	Direct	10
		Indirect	65.6
	Alkaline cleaning	Direct	88
		Indirect	88
	Annealing	Direct	13.3
		Indirect	13.3
	Cold forming	Direct	88
		Indirect	65.6
	Electroplating	Direct	10
		Indirect	5.11
	Hot dip coating	Direct	10
		Indirect	5.11
Fluoride	Acid pickling	Direct	1.9
		Indirect	0.814
	Alkaline cleaning	Direct	1.74
		Indirect	1.74
	Annealing	Direct	136
		Indirect	258

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants (continued)			
Fluoride (cont.)	Cold forming	Direct	1.74
		Indirect	0.814
	Electroplating	Direct	1.9
		Indirect	0.681
	Hot dip coating	Direct	1.9
		Indirect	0.681
Nonconventional Metals			
Aluminum	Acid pickling	Direct	0.16
		Indirect	1.67
	Alkaline cleaning	Direct	0.0738
		Indirect	0.0738
	Annealing	Direct	0.0738
		Indirect	0.0738
	Cold forming	Direct	0.0738
		Indirect	1.67
	Electroplating	Direct	0.16
		Indirect	0.031
	Hot dip coating	Direct	0.16
		Indirect	0.031
Boron	Acid pickling	Direct	0.0649
		Indirect	0.0577
	Alkaline cleaning	Direct	0.193
		Indirect	0.193
	Annealing	Direct	0.118
		Indirect	0.118
	Cold forming	Direct	0.193
		Indirect	0.0577
	Electroplating	Direct	0.0649
		Indirect	0.054
	Hot dip coating	Direct	0.0649
		Indirect	0.054
Hexavalent chromium	Acid pickling	Direct	0.0076
		Indirect	0.0978
	Alkaline cleaning	Direct	0.009
		Indirect	0.0978

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals (continued)			
Hexavalent chromium (cont.)	Annealing	Direct	0.0298
		Indirect	0.0298
	Cold forming	Direct	0.0132
		Indirect	0.0978
	Electroplating	Direct	0.01
		Indirect	0.0978
	Hot dip coating	Direct	0.0112
		Indirect	0.0112
Iron	Acid pickling	Direct	0.912
		Indirect	2.08
	Alkaline cleaning	Direct	1.45
		Indirect	1.45
	Annealing	Direct	0.923
		Indirect	0.923
	Cold forming	Direct	1.36
		Indirect	2.08
	Electroplating	Direct	0.969
		Indirect	0.008
	Hot dip coating	Direct	0.628
		Indirect	0.628
Manganese	Acid pickling	Direct	0.0376
		Indirect	0.055
	Alkaline cleaning	Direct	0.17
		Indirect	0.17
	Annealing	Direct	0.252
		Indirect	0.252
	Cold forming	Direct	0.17
		Indirect	0.055
	Electroplating	Direct	0.0376
		Indirect	0.0121
	Hot dip coating	Direct	0.0376
		Indirect	0.0121

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals (continued)			
Molybdenum	Acid pickling	Direct	0.0308
		Indirect	0.0356
	Alkaline cleaning	Direct	0.0552
		Indirect	0.0572
	Annealing	Direct	0.149
		Indirect	0.149
	Cold forming	Direct	0.0552
		Indirect	0.0356
	Electroplating	Direct	0.0308
		Indirect	0.0454
	Hot dip coating	Direct	0.0308
		Indirect	0.0483
Tin	Acid pickling	Direct	0.00213
		Indirect	0.002
	Alkaline cleaning	Direct	0.00204
		Indirect	0.00204
	Annealing	Direct	0.0036
		Indirect	0.0036
	Cold forming	Direct	0.0298
		Indirect	0.002
	Electroplating	Direct	0.0299
		Indirect	0.22
	Hot dip coating	Direct	0.0299
		Indirect	0.22
Titanium	Acid pickling	Direct	0.00481
		Indirect	0.00437
	Alkaline cleaning	Direct	0.004
		Indirect	0.004
	Annealing	Direct	0.0046
		Indirect	0.0046
	Cold forming	Direct	0.004
		Indirect	0.00437
	Electroplating	Direct	0.00481
		Indirect	0.00301
	Hot dip coating	Direct	0.00481
		Indirect	0.00301

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Metals			
Antimony	Acid pickling	Direct	0.0495
		Indirect	0.0134
	Alkaline cleaning	Direct	0.00952
		Indirect	0.00952
	Annealing	Direct	0.0179
		Indirect	0.0179
	Cold forming	Direct	0.0479
		Indirect	0.0134
	Electroplating	Direct	0.0495
		Indirect	0.0218
	Hot dip coating	Direct	0.0495
		Indirect	0.0218
Arsenic	Acid pickling	Direct	0.00192
		Indirect	0.00362
	Alkaline cleaning	Direct	0.00126
		Indirect	0.00514
	Annealing	Direct	0.00145
		Indirect	0.015
	Cold forming	Direct	0.00126
		Indirect	0.00362
	Electroplating	Direct	0.00192
		Indirect	0.0138
	Hot dip coating	Direct	0.00192
		Indirect	0.0138
Chromium	Acid pickling	Direct	0.12
		Indirect	0.167
	Alkaline cleaning	Direct	0.125
		Indirect	0.222
	Annealing	Direct	0.122
		Indirect	0.1
	Cold forming	Direct	0.0844
		Indirect	0.0774
	Electroplating	Direct	0.0811
		Indirect	0.049
	Hot dip coating	Direct	0.0973
		Indirect	0.06

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Metals(continued)			
Copper	Acid pickling	Direct	0.0110
		Indirect	0.0276
	Alkaline cleaning	Direct	0.0137
		Indirect	0.0178
	Annealing	Direct	0.0258
		Indirect	0.005
	Cold forming	Direct	0.0137
		Indirect	0.0396
	Electroplating	Direct	0.0102
		Indirect	0.115
	Hot dip coating	Direct	0.01
		Indirect	0.06
Lead	Acid pickling	Direct	0.00452
		Indirect	0.0371
	Alkaline cleaning	Direct	0.00791
		Indirect	0.0547
	Annealing	Direct	0.002
		Indirect	0.01
	Cold forming	Direct	0.0126
		Indirect	0.0625
	Electroplating	Direct	0.00663
		Indirect	0.0106
	Hot dip coating	Direct	0.0155
		Indirect	0.18
Nickel	Acid pickling	Direct	0.133
		Indirect	0.117
	Alkaline cleaning	Direct	0.0293
		Indirect	0.0951
	Annealing	Direct	0.208
		Indirect	0.63
	Cold forming	Direct	0.017
		Indirect	0.102
	Electroplating	Direct	0.0280
		Indirect	0.128
	Hot dip coating	Direct	0.0159
		Indirect	0.08

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Metals (continued)			
Zinc	Acid pickling	Direct	0.136
		Indirect	0.0523
	Alkaline cleaning	Direct	0.0961
		Indirect	0.0659
	Annealing	Direct	0.00894
		Indirect	0.0120
	Cold forming	Direct	0.127
		Indirect	0.277
	Electroplating	Direct	0.209
		Indirect	0.0875
	Hot dip coating	Direct	0.0589
		Indirect	0.635
Nonconventional Organic Constituents			
2-Propanone	Acid pickling	Direct	0.0632
		Indirect	0.176
	Alkaline cleaning	Direct	0.451
		Indirect	0.451
	Annealing	Direct	0.0503
		Indirect	0.0503
	Cold forming	Direct	0.451
		Indirect	0.176
	Electroplating	Direct	0.0632
		Indirect	0.04
	Hot dip coating	Direct	0.0632
		Indirect	0.04
Alpha-Terpineol	Acid pickling	Direct	0.01
		Indirect	0.0192
	Alkaline cleaning	Direct	0.0762
		Indirect	0.0762
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.0762
		Indirect	0.0192

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Organic Constituents (continued)			
Alpha-Terpineol (cont.)	Electroplating	Direct	0.01
		Indirect	0.0608
	Hot dip coating	Direct	0.01
		Indirect	0.0608
n-Dodecane	Acid pickling	Direct	0.01
		Indirect	0.0169
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.01
		Indirect	0.0169
	Electroplating	Direct	0.01
		Indirect	0.0608
	Hot dip coating	Direct	0.01
		Indirect	0.0608
n-Hexadecane	Acid pickling	Direct	0.01
		Indirect	0.01
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.01
		Indirect	0.01
n-Hexadecane (cont.)	Electroplating	Direct	0.01
		Indirect	0.0608
	Hot dip coating	Direct	0.01
		Indirect	0.0608

Table 10-43 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Organic Constituents			
Bis(2-ethylhexyl) phthalate	Acid pickling	Direct	0.01
		Indirect	0.0178
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.0158
		Indirect	0.0158
	Cold forming	Direct	0.01
		Indirect	0.0178
	Electroplating	Direct	0.01
		Indirect	0.0354
	Hot dip coating	Direct	0.01
		Indirect	0.0354

[a]Acid pickling includes hydrochloric acid strip, sulfuric acid strip, sulfuric acid bar, sulfuric acid pipe and tube, other acid strip, other acid bar, and other acid pipe and tube. Alkaline cleaning includes bar, strip or coil, and pipe and tube. Cold forming includes recirculation single-stand, recirculation multi-stand, combination, direct application single-stand, and direct application multi-stand. Electroplating includes tin and chrome, other metals, and other plating.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-44

Average Baseline Pollutant Concentrations for the Steel Finishing Subcategory Stainless Steel Segment

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants			
Total suspended solids (TSS)	Acid pickling	Direct	14.6
		Indirect	22.4
	Alkaline cleaning	Direct	2.77
		Indirect	2.77
	Annealing	Direct	27.9
		Indirect	27.9
	Cold forming	Direct	33
		Indirect	33
Hexane extractable material (HEM)	Acid pickling	Direct	7.33
		Indirect	7.33
	Alkaline cleaning	Direct	17.8
		Indirect	17.8
	Annealing	Direct	7.89
		Indirect	7.89
	Cold forming	Direct	7.85
		Indirect	7.85
Silica gel treated hexane extractable material (SGT-HEM)	Acid pickling	Direct	6.20
		Indirect	6.20
	Alkaline cleaning	Direct	6
		Indirect	6
	Annealing	Direct	6.37
		Indirect	6.37
	Cold forming	Direct	6.5
		Indirect	6.5
Ammonia-N	Acid pickling	Direct	17.1
		Indirect	17.1
	Alkaline cleaning	Direct	0.382
		Indirect	1.8
	Annealing	Direct	31.9
		Indirect	31.9

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants (continued)			
Ammonia-N (cont.)	Cold forming	Direct	22.5
		Indirect	22.5
Nitrate/nitrite	Acid pickling	Direct	506
		Indirect	506
	Alkaline cleaning	Direct	1.3
		Indirect	1.3
	Annealing	Direct	710
		Indirect	710
	Cold forming	Direct	519
		Indirect	519
Total cyanide	Acid pickling	Direct	2.36
		Indirect	2.36
	Alkaline cleaning	Direct	0.04
		Indirect	0.0360
	Annealing	Direct	2.36
		Indirect	2.36
	Cold forming	Direct	0.0300
		Indirect	0.0300
Total phenols	Acid pickling	Direct	0.0517
		Indirect	0.0517
	Alkaline cleaning	Direct	0.181
		Indirect	0.181
	Annealing	Direct	0.0525
		Indirect	0.0525
	Cold forming	Direct	0.05
		Indirect	0.05
Chemical oxygen demand (COD)	Acid pickling	Direct	44.3
		Indirect	44.3
	Alkaline cleaning	Direct	272
		Indirect	272
	Annealing	Direct	58.0
		Indirect	58.0
	Cold forming	Direct	85.6
		Indirect	85.6

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Conventional and Classic Pollutants (continued)			
Total organic carbon (TOC)	Acid pickling	Direct	10.2
		Indirect	10.2
	Alkaline cleaning	Direct	88
		Indirect	88
	Annealing	Direct	13.3
		Indirect	13.3
	Cold forming	Direct	16.6
		Indirect	16.6
Fluoride	Acid pickling	Direct	75.1
		Indirect	258
	Alkaline cleaning	Direct	11.3
		Indirect	11.3
	Annealing	Direct	136
		Indirect	258
	Cold forming	Direct	6.96
		Indirect	6.96
Nonconventional Metals			
Aluminum	Acid pickling	Direct	0.0730
		Indirect	0.0730
	Alkaline cleaning	Direct	0.0738
		Indirect	0.0738
	Annealing	Direct	0.0738
		Indirect	0.0738
	Cold forming	Direct	0.0916
		Indirect	0.0916
Barium	Acid pickling	Direct	0.0179
		Indirect	0.0179
	Alkaline cleaning	Direct	0.211
		Indirect	0.211
	Annealing	Direct	0.0228
		Indirect	0.0228
	Cold forming	Direct	0.0239
		Indirect	0.0239

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals (continued)			
Boron	Acid pickling	Direct	0.142
		Indirect	0.142
	Alkaline cleaning	Direct	0.193
		Indirect	0.193
	Annealing	Direct	0.118
		Indirect	0.118
	Cold forming	Direct	0.0585
		Indirect	0.0585
Cobalt	Acid pickling	Direct	0.0114
		Indirect	0.0114
	Alkaline cleaning	Direct	0.009
		Indirect	0.009
	Annealing	Direct	0.0112
		Indirect	0.0112
	Cold forming	Direct	0.012
		Indirect	0.012
Hexavalent chromium	Acid pickling	Direct	0.0397
		Indirect	0.0397
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.0298
		Indirect	0.0298
	Cold forming	Direct	0.0085
		Indirect	0.0085
Iron	Acid pickling	Direct	0.486
		Indirect	2.79
	Alkaline cleaning	Direct	0.0377
		Indirect	0.0377
	Annealing	Direct	0.923
		Indirect	0.923
	Cold forming	Direct	0.736
		Indirect	0.736

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals (continued)			
Magnesium	Acid pickling	Direct	21.7
		Indirect	21.7
	Alkaline cleaning	Direct	10.7
		Indirect	10.7
	Annealing	Direct	31.9
		Indirect	31.9
	Cold forming	Direct	43
		Indirect	43
Manganese	Acid pickling	Direct	0.168
		Indirect	0.0387
	Alkaline cleaning	Direct	0.17
		Indirect	0.17
	Annealing	Direct	0.252
		Indirect	0.252
	Cold forming	Direct	0.261
		Indirect	0.261
Molybdenum	Acid pickling	Direct	0.449
		Indirect	0.449
	Alkaline cleaning	Direct	0.0552
		Indirect	0.0572
	Annealing	Direct	0.149
		Indirect	0.149
	Cold forming	Direct	0.168
		Indirect	0.168
Tin	Acid pickling	Direct	0.0034
		Indirect	0.0034
	Alkaline cleaning	Direct	0.00204
		Indirect	0.00204
	Annealing	Direct	0.0036
		Indirect	0.0036
	Cold forming	Direct	0.004
		Indirect	0.004

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Metals (continued)			
Titanium	Acid pickling	Direct	0.0044
		Indirect	0.0044
	Alkaline cleaning	Direct	0.004
		Indirect	0.004
	Annealing	Direct	0.0046
		Indirect	0.0046
	Cold forming	Direct	0.005
		Indirect	0.005
Priority Metals			
Antimony	Acid pickling	Direct	0.0140
		Indirect	0.0140
	Alkaline cleaning.	Direct	0.00952
		Indirect	0.00952
	Annealing	Direct	0.0179
		Indirect	0.0179
	Cold forming	Direct	0.0168
		Indirect	0.0168
Arsenic	Acid pickling	Direct	0.00152
		Indirect	0.015
	Alkaline cleaning	Direct	0.00126
		Indirect	0.00514
	Annealing	Direct	0.00145
		Indirect	0.015
	Cold forming	Direct	0.00188
		Indirect	0.00188
Chromium	Acid pickling	Direct	0.0903
		Indirect	0.0765
	Alkaline cleaning	Direct	0.0223
		Indirect	0.0223
	Annealing	Direct	0.122
		Indirect	0.1
	Cold forming	Direct	0.0673
		Indirect	0.0673

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Priority Metals (continued)			
Copper	Acid pickling	Direct	0.0224
		Indirect	0.0129
	Alkaline cleaning	Direct	0.0191
		Indirect	0.0191
	Annealing	Direct	0.0258
		Indirect	0.005
	Cold forming	Direct	0.0236
		Indirect	0.0236
Lead	Acid pickling	Direct	0.00722
		Indirect	0.0553
	Alkaline cleaning	Direct	0.0051
		Indirect	0.0051
	Annealing	Direct	0.002
		Indirect	0.01
	Cold forming	Direct	0.0135
		Indirect	0.0135
Nickel	Acid pickling	Direct	0.122
		Indirect	0.339
	Alkaline cleaning	Direct	0.184
		Indirect	0.184
	Annealing	Direct	0.208
		Indirect	0.63
	Cold forming	Direct	0.158
		Indirect	0.158
Zinc	Acid pickling	Direct	0.0135
		Indirect	0.0347
	Alkaline cleaning	Direct	0.0296
		Indirect	0.0296
	Annealing	Direct	0.00894
		Indirect	0.0120
	Cold forming	Direct	0.009
		Indirect	0.009

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Organic Constituents			
2-Propanone	Acid pickling	Direct	0.0502
		Indirect	0.0502
	Alkaline cleaning	Direct	0.451
		Indirect	0.451
	Annealing	Direct	0.0503
		Indirect	0.0503
	Cold forming	Direct	0.0505
		Indirect	0.0505
Hexanoic acid	Acid pickling	Direct	0.015
		Indirect	0.015
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.01
		Indirect	0.01
n-Dodecane	Acid pickling	Direct	0.0189
		Indirect	0.0189
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.01
		Indirect	0.01

Table 10-44 (Continued)

Pollutant of Concern	Type of Operation[a]	Type of Discharge	Average Baseline Concentration (mg/L)
Nonconventional Organic Constituents (continued)			
n-Hexadecane	Acid pickling	Direct	0.0258
		Indirect	0.0258
	Alkaline cleaning	Direct	0.01
		Indirect	0.01
	Annealing	Direct	0.01
		Indirect	0.01
	Cold forming	Direct	0.01
		Indirect	0.01

[a]Acid pickling includes strip, bar, and plate. Alkaline cleaning includes bar, strip or coil, and pipe and tube. Cold forming includes recirculation single-stand, recirculation multi-stand, combination, direct application single-stand, and direct application multi-stand.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-45

Proposed Arithmetic Long-Term Averages for the Steel Finishing Subcategory Carbon and Alloy Steel Segment

Pollutant of Concern	Type of Operation[a]	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants			
Total suspended solids (TSS)	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	6.97
Hexane extractable material (HEM)	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	6.33
Hexane extractable material (SGT-HEM)	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	6.33
Ammonia-N	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.34
Nitrate/nitrite	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0623
Total phenols	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0820
Chemical oxygen demand (COD)	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	61.3
Total organic carbon (TOC)	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	10.9
Fluoride	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.349
Nonconventional Metals			
Aluminum	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0945
Boron	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0433
Hexavalent chromium	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0109
Iron	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.558
Manganese	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0387
Molybdenum	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.00617
Tin	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0124

Table 10-45 (Continued)

Pollutant of Concern	Type of Operation[a]	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Metals (continued)			
Titanium	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0045
Priority Metals			
Antimony	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0147
Arsenic	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0019
Chromium	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0387
Copper	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.00883
Lead	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0175
Nickel	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0362
Zinc	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0425
Nonconventional Organic Constituents			
2-Propanone	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.052
Alpha-Terpineol	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.01
n-Dodecane	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0119
n-Hexadecane	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.0128
Priority Organic Constituents			
Bis(2-Ethylhexyl) phthalate	Acid pickling, alkaline cleaning, annealing, cold forming, electroplating, and hot dip coating	BAT-1, PSES-1	0.01

[a]Acid pickling includes hydrochloric acid strip, sulfuric acid strip, sulfuric acid bar, sulfuric acid pipe and tube, other acid strip, other acid bar, and other acid pipe and tube. Alkaline cleaning includes bar, strip or coil, and pipe and tube. Cold forming includes recirculation single-stand, recirculation multi-stand, combination, direct application single-stand, and direct application multi-stand. Electroplating includes tin and chrome, other metals, and other plating.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-46

Proposed Arithmetic Long-Term Averages for the Steel Finishing Subcategory Stainless Steel Segment

Pollutant of Concern	Type of Operation[a]	Option	Arithmetic Long-Term Average (mg/L)
Conventional and Classic Pollutants			
Total suspended solids (TSS)	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	3.42
Hexane extractable material (HEM)	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	6.35
Silica gel treated hexane extractable material (SGT-HEM)	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	5.89
Ammonia-N	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	11.6
Nitrate/nitrite	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	93.9
Total cyanide	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0160
Total phenols	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.05
Chemical oxygen demand (COD)	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	14.4
Total organic carbon (TOC)	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	3.43
Fluoride	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	16.6
Nonconventional Metals			
Aluminum	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0763
Barium	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.00833
Boron	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.151
Cobalt	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.012
Hexavalent chromium	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0816
Iron	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0693

Table 10-46 (Continued)

Pollutant of Concern	Type of Operation[a]	Option	Arithmetic Long-Term Average (mg/L)
Nonconventional Metals (continued)			
Magnesium	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	1.32
Manganese	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.001
Molybdenum	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	1.03
Tin	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.003
Titanium	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.004
Priority Metals			
Antimony	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.00691
Arsenic	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.00173
Chromium	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.110
Copper	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0231
Lead	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0025
Nickel	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0444
Zinc	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.00474
Nonconventional Organic Constituents			
2-Propanone	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.05
Hexanoic acid	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.028
n-Dodecane	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0421
n-Hexadecane	Acid pickling, alkaline cleaning, annealing, and cold forming	BAT-1, PSES-1	0.0669

(a) Acid pickling includes strip, bar, and plate. Alkaline cleaning includes bar, strip or coil, and pipe and tube. Cold forming includes recirculation single-stand, recirculation multi-stand, combination, direct application single-stand, and direct application multi-stand.

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-47

Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Direct Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1
Chemical oxygen demand (COD)	27,200,000	10,400,000
Hexavalent chromium[a]	2,690	1,080
Silica gel treated hexane extractable material (SGT-HEM)	1,300,000	540,000
Total conventionals	4,560,000	1,760,000
Total nonconventional metals	310,000	115,000
Total nonconventional organic constituents	57,300	57,300
Total nonconventional other	1,240,000	1,240,000
Total phenols	36,700	36,700
Total organic carbon (TOC)	8,060,000	3,010,000
Total priority metals	78,900	29,600
Total priority organic constituents	2,430	2,430

[a]Hexavalent chromium was not included in the total nonconventional metals or the total priority metals, because total chromium is included in these totals.

Table 10-48

Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BAT-1
Total conventionals	1,220,000	496,000
Total priority and nonconventional pollutants	30,900,000	16,700,000

[a]Data are aggregated to protect confidential business information.

Table 10-49

Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Indirect Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		PSES-1
Chemical oxygen demand (COD)	169,000	90,970
Hexavalent chromium[a]	591	325
Silica gel treated-HEM (SGT-HEM)	6,680	4,600
Total nonconventional metals	2,970	1,640
Total nonconventional organic constituents	475	475
Total nonconventional other	12,200	12,200
Total phenols	296	296
Total organic carbon (TOC)	65,680	29,900
Total priority metals	1,010	664
Total priority organic constituents	92.0	92.0

[a]Hexavalent chromium was not included in the total nonconventional metals or the total priority metals, because total chromium is included in these totals.

Table 10-50

Summary of Baseline and Post-Compliance Pollutant Loadings for the Steel Finishing Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged from POTW (lbs/yr)
		BAT-1
Total priority and nonconventional pollutants	304,000	274,.000

[a]Data are aggregated to protect confidential business information.

Table 10-51

Summary of Pollutant Removals for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Direct Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1
Total conventionals	2,800,000
Total priority metals	49,300
Total nonconventional metals	195,000
Total nonconventional organic constituents	0
Total priority organic constituents	0
Total nonconventional other	0
Chemical oxygen demand (COD)	16,800,000
Total phenols	0
Total organic carbon (TOC)	5,050,000
Silica gel treated hexane extractable material (SGT-HEM)	764,000
Hexavalent chromium[a]	1,610

[a]Hexavalent chromium was not included in the total nonconventional metals or the total priority metals, because total chromium is included in these totals.

Table 10-52

Summary of Pollutant Removals for the Steel Finishing Subcategory Stainless Steel Segment Direct Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	BAT-1
Total conventionals	719,000
Total priority and nonconventional pollutants	14,200,000

[a]Data are aggregated to protect confidential business information.

Table 10-53

Summary of Pollutant Removals for the Steel Finishing Subcategory Carbon and Alloy Steel Segment Indirect Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)
	PSES-1
Total priority metals	345
Total nonconventional metals	1,330
Total nonconventional organic constituents	0
Total priority organic constituents	0
Total nonconventional other	0
Chemical oxygen demand (COD)	78,200
Total phenols	0
Total organic carbon (TOC)	35,700
Silica gel treated hexane extractable material (SGT-HEM)	2,080
Hexavalent chromium[a]	265

[a]Hexavalent chromium was not included in the total nonconventional metals or the total priority metals, because total chromium is included in these totals.

Table 10-54

Summary of Pollutant Removals for the Steel Finishing Subcategory Stainless Steel Segment Indirect Dischargers[a]

Pollutant Group	Pollutant Removals (lbs/yr)
	PSES-1
Total priority and nonconventional pollutants	31,000

[a]Data are aggregated to protect confidential business information.

Table 10-55

Average Baseline Pollutant Concentrations for the Other Operations Subcategory Forging Segment

Pollutant of Concern	Type of Discharge	Average Baseline Concentration (mg/L)
Hexane extractable material (HEM)	Direct, Indirect	8

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-56

Proposed Arithmetic Long-Term Averages for the Other Operations Subcategory DRI Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Aluminum	BPT	0.0403
Iron	BPT	2.40
Total suspended solids (TSS)	BPT	10.3

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-57

Proposed Arithmetic Long-Term Averages for the Other Operations Subcategory Forging Segment

Pollutant of Concern	Option	Arithmetic Long-Term Average (mg/L)
Hexane extractable material	BPT	6.56

Sources: U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys), U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (Analytical and Production Survey), and U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.

Table 10-58

Summary of Baseline and Post-Compliance Pollutant Loadings for the Other Operations Subcategory Forging Segment Direct Dischargers

Pollutant Group	Baseline Load (lbs/yr)	Treated Load Discharged to Surface Water (lbs/yr)
		BPT
Hexane extractable material (HEM)	1,100	652

Table 10-59
Summary of Pollutant Removals for the Other Operations Subcategory Forging Segment Direct Dischargers

Pollutant Group	Pollutant Removals (lbs/yr)
	BPT
Hexane extractable material (HEM)	444

SECTION 11

REGULATED POLLUTANTS

This section describes the selection of regulated pollutants for each subcategory at each statutory level (i.e., Best Practicable Control Technology Currently Available (BPT), Best Control Technology for Conventional Pollutants (BCT), Best Available Technology Economically Achievable (BAT), Pretreatment Standards for New Sources (PSNS), Pretreatment Standards for Existing Sources (PSES), and New Source Performance Standards (NSPS)). Regulated pollutants are pollutants for which EPA proposes to establish numerical effluent limitations and standards. EPA selected pollutants for regulation based on the following factors: applicable Clean Water Act provisions regarding the pollutants subject to each statutory level, the pollutants of concern (POCs) identified for each subcategory and segment, and co-treatment of compatible wastewater from different manufacturing operations. This section presents the following information:

- Section 11.1 presents EPA's methodology for selecting regulated pollutants for direct dischargers (those subject to BPT, BAT, or NSPS);
- Sections 11.2 through 11.8 discuss the regulated pollutants selected for direct dischargers for each proposed subcategory;
- Section 11.9 presents EPA's methodology for selecting regulated pollutants for indirect dischargers (those subject to PSES or PSNS); and
- Sections 11.10 through 11.16 discuss the regulated pollutants selected for indirect dischargers for each proposed subcategory.

11.1 Regulated Pollutant Selection Methodology for Direct Dischargers

The list of POCs for each subcategory represents those pollutants that are present at treatable concentrations in a significant percentage of untreated wastewater from that subcategory; Section 7 discusses the selection of POCs for each subcategory. Effluent monitoring for all POCs is not necessary to ensure that iron and steel wastewater pollution is adequately controlled, since many of the pollutants originate from similar sources, have similar treatabilities, are removed by similar mechanisms, and are treated to similar concentrations. Therefore, it may be sufficient to monitor for one pollutant as a surrogate or indicator of several others. From the POC list for each subcategory, EPA selected a subset of pollutants considered for regulation (DCN IS05070 in Section 5.4 of the Iron and Steel Administrative Proposal Record). Factors EPA considered in selecting pollutants considered for regulation from the list of POCs for each subcategory include the following:

- The pollutant was detected in the untreated wastewater at the BAT facility(ies) at treatable levels in a significant number of samples. EPA

eliminated pollutants that were not detected at greater than 10 times the minimum level in at least 10 percent of the untreated wastewater samples from the BAT facility(ies).

- The pollutant is not used as a treatment chemical in the selected treatment technology option. EPA excluded all pollutants that may serve as treatment chemicals: aluminum, boron, iron, magnesium, manganese, and sulfate (several other pollutants are commonly used as treatment chemicals but were already excluded as POCs). EPA eliminated these pollutants because regulating these pollutants could interfere with their beneficial use as wastewater treatment additives.

- The pollutant is not considered a nonconventional bulk parameter. EPA excluded many nonconventional bulk parameters (e.g., chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN), total organic carbon (TOC), nitrate/nitrite, total petroleum hydrocarbons (TPH), total phenols) because it determined it is more appropriate to target specific compounds of interest rather than a parameter that measures a variety of pollutants for this industry. The specific pollutants that comprise the bulk parameter may or may not be of concern to EPA.

- The pollutant is not considered to be volatile. Volatile pollutants are likely to be volatilized in the treatment system and are therefore not considered to be treated by the selected technology. For purposes of this evaluation, a pollutant was considered to be volatile if its Henry's Law Constant is greater than 10^{-4} atm·m^3/mol. If EPA could not obtain a Henry's Law Constant for a particular pollutant, it assumed the pollutant was not volatile.

- The pollutant is effectively treated by the selected treatment technology option. EPA excluded all pollutants for which the selected treatment option was ineffective (i.e., pollutant concentrations remained the same or increased across the treatment system).

From the list of pollutants considered for regulation, EPA determined the pollutants to regulate. Generally, EPA selected at least one pollutant from each pollutant group considered for regulation to ensure control of all remaining POCs in the pollutant group. For example, when one or more metals is proposed for regulation for a chemical precipitation system, EPA presumes that controlling those metals will control all other metals considered for regulation. The Agency did not propose for regulation POCs considered for regulation, but for which the model treatment technology was not designed or intended to treat (e.g., chemical precipitation systems are not designed to treat organic constituents, so EPA did not select organic constituents for regulation at options using only chemical precipitation).

The Clean Water Act establishes three classes of pollutants (conventional, nonconventional, and priority) and dictates which classes of pollutants EPA may regulate at each statutory level for direct dischargers.

- BPT - Conventional, nonconventional, and priority pollutants;
- BCT - Conventional pollutants;
- BAT - Nonconventional and priority pollutants; and
- NSPS - Conventional, nonconventional, and priority pollutants.

Section 14 presents the technology options proposed for each statutory level. As discussed in Section 14, EPA is not proposing to revise BPT limitations for those manufacturing processes currently subject to BPT limitations at 40 CFR Part 420; EPA is only proposing BPT limitations for those manufacturing processes in the Other Operations Subcategory, as these processes are not currently regulated under Part 420. In addition, EPA did not identify any technologies that better removed conventionals than BPT and at the same time passed the cost-effectiveness test; therefore, EPA proposes that BCT limitations be set equal to BPT limitations for every subcategory. Sections 11.2 through 11.8 discuss the selection of pollutants proposed for regulation for direct dischargers on a subcategory basis.

11.2 Cokemaking Subcategory

EPA selected proposed regulated pollutants for the By-Product Recovery Segment of the Cokemaking Subcategory only; EPA proposes zero discharge of pollutants from the Non-Recovery Segment. Table 11-1 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

BAT

For this subcategory, EPA proposes establishing BAT limitations for ammonia as nitrogen, total cyanide, phenol, benzo(a)pyrene, naphthalene, thiocyanate, mercury, selenium, and total residual chlorine (TRC). Except for TRC, these pollutants are characteristic of cokemaking wastewater. TRC is an indicator of post-alkaline chlorination residual chlorine concentration. Facilities would not need to meet the TRC limit if they certify to the permitting authority that they do not use alkaline chlorination in their wastewater treatment. These proposed regulated pollutants are key indicators of the performance of the ammonia distillation, biological treatment, and alkaline chlorination processes, which are the key components of the model BAT and NSPS treatment systems for by-product coke plants.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-2. EPA believes that controlling the regulated pollutants will control all the remaining POCs considered for regulation for this segment. Controlling benzo(a)pyrene, phenol, and naphthalene will effectively control all other remaining organic constituent POCs. EPA believes the removal mechanisms in biological treatment systems that

remove these parameters will also remove the remaining organic constituent POCs. Controlling mercury and selenium will also control the remaining metal POC, arsenic. Likewise, controlling total cyanide and thiocyanate will control the remaining cyanide compounds: amenable cyanide and weak acid dissociable (WAD) cyanide.

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as total suspended solids (TSS) and oil and grease (O&G).

11.3 Ironmaking Subcategory

EPA selected regulated pollutants for both the Blast Furnace and the Sintering Segments of the Ironmaking Subcategory. Table 11-3 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

BAT

EPA proposes establishing BAT limitations for ammonia as nitrogen, lead, zinc, total cyanide, phenol, and TRC for both the Blast Furnace and Sintering Segments. In addition, 2,3,7,8-tetrachlorodibenzofuran (TCDF) is proposed for the Sintering Segment only. EPA proposes to limit TRC to ensure that residual concentrations of chlorine are kept to a minimum to avoid effluent toxicity. Facilities would not need to meet the TRC limit if they certify to the permitting authority that they do not use alkaline chlorination in their wastewater treatment.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Tables 11-4 and 11-5. EPA believes that controlling the regulated pollutants will also control all the remaining POCs considered for regulation for this subcategory. Ammonia as nitrogen, phenol, and total cyanide are characteristic of blast furnace ironmaking wastewater and are key indicators of the performance of the alkaline chlorination process. Lead and zinc are the principal metals present in wastewater from this subcategory; controlling these metals will control of the remaining metal POCs considered for regulation, as well as fluoride, which is also treated by the model technology. Likewise, controlling total cyanide will also control the remaining cyanide compounds considered for regulation: amenable cyanide, thiocyanate, and WAD cyanide. 2,3,7,8-TCDF is the principal PCDD/PCDF present in sintering wastewater and will indicate control of the remaining PCDDs/PCDFs. EPA is not proposing to regulate pyridine, the remaining organic constituent, because the model treatment system is not designed to treat organics and because the total estimated industry treated effluent loading of pyridine is minimal (0.07 lb-equivalents/year).

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as TSS and O&G.

11.4 Integrated Steelmaking Subcategory

The regulated pollutants selected for the Integrated Steelmaking Subcategory apply to all three manufacturing processes included in this subcategory: basic oxygen furnace (BOF) steelmaking, vacuum degassing, and continuous casting. EPA proposes to regulate ladle metallurgy at zero discharge of pollutants. Table 11-6 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

BAT/NSPS

For this subcategory, EPA proposes establishing BAT and NSPS limitations for lead and zinc. These metals are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT and NSPS treatment system.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-7. EPA believes that controlling the regulated pollutants will control all the other metal POCs considered for regulation in this subcategory. EPA is not proposing to regulate ammonia as nitrogen, because the model treatment system is not designed to treat it and because the total estimated industry treated effluent loading of ammonia as nitrogen is minimal (85 lb-equivalents/year).

11.5 Integrated and Stand-Alone Hot Forming Subcategory

EPA selected regulated pollutants for both the Carbon and Alloy Steel and the Stainless Steel Segments of the Integrated and Stand-Alone Hot Forming Subcategory. Table 11-8 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

11.5.1 Carbon and Alloy Steel Segment

BAT

For this segment, EPA proposes BAT limitations for lead and zinc. These metals are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT and NSPS treatment systems.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-9. EPA believes that controlling the regulated parameters will also control all of the other metal POCs considered for regulation in this subcategory, as well as fluoride, which is also treated by the model technology. The model treatment system is not specifically designed to treat ammonia as nitrogen, but the total estimated industry effluent loading is minimal at 1,086 lb-equivalents/year.

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as TSS and O&G.

11.5.2 Stainless Steel Segment

BAT

For this segment, EPA proposes establishing BAT limitations for chromium and nickel, rather than lead and zinc, because of their prominence in stainless steel. These metals are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT and NSPS treatment systems.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-10. EPA believes that controlling the regulated pollutants will also control all other metal POCs considered for regulation in this subcategory, as well as fluoride, which is also treated by the model technology.

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as TSS and O&G.

11.6 Non-Integrated Steelmaking and Hot Forming Subcategory

EPA selected regulated pollutants for continuous casting and hot forming operations in both the Carbon and Alloy Steel and the Stainless Steel Segments of the Non-Integrated Steelmaking and Hot Forming Subcategory. EPA proposes to regulate electric arc furnace (EAF) steelmaking and ladle metallurgy manufacturing operations at zero discharge of pollutants. Table 11-11 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

11.6.1 Carbon and Alloy Steel Segment

BAT

For this segment, EPA proposes BAT limitations for lead and zinc. These pollutants are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT treatment system.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-12. EPA is not proposing to regulate ammonia as nitrogen, because the model treatment system is not designed to treat it and because the total estimated industry treated effluent loading of ammonia as nitrogen is minimal (179 lb-equivalents/year).

NSPS

EPA is proposing zero discharge of pollutants for NSPS.

11.6.2 Stainless Steel Segment

BAT

For this segment, EPA proposes BAT limitations for chromium and nickel, rather than lead and zinc, because of their prominence in stainless steel. These pollutants are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT treatment system.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-13. EPA believes that controlling the regulated pollutants will also control all other metal POCs considered for regulation in this subcategory, as well as fluoride, which is also treated by the model technology.

NSPS

EPA is proposing zero discharge of pollutants for NSPS.

11.7 Steel Finishing Subcategory

EPA selected regulated pollutants for both the Carbon and Alloy Steel and the Stainless Steel Segments of the Steel Finishing Subcategory. Table 11-14 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

11.7.1 Carbon and Alloy Steel Segment

BAT

For this segment, EPA established BAT limitations for hexavalent chromium, chromium, lead, and zinc. These metals are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT and NSPS treatment systems.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-15. EPA believes that controlling the regulated pollutants will also control all other metal POCs in this subcategory, as well as fluoride, which is also treated by the model technology. The model treatment system is not specifically designed to treat organics, but the only organic constituent considered for regulation, n-eicosane, was removed by 93 percent in the model treatment system and was never detected in the effluent of any carbon and alloy steel finishing treatment systems. The model treatment system also is not specifically designed to treat ammonia as nitrogen, but it removed ammonia by 24 percent and the total estimated industry effluent loading is minimal (813 lb-equivalents/year).

The 1982 regulation also limits naphthalene and tetrachloroethylene for cold forming wastewater; EPA does not propose regulating these parameters. EPA did not select either naphthalene or tetrachloroethylene as a POC for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory. As a result of the 1982 regulation, most cold forming facilities started using cold rolling lubricant formulations that did not contain these toxic organic constituents. Because EPA is not proposing to revise BPT for this subcategory, facilities continuing to use naphthalene and tetrachloroethylene in their cold forming solutions would still be subject to 1982 BPT limits (which are equivalent to 1982 BAT limits) on these pollutants.

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as TSS and O&G.

11.7.2 Stainless Steel Segment

BAT

For this segment, EPA established BAT limitations for hexavalent chromium, chromium, nickel, ammonia as nitrogen, and fluoride. These pollutants are key indicators of the performance of the solids removal and metals precipitation processes of the model BAT and NSPS treatment systems. Because ammonia as nitrogen is chiefly present only in wastewater from nitric acid pickling operations, ammonia as nitrogen is only regulated for acid pickling and other descaling operations and wet air pollution control devices associated with these operations.

The Agency selected the pollutants to regulate from the list of POCs considered for regulation, shown in Table 11-16. EPA believes that controlling regulated pollutants will also control all other POCs considered for regulation in this subcategory.

EPA is considering developing a limit for nitrate/nitrite for stainless steel finishing operations with combination acid pickling. EPA identified nitrate/nitrite as a POC for stainless steel acid pickling operations that use nitric acids and combinations of nitric and hydrofluoric acids to treat the surfaces of various grades of stainless steels. Nitrates originate from the nitric acids used in the process and are released from three sources: waste or spent pickling acids, pickle rinse waters, and acid pickling fume scrubbers. Some stainless steel finishing facilities dispose of their nitrate-bearing wastewater via off-site hauling. Many other stainless steel finishing facilities treat spent nitric acid and nitric/hydrofluoric acid pickle liquors on site with the pickling rinse waters and fume scrubber waters from other stainless steel finishing operations. Nitrates are soluble in water and, thus, are not removed to any appreciable degree in the metals precipitation systems used to treat chromium and nickel in stainless steel finishing wastewater.

EPA collected information from mills with stainless steel finishing operations with on-site chemical precipitation treatment of spent nitric and nitric/hydrofluoric acids in combination with pickle rinse waters and acid pickling fume scrubber blowdown. The treated effluent nitrate concentrations from these mills ranged from about 500 mg/L to more than 1,000 mg/L.

Several stainless steel acid pickling lines use acid purification systems to recover and reuse nitric and nitric/hydrofluoric acids. This technology removes dissolved metals (iron, chromium, nickel) from a side stream of the strong acid pickling solution and returns the purified acid to the acid pickling bath. This essentially extends the life of the pickling acids, thereby reducing the consumption of virgin nitric acid. A reject stream containing dilute acid and the dissolved metals is periodically sent to wastewater treatment.

The model BAT technology for stainless steel finishing operations includes acid purification units for recovery and reuse of spent nitric and nitric/hydrofluoric acid pickling solutions. EPA believes facilities using acid purification technology can achieve long-term average concentrations of nitrates in the treated stainless steel acid pickling wastewater effluent in the range of 200 mg/L to 300 mg/L.

The 1982 regulation also limits naphthalene and tetrachloroethylene for cold forming wastewater and total cyanide for salt bath descaling operations; EPA does not propose regulating these parameters. EPA did not select tetrachloroethylene as a POC for this segment; EPA did select naphthalene as a POC for this segment, but did not consider it for regulation because it was not detected in the influent of the model treatment facilities (naphthalene was also not detected in the effluent of any facility in this segment). As a result of the 1982 regulation, most cold forming facilities started using cold rolling lubricant formulations that did not contain these toxic organic constituents. EPA also does not propose regulating total cyanide because, as a result of the 1982 regulation, many facilities changed their descaling solutions or started using new descaling processes such as electrolytic sodium sulfate descaling. Because EPA is not

proposing to revise BPT for this subcategory, facilities continuing to use cyanide in their reducing salt bath descaling operations or naphthalene and tetrachloroethylene in their cold forming solutions would still be subject to 1982 BPT limits (which are equivalent to 1982 BAT limits) on these pollutants.

NSPS

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA proposes to regulate the same pollutants as for BAT, as well as TSS and O&G.

11.8 Other Operations Subcategory

EPA selected regulated pollutants for the Direct Reduced Ironmaking and the Forging Segments of the Other Operations Subcategory. The Briquetting Segment is proposed to be regulated at zero discharge of pollutants. Table 11-17 presents the list of pollutants proposed for regulation for the Other Operations Subcategory. The rationale for the selection of regulated pollutants for direct dischargers under this subcategory is presented below.

11.8.1 Direct Reduced Ironmaking Segment

BPT/BCT/NSPS

The Agency proposes to regulate TSS for the Direct Reduced Ironmaking Segment. This pollutant is a key indicator of the performance of the solids removal and filtration processes of the model treatment systems.

The Agency selected TSS to regulate from the list of POCs considered for regulation, shown in Table 11-18. EPA believes that controlling TSS will also incidentally control all other POCs considered for regulation in this segment.

11.8.2 Forging Segment

BPT/BCT/NSPS

The Agency proposes to regulate TSS and O&G for the Forging Segment. EPA is not proposing BAT limitations for this segment because it identified no priority or nonconventional POCs for the segment.

11.9 Regulated Pollutant Selection Methodology for Indirect Dischargers

Unlike direct dischargers whose wastewater receives no further treatment once it leaves the facility, indirect dischargers send their wastewater to publicly owned treatment works (POTWs) for further treatment. However, POTWs typically install secondary biological

treatment systems which are designed to control conventional pollutants (biochemical oxygen demand (BOD_5), TSS, O&G, pH, and fecal coliform), the principal parameters in domestic sewage. Except for nutrient control for ammonia and phosphorus, POTWs usually do not install (advanced or tertiary treatment) technology to control priority and nonconventional pollutants, although secondary biological treatment systems may achieve significant removals for some priority pollutants. Instead, the Clean Water Act envisions that, implementation of pretreatment programs and industrial compliance with categorical pretreatment standards, will adequately control priority and nonconventional pollutants in municipal effluents.

Therefore, for indirect dischargers, before establishing national technology-based pretreatment standards, EPA examines whether the pollutants discharged by the industry "pass through" POTWs to waters of the United States or interfere with POTW operations or sludge disposal practices. Generally, to determine if pollutants pass through POTWs, EPA compares the percentage of the pollutant removed by well-operated POTWs achieving secondary treatment with the percentage of the pollutant removed by facilities meeting the proposed BAT effluent limitations. A pollutant is determined to "pass through" POTWs when the median percentage removed by well-operated POTWs is less than the median percentage removed by direct dischargers complying with BAT effluent limitations. In this manner, EPA can ensure that the combined treatment at indirect dischargers and POTWs is at least equivalent to treatment by direct dischargers.

For specific pollutants, such as volatile organic compounds, EPA may use other means to determine pass-through. These evaluations may include chemical and physical properties (e.g., Henry's Law constants, octanol/water partition coefficients, and water solubility constants) and empirical data to estimate amounts of volatilization, biodegradation, and/or partitioning to the residue solids phase.

This approach to the definition of pass-through satisfies two competing objectives set by Congress: (1) that standards for indirect dischargers be equivalent to standards for direct dischargers, and (2) that the treatment capability and performance of POTWs be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by POTWs with the mass or concentration of pollutants discharged by BAT facilities, EPA compares the percentage of the pollutants removed by BAT facilities to the POTW removals. EPA takes this approach because comparing the mass or concentration of pollutants in POTW effluents with pollutants in BAT facility effluents would not take into account the mass of pollutants discharged to the POTW from other industrial and nonindustrial sources, nor the dilution of the pollutants in the POTW effluent to lower concentrations from the addition of large amounts of other industrial and nonindustrial water.

In selecting the regulated pollutants under the pretreatment standards, EPA starts with the priority and nonconventional pollutants regulated for direct dischargers under BAT for each subcategory and submits those pollutants to the pass-through test. Those pollutants that EPA determines pass through POTWs are the pollutants it proposes to regulate. The following

subsections describe the methodology used in determining median percent removals for "well-operated" POTWs and the median percent removals for the BAT technologies. Sections 11.10 through 11.16 present the results of the POTW pass-through analysis for each subcategory, along with discussions of regulated pollutant selection for PSES and PSNS.

11.9.1 POTW Pass-Through Methodology

The following subsections describe the methodology used in determining median percent removals for "well-operated" POTWs and the proposed BAT technologies and the methodology used for the volatile override test of the pass-through analysis.

Determination of Percent Removals for Well-Operated POTWs

The following explains the methodology used to estimate percent removals for well-operated POTWs for the proposed Iron and Steel rule. EPA is considering revising its determination of percent removals for "well-operated" POTWs. Interested parties should consult Appendix B and provide comment.

For the proposed Iron and Steel rule, EPA used its traditional methodology to determine POTW performance (percent removal) for priority and nonconventional pollutants. POTW performance is a component of the pass-through methodology used to identify the pollutants to be regulated for PSES and PSNS. It is also a component of the analysis to determine net pollutant reductions (for both total pounds and toxic pound-equivalents) for various indirect discharge technology options (see Section 10). However, as discussed in more detail in Appendices B and C, EPA is considering revising its traditional methodology for determining POTW performance (percent removals) for priority and nonconventional pollutants.

The primary source of the POTW percent removal data is the Fate of Priority Pollutants in Publicly Owned Treatment Works (Reference 11-1), commonly referred to as the "50-POTW Study." However, the 50-POTW Study did not contain data for all pollutants for which the pass-through analysis was required. Therefore, EPA obtained additional data from EPA's National Risk Management Research Laboratory (NRMRL)'s Treatability Database (formerly called the Risk Reduction Engineering Laboratory (RREL) Treatability Database), as well as data from POTWs that accept iron and steel plant wastewater. EPA used data from the latter source only if no data were available from the 50-POTW Study or the NRMRL database. These sources and their uses are discussed below.

The 50-POTW Study presents data on the performance of 50 well-operated POTWs that use secondary biological treatment in removing pollutants. At the time of the 50-POTW sampling program, which spanned approximately 2.5 years (July 1978 to November 1980), EPA collected samples at selected POTWs across the United States. At most of these POTWs, EPA collected a minimum of 6 days of 24-hour composite influent and effluent wastewater samples. EPA analyzed each sample for the conventional pollutants (excluding fecal coliform), selected nonconventional pollutants, and 126 priority pollutants. The conventional

pollutants, listed at 40 CFR 401.16, are BOD_5, TSS, O&G, pH, and fecal coliform. The selected nonconventional pollutants included COD, TOC, total phenols, ammonia as nitrogen, iron, aluminum, and magnesium, among others. The priority pollutants consist of the 126 compounds (listed in Appendix A of 40 CFR Part 423) that are a subset of the 65 priority pollutants and classes of pollutants referred to in Section 307(a) of the Clean Water Act and listed at 40 CFR 401.15. A total of 102 of the 126 priority pollutants were detected at least once in POTW influents (Reference 11-1).

Each laboratory reported results for the pollutants that it tested. If the laboratory found a pollutant to be present, the laboratory reported a result. If the laboratory found the pollutant not to be present, the laboratory reported either that the pollutant was "not detected' or a value with a "less than" sign (<) indicating that the pollutant was below that value. The value reported along with the "less than" sign was the lowest level to which the laboratory believed it could reliably measure. EPA subsequently established these lowest levels as the minimum levels of quantitation (MLs). In some instances, different laboratories reported different MLs for the same pollutant using the same analytical method.

Because of the variety of reporting protocols among the 50-POTW Study laboratories (Reference 11-1), EPA reviewed the percent removal calculations used in the pass-through analysis for previous industry studies, including those performed when developing the effluent limitations guidelines and standards for Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF), Commercial Hazardous Waste Combustors, and Centralized Waste Treatment (CWT) industries. EPA found that, for 12 parameters, different analytical MLs were reported for different rulemaking studies (nine of the metals, cyanide, and one of the organics). To provide consistency for data analysis and establishment of removal efficiencies, EPA reviewed the 50-POTW Study and standardized the reported MLs for use in the CWT final rule and other rulemaking efforts.

In using the 50-POTW Study data to estimate percent removals, EPA established data-editing criteria for determining pollutant percent removals. As noted in the 50-POTW Study, analytical laboratories reported pollutant concentrations below the ML qualitatively, as "not detected" or "trace," and reported a measured value above this level (Reference 11-1). Subsequent rulemaking studies such as the 1987 OCPSF study used the analytical method ML established in 40 CFR Part 136 for laboratory data reported below the analytical ML. Using the ML may overestimate the effluent concentration and underestimate the percent removal. (If the actual effluent concentration is less than the minimum level, then the calculated percent removal based on the actual value would be higher.) Because the data collected for evaluating POTW percent removals included both effluent and influent levels that were close to the analytical ML, EPA devised hierarchial data-editing criteria to exclude data with low influent concentration levels, thereby minimizing the possibility that low POTW removals might simply reflect low influent concentrations instead of being a true measure of treatment effectiveness.

EPA used hierarchic data-editing criteria for the pollutants in the 50-POTW Study. For the proposed Iron and Steel rule, the data-editing criteria included the following:

- Both influent and effluent data on a given date were deleted if either datum has a notation of analytical interference;
- The standardized pollutant-specific analytical ML was substituted for values reported as "not detected," "trace," "less than (followed by a number)," or a number less than the standardized analytical ML;
- Detected pollutants had to have at least three pairs (influent/effluent) of data points to be included;
- The average pollutant influent level had to be greater than or equal to 10 times the pollutant minimum level (10 × ML); and
- If none of the average pollutant influent concentrations were at least 10 times the minimum level, then data with average influent values greater than twice the minimum level (2 × ML) or greater than or equal to 20 µg/L were included, along with the corresponding average effluent values.

EPA then calculated each POTW percent removal for each pollutant based on its average influent and effluent values. The national POTW percent removal used for each pollutant in the pass-through test is the median value of all the POTW pollutant-specific percent removals.

The rationale for retaining POTW data using the "10 times the pollutant minimum level" editing criterion was based on the BAT organic pollutant treatment performance editing criteria initially developed for the 1987 OCPSF regulation (40 CFR Part 414; 52 FR 42522 at 42545 to 48). BAT treatment system designs in the OCPSF industry typically removed at least 90 percent of toxic pollutants. Since most of the OCPSF effluent data from BAT biological treatment systems had values of "not detected,"[1] the average influent concentration for a compound had to be at least 10 times the analytical ML for the difference to be meaningful (demonstration of at least 90 percent removal) and qualify effluent concentrations for calculation of effluent limits (Reference 11-2).

EPA also used data from the NRMRL Treatability Database (Reference 11-3) to augment the POTW database for the pollutants that the 50-POTW Study did not cover. This database provides information, by pollutant, on removals obtained by various treatment technologies. The database provides the specific data source and the industry from which the wastewater was generated. For each POC that EPA considered for the proposed rule not found in the 50-POTW Study database, EPA used data from the NRMRL database, using only treatment technologies representative of typical POTW secondary treatment operations (i.e.,

[1] Of the 57 regulated organic pollutants, limits for 34 (60 percent) were based on long-term averages (LTAs) of "not detected" or the analytical minimum level (Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category – the OCPSF DD, Vol. I. EPA 440/1-87/009, October 1987, pages VII-208 to VII-210).

activated sludge, activated sludge with filtration, and aerated lagoons). EPA further edited these files to include information pertaining only to domestic or industrial wastewater. EPA used pilot-scale and full-scale data only, and eliminated bench-scale data and data from less reliable references. Zero and negative percent removals were eliminated, as well as data with less than two pairs of influent/effluent data points. Finally, EPA calculated the average percent removal for each pollutant from the remaining pollutant removal data.

EPA used one additional source to determine POTW percent removals: data collected from POTWs receiving wastewater from iron and steel sites. The Agency used these data for determining the POTW percent removal for TKN and WAD cyanide. The following table presents the data for these pollutants.

1997 POTW Data for TKN and WAD Cyanide Removals

POTW	Influent (mg/L)	Effluent (mg/L)	Percent Removal
TKN			
Middletown, OH POTW	24.6	4.3	83%
City of Warren, OH POTW	17.4	1.8	89%
Greater Chicago, IL POTW (Calumet)	23.7	0.63	97%
Average (TKN)			**90%**
WAD Cyanide			
City of Warren, OH POTW	0.16	0.009	93%
Average (WAD Cyanide)			**93%**

In addition to the sources listed above, EPA transferred some POTW percent removals from another pollutant. Table 10-2 in Section 10 lists which pollutants received a transferred POTW percent removal and from which surrogate pollutant.

EPA selected the final percent removal for each pollutant based on data hierarchy, which was related to the quality of the data source. The Agency used the following hierarchy to select a POTW percent removal for a pollutant:

- The median percent removal from the 50-POTW Study was chosen using all POTW data with influent levels greater than or equal to 10 times the pollutant minimum analytical detection limit;
- The median percent removal from the 50-POTW Study was chosen using all POTW data with influent levels greater than two times the pollutant minimum analytical detection limit or 2 µg/L;

- The average percent removal from the NRMRL Treatability Database was chosen using only domestic wastewater;
- The average percent removal from the NRMRL Treatability Database was chosen using domestic and industrial wastewater;
- The average percent removal from POTWs receiving iron and steel industry wastewater was chosen; and
- The pollutant was assigned an average group percent removal, "generic" percent removal, or surrogate pollutant percent removal.

The CWT rule developed pollutant groups by combining pollutants with similar chemical structures. EPA calculated the average group percent removal by using all pollutants in the group with selected percent removals from either the 50-POTW Study or the NRMRL Treatability Database. EPA then averaged percent removals together to determine the average group percent removal. Chapter 7 of the U.S. EPA Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry (Volume I) (Reference 11-4) presents pollutant groups and generic removals used in the pass-through analysis.

Table 10-2 in Section 10 presents the final POTW percent removal assigned to each pollutant. Table 11-19 presents the POTW percent removals for pollutants proposed for regulation at BAT, along with the source and data hierarchy of each removal.

Methodology for Determining Treatment Technology (BAT) Percent Removals

EPA calculated treatment percent removals for each selected BAT option using the data used to determine the option LTAs and variability factors. Therefore, the data used to calculate treatment option percent removals was subjected to the same data-editing criteria as the data used in calculating LTAs and variability factors (described in Section 12). This editing included excluding the influent and effluent data for pollutants that were not detected in the influent at treatable levels, excluding data for pollutants that were not treated by the technology, and excluding data that were associated with process upsets.

EPA used the influent and effluent concentrations (paired data) at sites incorporating BAT to calculate the percent removal, if available. If there were multiple BAT sites with pollutant data, EPA calculated a percent removal for each site and used the median percent removal for the pass-through analysis. For the Cokemaking (ammonia as nitrogen and total cyanide only), Ironmaking (ammonia as nitrogen, lead, total cyanide, and zinc only), and Non-Integrated Steelmaking and Hot Forming (Carbon and Alloy Segment) Subcategories, influent data were not available for BAT sites and the average influent concentration was calculated using EPA's iron and steel sampling data.

After editing the data, EPA used the following methodology to calculate percent removals:

1. For each pollutant and each BAT facility (or sampled facility), EPA averaged the influent and effluent data to give an average influent concentration and an average effluent concentration.

2. EPA calculated percent removals for each pollutant and each BAT facility (or sampled facility) from the average influent and average effluent concentrations using the following equation:

$$\text{Percent Removal} = \frac{C_i(\text{avg}) - C_e(\text{avg})}{C_i(\text{avg})} \times 100 \qquad (11\text{-}1)$$

where:

$C_i(\text{avg})$ = Average influent concentration, mg/L
$C_e(\text{avg})$ = Average effluent concentration, mg/L.

EPA used the above equation for all pollutants and subcategories, except for benzo(a)pyrene, mercury, naphthalene, phenol, selenium, and thiocyanate for the Cokemaking Subcategory. The Agency calculated percent removals for these pollutants using paired data from the cokemaking BAT site, where control water is added to the treatment system resulting in dilution of the influent. To ensure that the calculated BAT percent removal was actual treatment, rather than dilution, EPA performed a mass loadings analysis and calculated the percent removal using the following equation:

$$\text{Percent Removal} = \frac{[C_i \times F_i]_{avg} - [C_e \times F_e]_{avg}}{[C_i \times F_i]_{avg}} \times 100 \qquad (11\text{-}2)$$

where:

C_i = Influent concentration
F_i = Influent flow rate
C_e = Effluent concentration
F_e = Effluent flow rate.

3. EPA calculated the BAT median percent removal for each pollutant for each selected BAT option from the facility-specific percent removals.

Volatile Override for Cokemaking

EPA applies the volatile override test when the overall percent removal estimated for well-operated POTWs is substantially caused by emission of the pollutant to the air rather than by actual treatment. Therefore, even though the POTW percent removal data indicate that volatile pollutants would not pass through, regulation of these pollutants is warranted to ensure their "treatment."

The EPA-selected technology option for the Cokemaking Subcategory is designed to control the emission of volatile pollutants. As such, for the proposed rulemaking, EPA believes the volatile override test is appropriate and has determined pass-through for the Cokemaking Subcategory by comparing percent removals and Henry's Law Constants.

The selected BAT technology option for the Cokemaking Subcategory is the only option designed to treat volatile pollutants; therefore, it is the only subcategory for which the volatile override test is applicable. Because this analysis applies only to pollutants that potentially volatilize and do not pass through based on percent removal comparison, it applies only to benzo(a)pyrene. For this analysis, EPA considered pollutants with a Henry's Law Constant greater than 10^{-4} atm·m^3/mol to pass through POTWs based on the volatile override.

11.10 Cokemaking Subcategory

EPA selected proposed regulated pollutants for only the By-Product Recovery Cokemaking Segment of the Cokemaking Subcategory; EPA proposes zero discharge of pollutants from the Non-Recovery Segment. Table 11-1 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

PSES/PSNS

Of the nine pollutants selected for regulation at BAT, EPA evaluated eight of these for pass-through. The only pollutant regulated at BAT but not evaluated for pass-through was total residual chlorine (TRC). TRC is not characteristic of cokemaking wastewater, but indicates post-alkaline-chlorination residual chlorine concentration. EPA did not evaluate TRC for pass-through because the selected PSES option does not include alkaline chlorination. Table 11-20 presents pass-through results for the Cokemaking Subcategory.

Of the eight pollutants evaluated, six were found to pass through:

- Nonconventionals - Ammonia as nitrogen, thiocyanate, and total cyanide;
- Priority organic constituents - Naphthalene and phenol; and
- Priority metal - selenium.

Therefore, EPA proposes to regulate these six parameters for PSES and PSNS. EPA notes that ammonia as nitrogen is a key indicator of the performance of the PSES and PSNS treatment systems because it reflects the performance of the ammonia stills, which not only control ammonia as nitrogen, but also acid gases (hydrogen cyanide, hydrogen sulfide) and volatile organic pollutants (benzene, toluene, xylenes). Some portions of these gases would otherwise be emitted to the air in coke plant and municipal sewer systems and in biological processes at POTWs.

11.11 Ironmaking Subcategory

EPA selected regulated pollutants for both the Blast Furnace and the Sintering Segments of the Ironmaking Subcategory. Table 11-3 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

PSES/PSNS

Of the seven pollutants selected for regulation at BAT, EPA evaluated six of these for pass through. The only pollutant regulated at BAT, but not evaluated for pass-through, was TRC. TRC is not characteristic of ironmaking wastewater, but is an indicator of post-alkaline-chlorination residual chlorine concentration. Since the selected PSES option for ironmaking does not contain alkaline chlorination, TRC will not be regulated. Table 11-21 presents pass-through results for the ironmaking subcategory.

Of the six pollutants evaluated, four were found to pass through. Listed below are the pollutants found to pass through for the Ironmaking Subcategory:

- Nonconventional - Ammonia as nitrogen;
- Nonconventional organic constituent - 2,3,7,8-TCDF; and
- Priority metals - Lead and zinc.

EPA proposes to regulate these parameters for PSES and PSNS (2,3,7,8-TCDF for the Sintering Segment only).

11.12 Integrated Steelmaking Subcategory

The regulated pollutants selected for the Integrated Steelmaking Subcategory apply to all three manufacturing processes included in this subcategory: basic oxygen furnace (BOF) steelmaking, vacuum degassing, and continuous casting. EPA proposes to regulate ladle metallurgy at zero discharge of pollutants. Table 11-6 lists pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

PSES/PSNS

Two pollutants were selected for regulation at BAT: lead and zinc. Both were found to pass through POTWs. Table 11-22 presents the pass-through results for the Integrated Steelmaking Subcategory.

EPA proposes to regulate lead and zinc at PSES and PSNS.

11.13 Integrated and Stand-Alone Hot Forming Subcategory

EPA selected regulated pollutants for both the Carbon and Alloy Steel and the Stainless Steel Segments of the Integrated and Stand-Alone Hot Forming Subcategory. Table 11-8 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

11.13.1 Carbon and Alloy Steel Segment

PSES

Two pollutants were selected for regulation at BAT for the Carbon and Alloy Steel Segment: lead and zinc. Neither pollutant was found to pass through POTWs. Table 11-23 presents the pass-through results for the Integrated and Stand-Alone Hot Forming Subcategory.

EPA proposes not to revise PSES for this segment. The Agency believes that pretreatment local limits implemented on a case-by-case basis can more appropriately address any individual toxic parameters present at these facilities. The Agency also does not believe that it is practicable for a direct discharging facility covered by this segment to become an indirect discharging facility because its flows would be too large for a POTW to handle.

PSNS

EPA does not propose to revise PSNS for this segment because EPA does not foresee the construction of any new indirect discharging facilities that would be subject to this segment.

11.13.2 Stainless Steel Segment

PSES/PSNS

Two pollutants were selected for regulation at BAT for the Stainless Steel Segment: chromium and nickel. Both pollutants were found to pass through POTWs. Table 11-23 presents pass-through results for the Integrated and Stand-Alone Hot Forming Subcategory.

EPA proposes not to revise PSES or PSNS for this segment. The Agency believes that pretreatment local limits implemented on a case-by-case basis can more appropriately address any individual toxic parameters present at these facilities. The Agency also does not believe that it is practicable for a direct discharging facility covered by this segment to become an indirect discharging facility because its flows would be too large for a POTW to handle.

11.14 Non-Integrated Steelmaking and Hot Forming Subcategory

EPA selected regulated pollutants for continuous casting and hot forming operations in both the Carbon and Alloy Steel and the Stainless Steel Segments of the Non-Integrated Steelmaking and Hot Forming Subcategory. EPA proposes to regulate EAF steelmaking and ladle metallurgy manufacturing operations at zero discharge of pollutants. Table 11-11 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

11.14.1 Carbon and Alloy Steel Segment

PSES

Two pollutants were selected for regulation at BAT for the Carbon and Alloy Segment: lead and zinc. Neither pollutant was found to pass through POTWs. Table 11-24 presents pass-through results for the Non-Integrated Steelmaking and Hot Forming Subcategory.

EPA does not propose to revise PSES for this segment.

PSNS

EPA is proposing zero discharge of process wastewater for PSNS.

11.14.2 Stainless Steel Segment

PSES

Two pollutants were selected for regulation at BAT for the stainless segment: chromium and nickel. Both pollutants were found to pass through POTWs. Table 11-24 presents pass-through results for the Non-Integrated Steelmaking and Hot Forming Subcategory.

EPA proposes to regulate chromium and nickel at PSES.

PSNS

EPA is proposing zero discharge of process wastewater for PSNS.

11.15 Steel Finishing Subcategory

EPA selected regulated pollutants for both the Carbon and Alloy Steel and the Stainless Steel Segments of the Steel Finishing Subcategory. Table 11-14 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

11.15.1 Carbon and Alloy Steel Segment

PSES

Four pollutants were selected for regulation at BAT for the carbon and alloy segment. Of the four, chromium, hexavalent chromium, and zinc were found to pass through POTWs. Table 11-25 presents pass-through results for the Steel Finishing Subcategory.

EPA does not propose to revise PSES for this segment; the PSES limits currently in 40 CFR Part 420 for each manufacturing process except electroplating would continue to apply under this proposal. Limits for the electroplating manufacturing process are currently included in 40 CFR Part 433. The PSES limits in 40 CFR Part 433 are concentration-based, as opposed to those in 40 CFR Part 420, which are mass-based. To ensure a consistent basis for facilities operating other operations in addition to electroplating, EPA is proposing to convert the existing 40 CFR Part 433 PSES concentration-based limits to mass-based limits by multiplying by the proposed BAT production-normalized flow rate and the appropriate conversion factor. Nine pollutants are regulated under PSES at 40 CFR Part 433, some of which do not apply to electroplating operations as performed in the iron and steel industry. EPA proposes to specify PSES limits for four of the pollutants: chromium, lead, nickel, and zinc. EPA identified these four metals as POCs for electroplating manufacturing operations (see Section 7). EPA does not believe this action will result in incremental cost increases to the industry.

PSNS

EPA is proposing to regulate the same pollutants as for BAT.

11.15.2 Stainless Steel Segment

PSES

Five pollutants were selected for regulation at BAT for the stainless segment. Of the five, fluoride, chromium, hexavalent chromium, and nickel were found to pass through. Table 11-25 presents pass-through results for the Steel Finishing Subcategory.

EPA does not propose to revise PSES for this segment.

PSNS

EPA is proposing to regulate the same pollutants as for BAT.

11.16 Other Operations Subcategory

EPA selected regulated pollutants for the Direct Reduced Ironmaking and the Forging Segments of the Other Operations Subcategory. EPA proposes to regulate the Briquetting Segment at zero discharge of pollutants. Table 11-17 lists the pollutants proposed for regulation for this subcategory. The rationale for the selection of regulated pollutants for indirect dischargers under this subcategory is presented below.

11.16.1 Direct Reduced Ironmaking Segment

PSES/PSNS

For the Direct Reduced Ironmaking Segment, no pollutants were selected for regulation at BAT and only conventional pollutants were selected for BPT; therefore, EPA did not perform a pass-through analysis for this segment. The Agency reserves PSES/PSNS for the Direct Reduced Ironmaking Segment.

11.16.2 Forging Segment

PSES/PSNS

For the Forging Segment, no pollutants were selected for regulation at BAT and only conventional pollutants were selected for BPT; therefore, EPA did not perform a pass-through analysis for this segment. The Agency reserves PSES/PSNS for the Forging Segment.

11.17 References

11-1. U.S. Environmental Protection Agency. Fate of Priority Pollutants in Publicly Owned Treatment Works. EPA 440/1-82/303. Washington, D.C., September 1982.

11-2. U.S. Environmental Protection Agency. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category (Volume 1). EPA-440/1-87/009. Washington, D.C., October 1987.

11-3. U.S. Environmental Protection Agency. National Risk Management Research Laboratory (NRMRL) Treatability Database Version 5.0. Cincinnati, OH, 1994.

11-4. U.S. Environmental Protection Agency. Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry (Volume I). EPA-821-R-98-020. Washington, D.C., December 1998.

Table 11-1

Proposed Regulated Pollutants for the Cokemaking Subcategory

Pollutant	BAT	PSES	NSPS	PSNS
Total suspended solids (TSS)			✔	
Oil and grease (O&G)			✔	
Ammonia as nitrogen	✔	✔	✔	✔
Total cyanide	✔	✔	✔	✔
Thiocyanate	✔	✔	✔	✔
Mercury	✔		✔	
Selenium	✔	✔	✔	✔
Benzo(a)pyrene	✔		✔	
Naphthalene	✔	✔	✔	✔
Phenol	✔	✔	✔	✔
Total residual chlorine (TRC)	✔		✔	

Notes: EPA is proposing zero discharge of pollutants for the Non-Recovery Cokemaking Segment of this subcategory, and is not proposing to revise BPT or BCT for this subcategory.

Table 11-2

Pollutants Considered for Regulation for Direct Dischargers Cokemaking Subcategory - By-Product Recovery Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Biochemical oxygen demand 5-day (BOD_5)						✔
	Biochemical oxygen demand 5-day (BOD_5) - carbonaceous						✔
	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Amenable cyanide						✔
	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Nitrate/nitrite	✔				✔	
	Total petroleum hydrocarbons (TPH)	✔					
	Thiocyanate						✔
	Total Kjeldahl nitrogen (TKN)	✔					
	Total organic carbon (TOC)	✔					
	Total phenols	✔					
	Weak acid dissociable (WAD) cyanide						✔
Priority metals	Arsenic						✔
	Mercury						✔
	Selenium						✔
Nonconventional metals	Boron			✔	✔		

Table 11-2 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Priority organic constituents	Acenaphthene						✔
	Acenaphthylene						✔
	Anthracene						✔
	Benzidine				✔		
	Benzo(a)anthracene						✔
	Benzo(b)fluoranthene						✔
	Benzo(k)fluoranthene				✔		
	Benzo(ghi)perylene				✔		
	Benzo(a)pyrene						✔
	Chrysene						✔
	2,4-Dimethylphenol						✔
	Fluoranthene						✔
	Fluorene						✔
	Indeno(1,2,3-cd)pyrene				✔		
	Naphthalene		✔				✔*
	Phenanthrene		✔				
	Phenol						✔
	Pyrene						✔
	Benzene		✔				
	1,2-Dichloroethane		✔		✔		
	Ethylbenzene		✔				
	Toluene		✔				

Table 11-2 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional organic constituents	Aniline		✔				
	2,3-Benzofluorene		✔		✔		
	Biphenyl		✔				
	Carbazole						✔
	o-Cresol						✔
	p-Cresol						✔
	Dibenzofuran		✔				
	Dibenzothiophene		✔				
	n-Eicosane		✔		✔		
	n-Hexadecane		✔		✔		
	4,5-Methylene phenanthrene						✔
	2-Methylnaphthalene		✔				
	1-Methylphenanthrene		✔		✔		
	1-Naphthylamine				✔		
	beta-Naphthylamine						✔
	n-Octadecane		✔		✔		
	Perylene				✔		
	2-Phenylnaphthalene		✔				
	2-Picoline						✔
	Pyridine						✔
	Styrene		✔				
	Thianaphthene						✔

Table 11-2 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional organic constituents (continued)	o-Toluidine						✔
	2-Propanone						✔
	Carbon disulfide		✔				
	2-Butanone						✔
	m-Xylene		✔				
	m- + p-Xylene		✔				
	o-Xylene		✔				
	o- + p-Xylene		✔				
Other priority pollutant	Total cyanide						✔

Note: EPA will consider naphthalene for regulation for this segment because it is semi-volatile and an important indicator of biological treatment effectiveness.

Table 11-3

Proposed Regulated Pollutants for the Ironmaking Subcategory

Pollutant	BAT	PSES	NSPS	PSNS
Total suspended solids (TSS)			✔	
Oil and grease (O&G)			✔	
Ammonia as nitrogen	✔	✔	✔	✔
Total cyanide	✔		✔	
Lead	✔	✔	✔	✔
Zinc	✔	✔	✔	✔
Phenol	✔		✔	
2,3,7,8-TCDF (Sintering Segment only)	✔	✔	✔	✔
Total residual chlorine (TRC)	✔		✔	

Note: EPA is not proposing to revise BPT or BCT for this subcategory.

Table 11-4

Pollutants Considered for Regulation for Direct Dischargers
Ironmaking Subcategory - Sintering Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Amenable cyanide						✔
	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Nitrate/Nitrite	✔					
	Total petroleum hydrocarbons (TPH)	✔					
	Thiocyanate						✔
	Total Kjeldahl nitrogen (TKN)	✔				✔	
	Total organic carbon (TOC)	✔					
	Total phenols	✔			✔		
	Weak acid dissociable (WAD) cyanide						✔
Priority metals	Arsenic				✔		
	Cadmium						✔
	Chromium				✔		
	Copper				✔		
	Lead						✔

Table 11-4 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Priority metals (continued)	Mercury				✔		
	Selenium				✔		
	Silver				✔		
	Thallium						✔
	Zinc						✔
Nonconventional metals	Aluminum			✔			
	Boron			✔	✔		
	Iron			✔			
	Magnesium			✔			
	Manganese			✔			
	Titanium				✔		
Priority organic constituents	Benzo(a)anthracene				✔		
	Benzo(b)fluoranthene				✔		
	Benzo(k)fluoranthene				✔		
	Benzo(a)pyrene				✔		
	Chrysene				✔		
	2,4-Dimethylphenol				✔		
	Fluoranthene				✔		
	4-Nitrophenol						✔
	Phenanthrene		✔		✔		
	Phenol						✔
	Pyrene				✔		

Table 11-4 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional organic constituents	n-Tetracosane				✔		
	n-Docosane		✔		✔		
	n-Eicosane		✔		✔		
	n-Hexadecane		✔		✔		
	n-Octadecane				✔		
	o-Cresol				✔		
	p-Cresol				✔		
	Pyridine						✔
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin				✔		
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin				✔		
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin				✔		
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin				✔		
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin				✔		
	Octachlorodibenzo-p-dioxin				✔		
	2,3,7,8-Tetrachlorodibenzofuran						✔
	1,2,3,7,8-Pentachlorodibenzofuran				✔		
	2,3,4,7,8-Pentachlorodibenzofuran				✔		
	1,2,3,4,7,8-Hexachlorodibenzofuran				✔		
	1,2,3,6,7,8-Hexachlorodibenzofuran				✔		

Table 11-4 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional organic constituents (continued)	1,2,3,7,8,9-Hexachlorodibenzofuran				✔		
	2,3,4,6,7,8-Hexachlorodibenzofuran				✔		
	1,2,3,4,6,7,8-Heptachlorodibenzofuran				✔		
	1,2,3,4,7,8,9-Heptachlorodibenzofuran				✔		
	Octachlorodibenzofuran				✔		
Other priority pollutant	Total cyanide						✔

Table 11-5

Pollutants Considered for Regulation for Direct Dischargers
Ironmaking Subcategory - Blast Furnace Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Amenable cyanide						✔
	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Nitrate/Nitrite	✔				✔	
	Total petroleum hydrocarbons (TPH)	✔					
	Thiocyanate						✔
	Total Kjeldahl nitrogen (TKN)	✔					
	Total organic carbon (TOC)	✔			✔		
	Weak acid dissociable (WAD) cyanide						✔
Priority metals	Chromium				✔		
	Copper				✔		
	Lead						✔
	Nickel				✔		
	Selenium				✔		
	Zinc						✔

Table 11-5 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional metals	Aluminum			✔			
	Boron			✔	✔		
	Iron			✔			
	Magnesium			✔	✔		
	Manganese			✔			
	Molybdenum						✔
	Titanium						✔
Nonconventional organic constituent	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin				✔		
Other priority pollutant	Total cyanide						✔

Table 11-6

Proposed Regulated Pollutants for the Integrated Steelmaking Subcategory

Pollutant	BAT	PSES	NSPS	PSNS
Lead	✔	✔	✔	✔
Zinc	✔	✔	✔	✔

Note: EPA is not proposing to revise BPT or BCT for this subcategory.

Table 11-7

Pollutants Considered for Regulation for Direct Dischargers Integrated Steelmaking Subcategory

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride					✔	
	Nitrate/nitrite	✔					
	Total petroleum hydrocarbons (TPH)	✔					
	Total organic carbon (TOC)	✔					
Priority metals	Antimony						✔
	Beryllium				✔		
	Cadmium						✔
	Chromium						✔
	Copper						✔
	Lead						✔
	Mercury				✔		
	Nickel						✔
	Silver						✔
	Zinc						✔

Table 11-7 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional metals	Aluminum			✔			
	Cobalt				✔		
	Iron			✔			
	Magnesium			✔			
	Manganese			✔			
	Molybdenum						✔
	Tin						✔
	Titanium						✔
	Vanadium						✔
Priority organic constituent	Phenol				✔		

Table 11-8

Proposed Regulated Pollutants for the Integrated and Stand-Alone Hot Forming Subcategory

Pollutant	BAT	NSPS
Carbon and Alloy Steel Segment		
Total suspended solids (TSS)		✔
Oil and grease (O&G)		✔
Lead	✔	✔
Zinc	✔	✔
Stainless Steel Segment		
Total suspended solids (TSS)		✔
Oil and grease (O&G)		✔
Chromium	✔	✔
Nickel	✔	✔

Note: EPA is not proposing to revise BPT, BCT, PSES, or PSNS for this subcategory.

Table 11-9

Pollutants Considered for Regulation for Direct Dischargers
Integrated and Stand-Alone Hot Forming Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Total petroleum hydrocarbons (TPH)	✔					
Priority metals	Lead						✔
	Zinc						✔
Nonconventional metals	Iron			✔			
	Manganese			✔			
	Molybdenum						✔

Table 11-10

Pollutants Considered for Regulation for Direct Dischargers Integrated and Stand-Alone Hot Forming Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Total petroleum hydrocarbons (TPH)	✔					
	Total organic carbon (TOC)	✔					
Priority metals	Antimony						✔
	Chromium						✔
	Copper				✔		
	Nickel						✔
	Zinc				✔		
Nonconventional metals	Iron			✔			
	Manganese			✔			
	Molybdenum						✔
	Titanium						✔

Table 11-11

Proposed Regulated Pollutants for the Non-Integrated Steelmaking and Hot Forming Subcategory

Pollutant	BAT	PSES
Carbon and Alloy Steel Segment		
Lead	✔	
Zinc	✔	
Stainless Steel Segment		
Chromium	✔	✔
Nickel	✔	✔

Note: EPA is proposing zero discharge of pollutants for NSPS and PSNS.
EPA is not proposing to revise PSES for the Carbon and Alloy Segment of this subcategory.
EPA is not proposing to revise BPT or BCT for this subcategory.

Table 11-12

Pollutants Considered for Regulation for Direct Dischargers
Non-Integrated Steelmaking and Hot Forming Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Total petroleum hydrocarbons (TPH)	✔					
	Total organic carbon (TOC)	✔					
Priority metals	Lead						✔
	Zinc						✔
Nonconventional metals	Iron			✔			
	Manganese			✔			

Table 11-13

Pollutants Considered for Regulation for Direct Dischargers Non-Integrated Steelmaking and Hot Forming Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen					✔	
	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Nitrate/nitrite	✔					
	Total petroleum hydrocarbons (TPH)	✔					
	Total organic carbon (TOC)	✔					
Priority metals	Antimony					✔	
	Chromium						✔
	Copper				✔		
	Lead						✔
	Nickel						✔
	Zinc				✔		

Table 11-13 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional metals	Aluminum			✔	✔		
	Boron			✔			
	Hexavalent chromium						✔
	Iron			✔			
	Manganese			✔			
	Molybdenum						✔
	Titanium						✔
Priority organic constituent	Tribromomethane		✔		✔		

Table 11-14

Proposed Regulated Pollutants for the Steel Finishing Subcategory

Pollutant	BAT	NSPS	PSNS
Carbon and Alloy Steel Segment			
Total suspended solids (TSS)		✔	
Oil and grease (O&G)		✔	
Chromium	✔	✔	✔
Hexavalent chromium	✔	✔	✔
Lead	✔	✔	✔
Zinc	✔	✔	✔
Stainless Steel Segment			
Total suspended solids (TSS)		✔	
Oil and grease (O&G)		✔	
Ammonia as nitrogen	✔	✔	✔
Fluoride	✔	✔	✔
Chromium	✔	✔	✔
Hexavalent chromium	✔	✔	✔
Nickel	✔	✔	✔

Note: EPA is not proposing to revise BPT, BCT, or PSES for this subcategory.

Table 11-15

Pollutants Considered for Regulation for Direct Dischargers Steel Finishing Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride				✔		
	Nitrate/Nitrite	✔					
	Total petroleum hydrocarbons (TPH)	✔					
	Total organic carbon (TOC)	✔					
	Total phenols	✔			✔		
	Sulfate			✔			
Priority metals	Antimony				✔		
	Arsenic				✔		
	Chromium						✔
	Copper				✔		
	Lead				✔		✔*
	Nickel						✔
	Selenium				✔		
	Zinc						✔

Table 11-15 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional metals	Aluminum			✔	✔		
	Boron			✔	✔		
	Hexavalent chromium						✔
	Iron			✔			
	Manganese			✔			
	Molybdenum				✔		
	Tin						✔
	Titanium				✔		
Priority organic constituents	Bis(2-ethylhexyl) phthalate				✔		
	1,1,1-Trichloroethane		✔		✔		
Nonconventional organic constituents	alpha-Terpineol				✔		
	Benzoic acid				✔		
	n,n-Dimethylformamide				✔		
	n-Dodecane		✔		✔		
	n-Eicosane						✔
	n-Hexadecane		✔				
	n-Octadecane				✔		
	n-Tetradecane		✔		✔		
	2-Propanone				✔		

Table 11-16

Pollutants Considered for Regulation for Direct Dischargers Stainless Finishing Subcategory - Stainless Steel Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride						✔
	Nitrate/nitrite	✔				✔	
	Total petroleum hydrocarbons (TPH)	✔					
	Total cyanide				✔		
	Total organic carbon (TOC)	✔					
	Total phenols	✔			✔		
Priority metals	Antimony				✔		
	Arsenic				✔		
	Cadmium				✔		
	Chromium						✔
	Copper						✔
	Lead				✔		
	Nickel						✔
	Selenium				✔		
	Zinc				✔		

Table 11-16 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional metals	Aluminum			✔			
	Barium				✔		
	Boron			✔			
	Cobalt				✔		
	Hexavalent chromium						✔
	Iron			✔			
	Magnesium			✔			
	Manganese			✔			
	Molybdenum						✔
	Tin				✔		
	Titanium						✔
	Vanadium				✔		
Priority organic constituents	Naphthalene		✔		✔		
	Phenol				✔		
	Ethylbenzene		✔		✔		
	Toluene		✔		✔		
Nonconventional organic constituents	2,6-Di-tert-butyl-p-benzoquinone				✔		
	2-Methylnaphthalene		✔		✔		
	Benzoic acid				✔		
	Hexanoic acid		✔		✔		
	n-Docosane		✔		✔		
	n-Dodecane		✔		✔		
	n-Eicosane		✔		✔		

Table 11-16 (Continued)

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Nonconventional organic constituents (continued)	n-Hexadecane		✔		✔		
	n-Octadecane		✔		✔		
	n-Tetracosane				✔		
	n-Tetradecane		✔		✔		
	2-Propanone				✔		
	m-Xylene		✔		✔		
	o- + p-Xylene		✔		✔		

Table 11-17

Proposed Regulated Pollutants for the Other Operations Subcategory

Pollutant	BPT	BCT	NSPS
Direct Reduced Iron Segment			
Total suspended solids (TSS)	✔	✔	✔
Forging Segment			
Total suspended solids (TSS)	✔	✔	✔
Oil and grease (O&G)	✔	✔	✔

Note: EPA is proposing zero discharge of pollutants for the Briquetting Segment.
EPA is not proposing limits at BAT, PSES, or PSNS for this subcategory.

Table 11-18

Pollutants Considered for Regulation for Direct Dischargers
Other Operations Subcategory - Direct Reduced Ironmaking Segment

Pollutant Group	Pollutant of Concern	Bulk Parameter	Volatile Parameter	Treatment Chemical	Not Detected at Treatable Levels	Not Effectively Treated	Considered for Regulation
Conventional pollutants	Oil and grease (O&G)						✔
	Total suspended solids (TSS)						✔
Nonconventional pollutants	Ammonia as nitrogen						✔
	Chemical oxygen demand (COD)	✔					
	Fluoride					✔	
	Total petroleum hydrocarbons (TPH)	✔					
Nonconventional metals	Aluminum			✔			
	Iron			✔			
	Manganese			✔			
	Titanium						✔

Table 11-19

POTW Percent Removals

Pollutant	Subcategory	Percent Removal	Source
Ammonia as nitrogen	A, B, F	39	50 POTW Study (10 × ML)
Benzo(a)pyrene	A	95	NRMRL (all wastewater)
Chromium	D, E, F	80	50 POTW Study (10 × ML)
Fluoride	F	54	NRMRL (all wastewater)
Hexavalent chromium	F	6	NRMRL (all wastewater)
Lead	B, C, D, E, F	77	50 POTW Study (10 × ML)
Mercury	A	90	50 POTW Study (10 × ML)
Naphthalene	A	95	50 POTW Study (10 × ML)
Nickel	D, E, F	51	50 POTW Study (10 × ML)
Phenol	A, B	95	50 POTW Study (10 × ML)
Selenium	A	34	NRMRL (domestic wastewater)
2,3,7,8-tetrachlorodibenzofuran (TCDF)	B	83	Transfer from 1,2,3,4,6,7,8-HPCDF (NRMRL)
Thiocyanate	A	70	Transfer from total cyanide
Total cyanide	A, B	70	50 POTW Study (10 × ML)
Zinc	B, C, D, E, F	79	50 POTW Study (10 × ML)

ML - Minimum level.
A - Cokemaking.
B - Ironmaking.
C - Integrated Steelmaking.
D - Integrated and Stand-Alone Hot Forming.
E - Non-Integrated Steelmaking and Hot Forming.
F - Steel Finishing.

Table 11-20

POTW Pass-Through Analysis Results for the Cokemaking Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Henry's Law Constant (atm/gmole/m^3)	BAT% removal > POTW % Removal?	Henry's Law Constant > 1E-04 ?	Does Pollutant Pass Through?
Ammonia as nitrogen	>99.9%	39 % (A)	--[a]	Yes	--	Yes
Total cyanide	96 %	70 % (A)	--[a]	Yes	--	Yes
Thiocyanate	99.9 %	70 % (C)	--[a]	Yes	--	Yes
Mercury	83 %	90 % (A)	--[a]	No	--	No
Selenium	73 %	34 % (B)	--[a]	Yes	--	Yes
Benzo(a)pyrene	≥88 %	95 % (B)	4.9E-07[b]	No	No	No
Naphthalene	≥99.9 %	95 % (A)	--[a]	Yes	--	Yes
Phenol	≥99.9 %	95 % (A)	--[a]	Yes	--	Yes

[a]EPA did not perform a volatile override analysis for pollutants already determined to pass through based on BAT and POTW percent removal comparison and for nonvolatile pollutants.
[b]Source: U.S. EPA, Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry, December 1998 (Reference 11-4).
(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥ 10 × ML were used.
(B) U.S. EPA's NRMRL Database.
(C) Transfer from another pollutant.

Table 11-21

POTW Pass-Through Analysis Results for the Ironmaking Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Does Pollutant Pass Through?
Ammonia as nitrogen	99.8%	39 % (A)	Yes
Total cyanide	0 %	70 % (A)	No
Lead	99.8 %	77 % (A)	Yes
Zinc	99.8 %	79 % (A)	Yes
Phenol	≥90 %	95 % (A)	No
2,3,7,8-Tetrachlorodibenzofuran (TCDF)[a]	≥94 %	83 % (B)	Yes

[a]2,3,7,8-TCDF is regulated for the Sintering Segment of the Ironmaking Subcategory only.
(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥ 10 × ML were used.
(B) Transfer from another pollutant.

Table 11-22

POTW Pass-Through Analysis Results for the Integrated Steelmaking Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Does Pollutant Pass Through?
Lead	99.8 %	77 % (A)	Yes
Zinc	>99.9 %	79 % (A)	Yes

(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥ 10 × ML were used.

Table 11-23

POTW Pass-Through Analysis Results for the Integrated and Stand Alone Hot Forming Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Does Pollutant Pass Through?
Carbon and Alloy Steel Segment			
Lead[a]	18 %	77 % (A)	No
Zinc	70 %	79 % (A)	No
Stainless Steel Segment			
Chromium	97 %	80 % (A)	Yes
Nickel	96 %	51 % (A)	Yes

[a]No BAT data for this pollutant passed the influent ≥10 × ML criteria; therefore, paired data with influent concentration < 10 × ML were used to calculate percent removal.
(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥10 x ML were used.

Table 11-24

POTW Pass-Through Analysis Results for the Non-Integrated Steelmaking and Hot Forming Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Does Pollutant Pass Through?
Carbon and Alloy Steel Segment			
Lead[a]	98 %	77 % (A)	Yes
Zinc	97 %	79 % (A)	Yes
Stainless Steel Segment			
Chromium	97 %	80 % (A)	Yes
Nickel	96 %	51 % (A)	Yes

[a]No BAT data for this pollutant passed the influent ≥10 × ML criteria; therefore, paired data (stainless) influent concentration and influent data (carbon) were < 10 × ML.
(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥10 x ML were used.

Table 11-25

POTW Pass-Through Analysis Results for the Steel Finishing Subcategory

Pollutant	BAT % Removal	POTW % Removal (Reference)	Does Pollutant Pass Through?
Carbon and Alloy Steel Segment			
Chromium	99.6 %	80 % (A)	Yes
Hexavalent chromium	98 %	6 % (B)	Yes
Lead[a]	74 %	77 % (A)	No
Zinc	99 %	79 % (A)	Yes
Stainless Steel Segment			
Ammonia as nitrogen	7 %	39 % (A)	No
Fluoride	81 %	54 % (B)	Yes
Chromium	99.9 %	80 % (A)	Yes
Hexavalent chromium	99 %	6 % (B)	Yes
Nickel	99.6 %	51 % (A)	Yes

[a]No BAT data for this pollutant passed the influent ≥ 10 × ML criteria; therefore, paired data (carbon) influent concentration and influent data (stainless) < 10 x ML were used to calculate the percent removal.
(A) U.S. EPA's 50-POTW Study, with data-editing criteria such that only data pairs (influent and effluent) with influent ≥ 10 × ML were used.
(B) U.S. EPA's NRMRL Database.

SECTION 12

LIMITATIONS AND STANDARDS: DATA SELECTION AND CALCULATION

This section describes the data sources, data selection, data conventions, and statistical methodology used by EPA in calculating the long-term averages, variability factors, and proposed limitations. The proposed effluent limitations and standards[1] for each subcategory and option are based on long-term average effluent values and variability factors that account for variation in treatment performance within a particular treatment technology over time.

Section 12.1 briefly describes the data sources (a more detailed discussion is provided in Section 3) and gives a general overview of EPA's evaluation and selection of facility datasets that are the basis of the proposed limitations. Section 12.2 provides a more detailed discussion of the selection of facility datasets for each subcategory and option. Sections 12.3 and 12.4 describe data substitution and aggregation used in calculating the proposed limitations. Section 12.5 provides a general overview of limitations in terms of EPA's objective, selection of percentiles as their basis, and compliance with final limitations. Section 12.6 provides an overview of the proposed limitations and Section 12.7 describes the calculation of the concentration-based limitations. Section 12.8 describes the conversion of these concentration-based limitations into the proposed production-normalized limitations. Section 12.9 describes the transfers of limitations from one option to another and the few cases where EPA has converted limitations from the 1982 regulations[2] using the revised production-normalized flows. The attachments for Section 12 are provided in Appendix F.

12.1 Overview of Data Selection

To develop the long-term averages, variability factors, and proposed limitations, EPA used wastewater data from facilities with components of the model technology for each subcategory and option. These data were collected from two sources. The first source was EPA's sampling episodes for which data were collected from 1997 to 1999. The second source was self-monitoring data, which were provided by facilities either in response to the detailed, short, or analytical and production follow-up surveys, or in conjunction with EPA site visits or other industry contacts. These data were collected from 1996 to 1998. This section refers to the first source as 'sampling episodes' and the second source as 'self-monitoring episodes.' This section provides a general overview of EPA's review of the data from these two sources and selection of facilities representing each option. For the final rule, EPA intends to further review and possibly revise the data selection methodology.

EPA qualitatively reviewed the data from these two sources and selected episodes to represent each option based on a review of the production processes and treatment technologies in place at each facility. EPA only used data from facilities that had some or all

[1]In the remainder of this chapter, references to 'limitations' includes 'standards.'

[2]In this section, the regulations promulgated in 1982 are referred to as the 1982 regulations.

components of the model technologies for the option (model technologies for each option are described in Section 8). After EPA identified those facilities with components of the model treatment in place for each option, EPA selected facilities that met several other criteria as described in the following paragraphs.

The first criteria was that the influents and effluents from the treatment components had to represent wastewater from that subcategory and option, with no incompatible wastewater from other subcategories or large amounts of noncontact cooling water or stormwater. Typically, facilities may commingle wastewater streams with noncontact cooling water, stormwater, or wastewaters from different subcategories. Application of this criterion resulted in EPA selecting only those facilities where the commingled wastewaters did not result in substantial dilution, more concentrated wastewaters, or wastewaters with different types of pollutants than those generated in the subcategory.

The second criterion was that the facility had to demonstrate good operation of the treatment component, as indicated by pollutant removals across the treatment system and treatment system effluent quality (e.g., datasets for episodes with generally high pollutant concentrations for all pollutants were excluded). EPA made its determinations regarding whether a facility met this criterion based upon site visit reports, survey responses, and the chemical analytical data collected during sampling episodes or obtained as self-monitoring data from the facilities.

A third criterion was that the facility had to demonstrate water usage practices representative of a well-operated system in terms of production-normalized flow rates.[3] These flows were required to be near the model production-normalized flow rate selected for each option (see Section 7 for discussion of flow rates). Such facilities typically practice high-rate recycle (generally 95 percent or greater recycle rate) or other water usage practices (depending on the manufacturing process) geared toward more efficient water use. In contrast, episodes with unusually high production-normalized flow rates were considered to be not representative of other facilities in the subcategory because they did not practice good water usage and, because of dilution, analytical data from these processes may represent lower concentrations than those achievable by facilities using less water.

A fourth criterion was that the data could not represent periods of process or treatment upsets. EPA did not use data from its sampling episodes that were collected during times of production or wastewater treatment shut downs. For self-monitoring data, EPA used facility responses to the survey and contacted the facility when necessary to determine whether data submitted were representative of normal operating conditions.

EPA determined that the datasets from the episodes that met all four criteria demonstrated the best performance. Thus, EPA used these datasets to develop the proposed

[3]These flow rates were the operating conditions during EPA's sampling episodes or as reported in the survey responses.

limitations for each subcategory option. EPA selected some episodes for more than one subcategory because these facilities met the criteria for more than one subcategory.

Generally, if EPA selected data from a sampling episode, it also selected any self-monitoring episode data submitted from the same treatment system from the same facility. EPA's sampling episodes typically provided data for all of the pollutants proposed for regulation (see Section 11). In contrast, the industry self-monitoring data were only for a limited subset of pollutants (most facilities monitor only for pollutants specified in their permits). EPA analyzed the data from each episode separately in calculating the proposed limitations. This is consistent with EPA's practice for other industrial categories. Data from different sources generally characterize different time periods and different chemical analytical methods. EPA's concern in combining data from different time periods is that operating conditions are usually different due to changes such as management, personnel, and procedures.

In developing the proposed limitations, EPA generally used the self-monitoring data when they were measured by analytical methods specified in or approved under 40 CFR Part 136 that facilities are required to use for compliance monitoring. Section 4 describes all but one of the exceptions to this general rule. The remaining exception was EPA's exclusion of all industry self-monitoring data for oil and grease because facilities generally used methods which require freon, an ozone-depleting agent, as an extraction solvent. For the samples collected in its sampling episodes, EPA used a more recent method, Method 1664, which uses normal hexane (*n*-hexane) as the extraction solvent and measures oil and grease (O&G) as hexane extractable material (HEM). While developing Method 1664, EPA received comments about potentially differing results using the new method that could bring a permittee into noncompliance under certain circumstances.[4,5] Although EPA has determined that the methods are comparable and that direct replacement of the new method is warranted, EPA expects that facilities will choose to use Method 1664 rather than the freon methods as freon becomes more expensive and difficult to obtain. Further, EPA has determined that it collected sufficient data to establish the oil and grease limitations using only the HEM data. Thus, EPA has chosen to develop the oil and grease limitations solely on the HEM measurements from Method 1664.

After selecting the EPA sampling and self-monitoring datasets for the best performers, EPA reviewed the pollutant concentrations in each dataset. If an episode's pollutant concentrations for a particular pollutant were substantially higher than for other episodes selected for the option, EPA excluded the data for that pollutant from that episode. EPA also excluded

[4]U.S. Environmental Protection Agency. Approval of EPA Methods 1664, Revision A, and 9071B for Determination of Oil and Grease and Non-polar Material in EPA's Wastewater and Hazardous Waste Programs, EPA-821-F-98-005, February 23, 1999. (Also located at www.epa.gov/ost/methods/1664fs.html and DCN IS04884 in Section 3.1 of the proposal record.)

[5]U.S. Environmental Protection Agency. Analytical Method Guidance for EPA Method 1664A Implementation and Use (40 CFR part 136). EPA/821-R-00-003, February 2000. (Also located at http://www.epa.gov/ost/methods/1664guide.pdf.)

outliers within episode datasets when it deemed such exclusions were appropriate. These exclusions, along with justifications, are described in detail in the next section.

12.2 Episode Selection for Each Subcategory and Option

This section describes the data selected for each pollutant for each technology option in each subcategory. This discussion is divided into subparts corresponding to the subcategories and options where EPA is proposing numerical limitations. (See Section 8 for those options for which EPA is proposing *no discharge of process wastewater pollutants to waters of the United States).*

In the following sections and the public record, EPA has masked the identity of the episodes and sample points to protect confidential business information (CBI). EPA sampling episodes are identified as ESExx and the industry self-monitoring episodes as ISMxx where 'xx' is a unique two-digit number assigned to each episode (for example, ESE01 and ISM51). The sample points are identified with SP-c where 'c' is a character (for example, SP-A). The daily data and sample points corresponding to these episodes are listed in Appendix D. Attachment 12-1 in Appendix F provides summary statistics for all episodes, sorted by subcategory and option.

12.2.1 Subpart A: Cokemaking Subcategory

For the By-Product Recovery Segment in the Cokemaking Subcategory,[6] as described in the following subsections, EPA evaluated four options: BAT-3, BAT-1, PSES-1, and PSES-3. The data for the BAT-3 and BAT-1 options were used to calculate the proposed limitations for direct dischargers. The data from the BAT-1 and PSES-1 options were used to calculate the two sets of co-proposed standards for indirect dischargers. (The technical components for BAT-1 are the same as those for PSES-3.)

BAT-3

The proposed BAT-3 option technology is the basis of the proposed limitations for direct dischargers in the By-Product Recovery Segment. This option has an alkaline chlorination component, plus the components of the BAT-1 option (see Section 8 for detailed descriptions of the BAT-3 and BAT-1 model technologies). As described below, of the pollutants proposed for regulation, alkaline chlorination is the relevant technology component for the proposed ammonia as nitrogen, phenol, total cyanide, and total residual chlorine (TRC) limitations. The BAT-1 components are the basis for the proposed limitations for benzo(a)pyrene, O&G, mercury, naphthalene, selenium, TSS, and thiocyanate. (EPA proposed O&G and TSS standards only for new direct dischargers.)

[6]For the Non-recovery Segment in this subcategory, EPA has proposed *no discharge of process wastewater pollutants to waters of the United States* as explained in Section 8.

EPA was only able to identify one facility (episode ISM52) with the alkaline chlorination component. This facility is located in Canada and EPA was unable to obtain the facility's permission to sample its wastewaters (EPA's statutory authority under the Clean Water Act Section 308 to require facilities to produce information does not apply to Canadian mills). The cokemaking wastewater at this facility passed through a biological treatment system and then was commingled with blast furnace ironmaking wastewater. This commingled stream was treated with alkaline chlorination and then mixed with a second stream consisting of wastewaters from the Integrated Steel Subcategory and Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. The wastewaters from both streams were commingled and sent through filters before reaching the discharge point, which was the facility's monitoring point. (See Figure 12-1.) Although the cokemaking wastewater was treated by all the components of the BAT-3 model technology, the wastewater was commingled with ironmaking wastewaters that were not treated by the biological treatment component. Because cokemaking and ironmaking contribute some of the same pollutants to the wastewaters, EPA excluded the data for pollutants that were not treated by the alkaline chlorination component of the model technology.

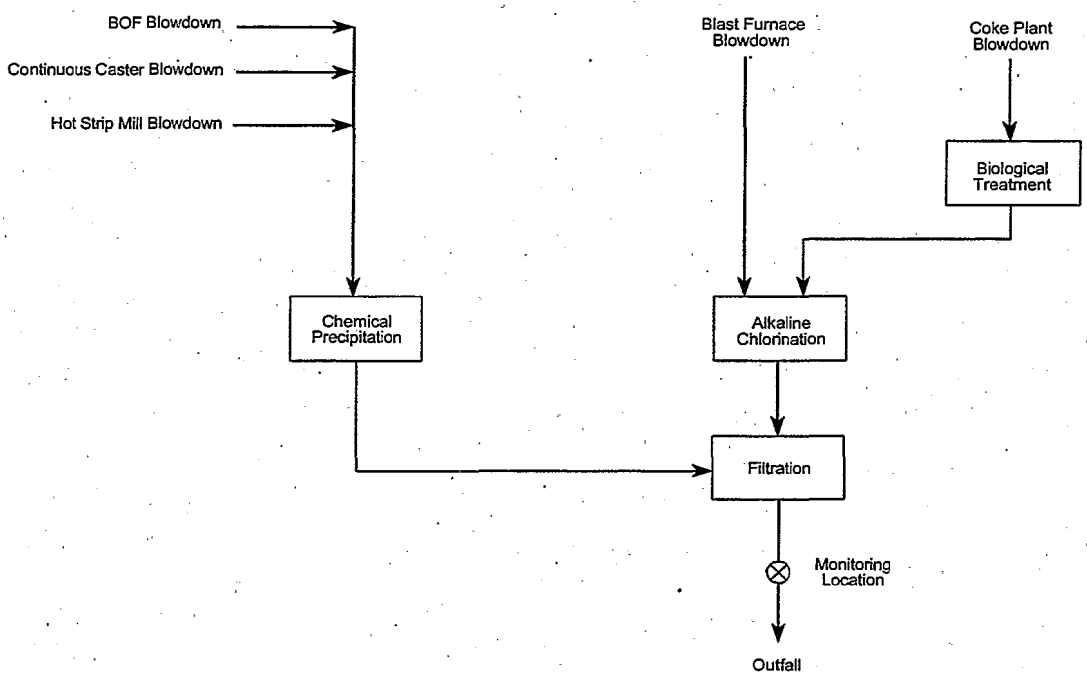


Figure 12-1. Alkaline Chlorination Model Technology Facility

Of the parameters monitored for episode ISM52,[7] only ammonia as nitrogen, total cyanide, and total phenols are treated by alkaline chlorination. For these parameters only, EPA assumed that the entire loading was contributed by cokemaking and blast furnace ironmaking operations. This assumption is supported by facility personnel (DCN IS04112), process chemistry considerations, and EPA sampling data showing that these parameters are not present to a significant degree in the Integrated Steel and Integrated and Stand-Alone Hot Forming Subcategories (DCN 1505030 in Section 5.4 of the proposal record). Because the cokemaking and ironmaking wastewaters were commingled with the second wastestream, the pollutant concentrations were diluted at the monitoring point. The facility provided EPA with the daily flow at the monitoring point, and also provided the blowdown rates of the coke plant and blast furnaces, which remained constant during the self-monitoring episode. EPA used this information in conjunction with the pollutant concentrations to estimate the ammonia as nitrogen, total cyanide, and total phenols[8] concentrations achievable by alkaline chlorination. In its estimation procedure, EPA divided the pollutant concentration at the monitoring point by the ratio of the flow processed in alkaline chlorination to the total effluent flow (DCN 1504933 in Section 5.6 of the proposal record). For example, if the total cyanide concentration is 2 mg/L, the combined flow from cokemaking and blast furnace (flow processed by alkaline chlorination) is 0.5 million gallons per day (mgd), and the flow at the monitoring point is 1 mgd, then the ratio of the two flows is 0.5/1 = 0.5. Then, the estimated concentration corresponding to the flow treated by alkaline chlorination is (2 mg/L)/0.5 = 4 mg/L. Because this estimation is only appropriate for pollutants treated by alkaline chlorination, EPA selected ammonia as nitrogen and total cyanide data from this episode to calculate the proposed BAT-3 limitations. The estimated concentration values are listed in Appendix D.

Of the pollutants that EPA is proposing to regulate for this segment, ammonia as nitrogen, total cyanide, and phenol are the only three treated differently by this technology than by the BAT-1 technology. As discussed above, ammonia as nitrogen and total cyanide were estimated from the data for episode ISM52.[9] Phenol is proposed for regulation instead of total phenols, but data were not available from episode ISM52. Phenol is treated both by the alkaline chlorination and biological treatment components of the model technology. The biological treatment component is also part of the model BAT-1 technology. For phenol, because the

[7]The facility provided its self-monitoring data for ammonia as nitrogen, total cyanide, total phenols, benzene, benzo(a)pyrene, naphthalene, total suspended solids, O&G, lead, and zinc.

[8]EPA is not proposing to regulate total phenols. However, EPA used this estimation procedure for the total phenols data in determining pollutant loadings reductions in Section 10.

[9]EPA excluded all pollutant concentrations for one sampling day that had a reported flow rate three times greater than others in that time period. The facility's treatment system would have had difficulties in treating such a high wastewater volume. (DCN 1504991 in Section 5.6 of the proposal record.) EPA will contact this facility before the final rule to determine the reason for the unusually large flow rate for this day.

BAT-3 technology is more sophisticated than the BAT-1 technology, EPA determined that it was appropriate to transfer the proposed BAT-1 limitation[10] to the BAT-3 option.

Total residual chlorine (TRC) is not treated by the BAT-3 technology, but EPA proposes to regulate TRC to ensure that residual concentrations of chlorine from the alkaline chlorination process are kept to a minimum to avoid effluent toxicity. EPA is proposing that facilities would not need to meet the TRC limitation if they certify to the permitting authority that they do not employ alkaline chlorination in their wastewater treatment. Because EPA did not receive any TRC data from episode ISM52, EPA proposed limitations for TRC based upon the 1982 regulations for the Ironmaking Subcategory. (After adjusting the 1982 mass-based limitations for the production-normalized flows used in 1982, the 1982 limitations are the same on a concentration-basis for both the sintering and ironmaking subcategories.) The 1982 regulations for TRC were based upon model technologies that included a component for alkaline chlorination. EPA determined that the 1982 TRC limitation for ironmaking was based on the alkaline chlorination process itself, and therefore the 1982 limitation from ironmaking would apply to alkaline chlorination performed at cokemaking operations. Thus, EPA used the 1982 regulations from the Ironmaking Subcategory as the basis for the proposed limitations. (Section 12.9 describes the adjustment for differences in production flows between the two subcategories.)

For the remaining pollutants (benzo(a)pyrene, O&G, mercury, naphthalene, selenium, TSS, and thiocyanate) proposed for regulation, EPA transferred the proposed limitations from the BAT-1 option. (As explained previously, EPA excluded the data from episode ISM52 for pollutants other than those treated by the alkaline chlorination component.) EPA determined that these transfers were appropriate because the BAT-1 component of the BAT-3 technology treats these remaining pollutants and the alkaline chlorination component does not provide additional removals of these pollutants.

BAT-1 (PSES-3)

The proposed BAT-1 option technology was used as the basis for the proposed limitations for direct dischargers. The proposed limitations based on the BAT-1 option technology were also used as pretreatment standards for the PSES-3 option, which is based on the same physical, chemical, and biological technology. As mentioned in previous Section 12.2, PSES-3 pretreatment standards were co-proposed with PSES-1 pretreatment standards for physical and chemical technology. The proposed BAT-1 limitations for some pollutants were also transferred to the BAT-3 option, as explained in the previous section.

Based on an evaluation of industry survey responses, EPA determined that all but two of the direct-discharging facilities with processes in the By-Product Recovery Segment have

[10]Phenol was not measured above the detection level in any BAT-1 sample. The long-term average of 10.08 ug/L is an average across sample-specific detection limits for the BAT-1 samples. With one exception, all sample-specific detection limits were equal to 10 ug/L which is also the minimum level for the analytical method. The other sample-specific detection limit was 10.4 ug/L and resulted from a 1.04-fold dilution to correct for a smaller extraction (960 mL) than the 1000 mL specified by the analytical method.

the model technology associated with the BAT-1 option, namely ammonia stripping and biological treatment. Of these facilities, EPA selected data from three facilities that met the criteria described in Section 12.1. These data were from two sampling episodes (ESE01 and ESE02) and two self-monitoring episodes (ISM50 and ISM51). (One sampling episode and self-monitoring episode were from the same facility.) These facilities treat wastewater from by-product recovery operations as well as small amounts of groundwater or control water added for biological treatment optimization. One facility (episode ESE02) had the BAT-1 model technology; however, its performance was uniformly poor as evidenced by high concentration discharges. For this reason, EPA excluded all data except mercury from this episode in calculating the proposed limitations (see discussion below about the mercury data). Where data for a particular pollutant were available from the remaining three episodes, EPA generally included the data in calculating the proposed limitations. However, for episode ISM51, EPA excluded the portion of the dataset corresponding to the time period when the facility was operating a treatment system different from the BAT-1 model technology. In addition, EPA found that episode ISM51 demonstrated poor performance of the model technology for several pollutants and excluded the data for those pollutants from the calculations. For the final rule, EPA intends further review of this episode and its data to determine if the performance should be considered uniformly poor and the data for all pollutants excluded from calculating the limitations.

Thus, data from one to three episodes with the BAT-1 technology were used to develop the proposed limitations for benzo(a)pyrene, mercury, naphthalene, selenium, and thiocyanate. In addition, the data from these episodes were used to calculate the proposed TSS and O&G standards for new direct dischargers. Data from these episodes were also used to calculate the proposed pretreatment standards for ammonia as nitrogen, total cyanide, naphthalene, phenol, selenium, and thiocyanate (because the PSES-3 technology has the same components as the BAT-1 technology). The following paragraphs describe the episodes selected for each pollutant.

For benzo(a)pyrene, EPA had concentration data from its sampling episode (ESE01) and from the two self-monitoring episodes. EPA excluded the benzo(a)pyrene data from one self-monitoring episode (ISM50) because of concerns about the analytical methods (see section 4.4.15, DCNs IS07040 and IS07051 in Sections 8.4 and 8.5 of the proposal record). EPA excluded the data from the other self-monitoring episode (ISM51) because all reported data were associated with a new non-BAT-1 treatment system.

For mercury, EPA had concentration data from one EPA sampling episode (ESE01) and one self-monitoring facility (ISM51). Because the data were all non-detected, variability cannot be calculated (as explained in Appendix E). Thus, EPA included one additional facility (episode ESE02) to develop variability factors for the proposed limitations. EPA excluded this episode from the long-term average calculations because this facility did not operate its treatment systems to the non-detectable levels demonstrated by the other two episodes. However, because episode ESE02 has the BAT-1 technology, EPA concluded that the variability of the wastewaters at this episode would be similar to the variability of well-operated facilities. Thus, this episode was used to calculate variability factors for the proposed mercury limitations.

For naphthalene, EPA had concentration data from one EPA sampling episode (ESE01) and two self-monitoring episodes (ISM50 and ISM51). EPA excluded the data from self-monitoring episode ISM51 because all reported data were associated with a new non-BAT-1 treatment system. EPA calculated the proposed limitations using the data from episode ESE01.

For selenium and thiocyanate, EPA had concentration data from EPA sampling episode ESE01 and self-monitoring episode ISM51. EPA excluded the data from self-monitoring episode ISM51 because all reported data were associated with a new non-BAT-1 treatment system. EPA calculated the proposed limitations for selenium and thiocyanate using the data from episode ESE01.

For the O&G standards proposed for new direct dischargers, EPA used concentration data from its sampling episode (ESE01) for O&G measured as HEM. As explained in Section 12.1, industry did not measure O&G as HEM and thus none of the self-monitoring episodes were included in calculating the proposed O&G standards.

For the TSS standards proposed for new direct dischargers, EPA had concentration data from one sampling episode (ESE01) and two self-monitoring episodes (ISM50 and ISM51). For episode ESE01, EPA excluded two duplicate pairs (samples collected from the same stream at approximately the same time and under approximately the same field conditions) because the results indicated poor precision.[11] (EPA intends to re-evaluate this decision for the final rule.) For episode ISM51, EPA had concentration data corresponding to two chemical analytical methods: 160.2 and 2540D (see section 4.4.3 for a description of these methods). The data from Method 160.2 from that episode were excluded because the average was more than five times higher than either of the other episodes (DCN IS07052 in Section 8.5 of the proposal record). The data from Method 2540D from that episode were excluded because the data represented the new treatment system.

For the ammonia as nitrogen pretreatment standards for the PSES-3 option, EPA had concentration data from one sampling episode and two self-monitoring episodes. EPA proposed pretreatment standards for indirect dischargers using the data from the two self-monitoring episodes. (The proposed limitations for direct dischargers were based upon the BAT-3 option.) EPA excluded data from the sampling episode (ESE01) because the levels were uniformly low at all influent and effluent sampling points in comparison to other BAT-1 episodes. EPA also excluded some ammonia as nitrogen data from one self-monitoring episode (ISM51) because the data represented the facility's new non-BAT-1 treatment system. EPA excluded the data for two days from another self-monitoring episode (ISM50) because the concentration levels of 14.5 and 38.7 mg/L reported for the first two consecutive samples were substantially greater than the data for the remaining 54 sampling days. In addition, these two data values were greatly in excess (about four and ten times, respectively) of concentrations in the following weeks. For the final rule, EPA intends to contact the facility to determine if a particular process condition resulted in these extreme values.

[11]The first pair had values of 78 mg/L and 13 mg/L. The second pair had values of 110 mg/L and 18 mg/L.

For the phenol pretreatment standards, EPA had concentration data from EPA sampling episode ESE01. Industry did not monitor for phenol and thus none of the self-monitoring episodes were included in calculating the proposed phenol pretreatment standards. The industry supplied data were for total recoverable phenolic material ("total phenols") rather than phenol, which is a single organic analyte.

For the total cyanide pretreatment standards, EPA had data from one sampling episode (ESE01) and two self-monitoring episodes (ISM50 and ISM51). EPA proposed pretreatment standards for indirect dischargers using these data. (The proposed limitations for direct dischargers were based upon the BAT-3 option.) EPA excluded some data from episode ISM51 because the data represented the new treatment technology rather than the BAT-1 technology. Of the remaining eight data points from episode ISM51, which were measured with Standard Method 4500, EPA excluded the first six, which were all reported as detected at the same value of 12 mg/L. Because data are seldom reported at the same value unless they are non-detected or very close to the lowest level that can be measured by the chemical analytical method, EPA determined that these data should be excluded because of concerns about the level of precision attained by the laboratory. In addition, EPA excluded the remaining two data values (8 and 8.7 mg/L) which were also measured with Standard Method 4500, because EPA concluded that all results were probably unreliable from this method during the self-monitoring episode.

PSES-1

EPA co-proposed pretreatment standards for indirect dischargers based on the PSES-1 technology (physical and chemical technology) and the PSES-3 technology (physical, chemical, and biological technology which has the same components as the BAT-1 option technology and is described in Section 12.2.1.2.) Eight facilities (corresponding to eight episodes) had the PSES-1 option technology and met the criteria in Section 12.1. Four of these episodes were EPA sampling episodes (ESE01, ESE02, ESE03, and ESE11) and four were self-monitoring episodes (ISM53, ISM54, ISM55, and ISM56). None of the facilities commingled cokemaking wastewater with wastewater from other subcategories. When data were available, EPA used the data from the indirect dischargers (i.e., the self-monitoring episodes) to calculate the proposed PSES-1 pretreatment standards for ammonia as nitrogen, total cyanide, thiocyanate, selenium, naphthalene, and phenol. For the final rule, EPA intends to consider whether self-monitoring episode ISM54 should be excluded because of its unusually high influent wastewater flow (and consequently, high production-normalized flows).

The direct dischargers represented in the four sampling episodes had employed the proposed model technology that was the basis for the proposed pretreatment standards. EPA used their data to calculate the proposed pretreatment standards only when no data were available from the indirect dischargers. For the final rule, EPA intends to reconsider the exclusions of data from three of these episodes (DCN IS07053 in Section 8.5 of the proposal record lists the data and summary statistics for these three episodes). EPA intends to continue to exclude the data from the fourth sampling episode (ESE11) to protect confidential business information (CBI). Because EPA sampled this facility for a single day, it is not possible to adequately aggregate the data for public review while still protecting CBI. While EPA can and has used CBI data in

developing limitations and standards, EPA has determined in this case that sufficient data are available to develop the proposed pretreatment standards without the data from this sampling episode.[12] Thus, EPA intends to continue to exclude the data from developing the pretreatment standards, but EPA will compare these data to the final pretreatment standards to evaluate the facility's treatment performance.

For ammonia as nitrogen, EPA had data from four self-monitoring episodes (ISM53, ISM54, ISM55, and ISM56) at indirect-discharging facilities. EPA excluded data from self-monitoring episode ISM56 because this facility employs biological treatment in addition to ammonia stripping (ammonia stripping is the PSES-1 model treatment technology), and biological treatment provides additional removal of ammonia.

For selenium, the indirect-discharging facilities did not collect any data for this pollutant in their self-monitoring episodes. Therefore, EPA selected one of the three sampling episodes (ESE01) to calculate the PSES-1 pretreatment standards. EPA only chose selenium data from this single episode because the selenium concentrations from each episode were similar. For the final rule, EPA will reconsider the exclusion of the selenium data from the remaining two sampling episodes (see DCN IS07053 in Section 8.5 of the proposal record for summary statistics).

For total cyanide, EPA had data from all four self-monitoring episodes. EPA excluded data from ISM53 and ISM55 because these two facilities employ cyanide precipitation in addition to ammonia stripping; cyanide precipitation is not part of the PSES-1 treatment technology and provides additional removal of total cyanide. For the final rule, EPA will reconsider the exclusion of the total cyanide data from episode ISM54 (see DCN IS07055 in Section 8.5 of the proposal record for summary statistics).

For phenol and thiocyanate, the indirect-discharging facilities did not collect any data for these pollutants in their self-monitoring episodes. Therefore, EPA selected one of the three sampling episodes (ESE03) to calculate the PSES-1 pretreatment standards. EPA excluded the data for thiocyanate and phenol from episode ESE02 because the thiocyanate concentrations from this episode were an order of magnitude less than data from the other sampling episodes and because phenol concentrations were all reported as greater than the highest calibration value of the analysis (200 mg/L). EPA also excluded the data from episode ESE01 because the high concentration levels for thiocyanate and phenol indicated poor treatment for these parameters.

For naphthalene, EPA also used sampling episode ESE03 to develop the proposed pretreatment standards. For the final rule, EPA will reconsider the exclusion of the naphthalene data from sampling episodes ESE01 and ESE02 and self-monitoring episode ISM54 (see DCNs IS07053 and IS07055 for summary statistics). Except for one data point, EPA used all the data from episode ESE03 to calculate the proposed pretreatment standards for naphthalene. EPA

[12]If the facility chooses to waive its CBI claim for the concentration data from this sampling episode, EPA will consider using these data in calculating the final limitations.

excluded one data point (0.018 mg/L) for naphthalene because it was substantially lower than the sample-specific detection limits (both were 0.1 mg/L) in the episode dataset.

12.2.2 Subpart B: Ironmaking Subcategory

The Ironmaking Subcategory has two segments: the Sintering Segment and the Blast Furnace Segment. EPA is proposing limitations for the same pollutants for both B except as noted in the preamble to the proposed rule. EPA used the same concentration data but different production normalized flows for the two segments (see Section 12.8.1). EPA determined that it was appropriate to use the same concentration data for both segments because wastewaters from these two segments are compatible, and all facilities with co-located blast furnaces and sinter plants co-treat the wastewaters from each operation.

Using the criteria in Section 12.1, EPA selected data from facilities with high-rate recycle and the relevant portions of the model technology for each pollutant. As described in the following subsections, EPA evaluated two options: BAT-1 and PSES-1. The data for the first option were used to calculate the proposed limitations for direct dischargers, and data for the second option were used to calculate the proposed pretreatment standards for indirect dischargers.

BAT-1

The proposed BAT-1 option technology is the basis of the proposed limitations for the direct dischargers in the Ironmaking Subcategory; EPA identified one facility with all of the model technologies in place. However, data submissions from this episode indicated that the facility was not operating its treatment system effectively, and several EPA attempts to inquire about process conditions at the facility went unanswered. Thus, EPA excluded data from this facility for this option (DCN 1504992 in Section 5.6 of the proposal record). Instead, EPA used data from other sources in calculating the proposed limitations for ammonia as nitrogen, total cyanide, lead, zinc, O&G, 2,3,7,8-tetrachlorodibenzo-furan (2,3,7,8-TCDF), phenol, TRC, and TSS as described in the following paragraphs. (EPA proposed O&G and TSS standards only for new direct dischargers.)

For ammonia as nitrogen and total cyanide, EPA selected episode ISM52 as the model facility for this option. Although the data from episode ISM52 are from effluent from commingled wastewaters for cokemaking, blast furnace ironmaking, integrated steel, and integrated and stand-alone hot forming subcategories (see Figure 12-1 and description in Section 12.2.1.1), EPA has determined that the pollutant concentrations for ammonia as nitrogen and total cyanide are representative of ironmaking wastewaters (for both sintering and blast furnaces) because the alkaline chlorination component of the model technology treats only ammonia as nitrogen, total cyanide, and phenol. As explained in Section 12.2.1.1, EPA used the daily flow at the monitoring point, the blowdown rates of the coke plant and blast furnaces, and pollutant concentrations to estimate the ammonia as nitrogen and total cyanide concentrations achievable

by alkaline chlorination[13] (which is one of the components of the model technology for this subcategory).[14] While phenol is also treated by alkaline chlorination, industry did not supply any data for phenol. In calculating the proposed limitations, EPA used the phenol long-term average from two options in the 1982 rulemaking that included components for alkaline chlorination. This long-term average (0.01 mg/L) was the same for both the sintering and ironmaking subcategories for the 1982 rule. (This value corresponds to sintering option BAT-3 on page 402 and ironmaking option BAT-4 on page 406 in Appendix C of Volume I of the 1982 Development Document).

TRC is not treated by the BAT-1 technology, but EPA proposes to regulate TRC to ensure residual concentrations of chlorine are kept to a minimum to avoid effluent toxicity. (EPA is proposing that facilities would not need to meet the TRC limitation if they certify to the permitting authority that they do not employ alkaline chlorination in their wastewater treatment). Because EPA did not receive any TRC data from industry, EPA proposed limitations for TRC based upon the 1982 regulations for the 1982 Ironmaking Subcategory. (After adjusting the 1982 mass-based limitations for the production-normalized flows used in 1982, the limitations are the same on a concentration-basis for the sintering and ironmaking subcategories.) The 1982 regulations for TRC were based upon model technologies that included a component for alkaline chlorination. Thus, EPA used the 1982 regulations from the Ironmaking Subcategory as the basis for the proposed limitations (Section 12.9 describes the adjustment for differences in production flows between the two subcategories.)

For lead and zinc, EPA excluded the data from episode ISM52 because the commingled streams all contribute to the pollutant concentrations (as explained in Section 12.2.1.1). Thus, EPA used blast furnace ironmaking data from another self-monitoring episode (ISM61) that did not have the alkaline chlorination component of the model technology. This is a reasonable substitution because this episode only had the metals precipitation and filtration components; alkaline chlorination does not provide any additional removals of the metals.

For O&G, which is proposed for new direct dischargers, industry did not measure O&G as HEM (see Section 12.1), and the standards for this option were calculated using O&G data measured as HEM in a sampling episode that demonstrated the PSES-1 option technology (for further discussion of the O&G data, see Section 12.2.2.2). EPA concluded that transfer of these data are appropriate given that the technology basis for BAT-1 includes additional treatment steps and should provide better removals than PSES-1. As such, EPA expects that facilities utilizing the BAT-1 technologies can achieve O&G effluent concentration levels at least as low as the values from facilities using the PSES-1 technologies.

[13]EPA also used this estimation procedure for the total phenols data in determining the pollutant loadings reductions in Section 10.

[14]Also as explained in Section 12.2.1.1, EPA excluded all pollutant concentrations for one sampling day with a high flow rate.

For 2,3,7,8-TCDF, which is proposed for sintering wastewater only, EPA did not receive any data from the industry for the BAT-1 option technology. However, EPA collected data for the PSES-1 option technology, and the limitations for this option were transferred from the PSES-1 option (for further discussion of the 2,3,7,8-TCDF data, see Section 12.2.2.2). The PSES-1 technology is identical to BAT-1 except that PSES-1 does not include alkaline chlorination; EPA determined that this limitations transfer is appropriate because alkaline chlorination does not provide treatment for 2,3,7,8-TCDF.

For TSS, industry did not provide any data from the BAT-1 model technology. The 1982 regulations for TSS for new sources that are direct dischargers are based upon a technology similar to BAT-1. After adjusting for differences in production-normalized flows for each subcategory; the 1982 regulations for the ironmaking and sintering subcategories are the same on a concentration basis. Thus, EPA has transferred the 1982 TSS regulations for new sources that are direct dischargers as the basis for the proposed standards. (Section 12.9 describes the adjustment for differences in the proposed production flows for this subcategory.)

PSES-1

The proposed PSES-1 option technology is the basis of the proposed pretreatment standards for the indirect dischargers in the Ironmaking Subcategory. EPA selected one facility (corresponding to two episodes) as the best performer for this option. This facility commingles blast furnace ironmaking and sintering wastewaters. EPA had final effluent data from its sampling episode ESE08 and self-monitoring episode ISM62 supplied by the facility. EPA determined that these data represent the pollutant concentrations for this subcategory because both processes in the subcategory are represented.

For lead, zinc, and ammonia as nitrogen, EPA used the data from both episodes to calculate the proposed pretreatment standards. None of the data were excluded.

For 2,3,7,8-TCDF, EPA has proposed a daily maximum pretreatment standard that applies only to sintering wastewater. EPA proposes to require compliance monitoring at internal outfalls before any non-process or additional process wastewaters other than blast furnace wastewater flows are combined with the sinter plant wastewater. This proposed 2,3,7,8-TCDF pretreatment standard is based upon data from treated effluent from commingled sintering and blast furnace wastestreams from sampling episode ESE08. (During this sampling episode, EPA did not collect samples of treated sintering wastewater.) These data were all reported at non-detected concentration levels of 2,3,7,8-TCDF. EPA also collected data in a sampling episode at a facility that had sintering operations only. At this facility, EPA found detected concentrations of 2,3,7,8-TCDF in the treated effluent (these concentrations are listed in DCN 1500490 in Section 4.4 of the proposal record). However, EPA has excluded these data because the facility did not have the model treatment technology in place. EPA expects to gather additional information on dioxin and furan concentrations in sinter plant-only effluent and on the regulatory approach through the public comment process.

While EPA is not proposing pretreatment standards for O&G, EPA is transferring the standards calculated from the O&G data measured as HEM from this proposed option to BAT-1 (see Section 12.2.2.1). These proposed standards are for new direct dischargers. Industry did not provide any O&G data measured as HEM (see Section 12.1). Thus, EPA used the O&G data measured as HEM from sampling episode ESE08 to calculate the proposed standards for O&G for BAT-1.

12.2.3 Subpart C: Integrated Steelmaking Subcategory

For the Integrated Steelmaking Subcategory, EPA is calculating the proposed limitations for direct dischargers and indirect dischargers using data from the BAT-1 option for three general processes: basic oxygen furnaces (wet-open combustion), vacuum degassing, and continuous casting. (The technology components are the same for the BAT-1 and PSES-1 options.) For the BAT-1 option in this subcategory, EPA selected effluent data from one facility (corresponding to one sampling episode (ESE04) and one self-monitoring episode (ISM60)) to calculate the proposed limitations for lead and zinc. EPA selected this facility using the criteria described in Section 12.1. This facility had separate treatment systems for its basic oxygen furnaces (BOF), continuous casting, and vacuum degassing wastewaters (some underflows were treated together). The effluents from each treatment system were sampled before they were discharged to a common outfall. EPA mathematically composited the data from each sampling point to obtain a single daily concentration value for each pollutant at the outfall (see Section 12.4.3 for the aggregation procedure). (The facility uses a similar mathematical compositing procedure before reporting the monitoring data to its permitting authority.) EPA determined that these data represent the pollutant concentrations for all processes in this subcategory because all processes in the subcategory are represented except for BOFs with wet-suppressed and semi-wet air pollution control systems. However, because the pollutants generated in BOF steelmaking are dependent only upon the materials processed and the chemistry of the steelmaking reaction, EPA has determined that the concentrations achievable by the model treatment technology would also apply to BOFs with wet-suppressed and semi-wet air pollution control systems.

12.2.4 Subpart D: Integrated and Stand-Alone Hot Forming Subcategory

The Integrated and Stand-Alone Hot Forming Subcategory has two segments: Carbon and Alloy Steel Segment and the Stainless Steel Segment. EPA evaluated two options: CARBON_BAT-1 (for the Carbon andAalloy Steel Segment and SPECIALTY_BAT-1 (for the Stainless Steel Segment). The following two subsections describe the data for the two segments.

CARBON_BAT-1

CARBON_BAT-1 is the proposed option for the direct dischargers in the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. EPA selected two facilities corresponding to two sampling episodes (ESE04 and ESE07) and one self-monitoring episode (ISM66) to calculate the proposed limitations for lead, zinc, O&G, and TSS. EPA proposed O&G and TSS standards only for new direct dischargers. EPA selected these episodes using the criteria described in Section 12.1. In addition, both facilities employ high-rate

recycle and process only wastewater from hot strip mill operations. EPA used all of the data from the two sampling episodes in calculating the proposed limitations. EPA excluded the data from ISM66 because the data were collected after wastewater from the Steel Finishing Subcategory were commingled with the effluent from the hot strip mill effluent; the EPA sampling data were collected upstream of where the finishing wastewater was added.

For zinc, the two episodes had substantially different concentration values. Episode ESE04 had all non-detected measurements with sample-specific detection limits ranging from 2.8 to 4 ug/L. In contrast, episode ESE07 had all detected measurements ranging from 140 to 246 ug/L. EPA used the data from both episodes in calculating the proposed limitations. As a result, two of the detected measurements are greater than the proposed daily maximum limitation. For the final rule, EPA will review the data and process information to determine whether both datasets should be used in calculating the limitations.

SPECIALTY_BAT-1

The proposed SPECIALTY_BAT-1 option technology is the basis of the proposed limitations for the direct dischargers in the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. EPA did not sample any stainless steel integrated or stand-alone hot forming operations and did not obtain any self-monitoring data from this segment. Because water use and wastewater characteristics of stainless steel hot forming operations at non-integrated steel mills are similar to those at integrated and stand-alone hot forming mills, EPA transferred the proposed limitations from the Stainless Steel Segment of the Non-integrated Steelmaking and Hot Forming Subcategory to this segment. (EPA also used the data from that subcategory in selecting the pollutants of concern (POCs) for this segment that are identified in Section 11.) The data for the proposed limitations are discussed further in Section 12.2.5.2.

12.2.5 Subpart E: Non-Integrated Steelmaking and Hot Forming Subcategory

The Non-integrated Steelmaking and Hot Forming Subcategory has two segments: the Carbon and Alloy Steel Segment and the Stainless Steel Segment. EPA evaluated the data for two options: CARBON_BAT-1 (for the Carbon and Alloy Steel Segment) and SPECIALTY_BAT-1 (for the Stainless Steel Segment). The following two subsections describe the data for the two segments.

CARBON_BAT-1

The proposed CARBON_BAT-1 option technology is the basis of the proposed limitations for the direct dischargers in the Carbon and Alloy Steel Segment of the Non-integrated Steelmaking and Hot Forming Subcategory. This segment has three manufacturing processes that discharge wastewater: vacuum degassing, continuous casting, and hot forming. Using the criteria described in Section 12.1, EPA selected data from one facility corresponding to one self-monitoring episode (ISM63) to calculate the proposed limitations for lead and zinc. This facility treats vacuum degassing, continuous casting, and hot forming wastewater in its model technology treatment system. A small amount of noncontact cooling water is also treated in the treatment

system. EPA determined that these data represent the pollutant concentrations for all processes in this segment because all major wastewater-generating processes in the subcategory are represented. EPA used all of the data from this episode in calculating the proposed limitations.

SPECIALTY_BAT-1

The proposed SPECIALTY_BAT-1 option technology is the basis of the proposed limitations and standards for the direct and indirect dischargers in the Stainless Steel Segment of the Non-integrated Steelmaking and Hot Forming Subcategory. Using the criteria described in Section 12.1, EPA selected one facility corresponding to two episodes: one sampling episode (ESE09) and one self-monitoring episode (ISM64). The data from this facility represented wastewaters from continuous casting and hot forming. EPA determined that these data represent the pollutant concentrations for all processes because the continuous casting and hot forming wastestreams comprise the majority of wastestreams covered in this segment and the proposed technology components will treat the metals from all three wastestreams to the same levels regardless of the influent concentration levels. EPA proposed limitations for chromium and nickel. In calculating the proposed limitations, EPA used the chromium data from the sampling episode and the nickel data from both episodes (the self-monitoring episode did not include data for chromium).

In the following discussion, the Integrated and Stand-Alone Hot Forming Subcategory will be identified as the 'Integrated Hot Forming' Subcategory and the Non-integrated Steelmaking and Hot Forming Subcategory as the 'Non-integrated' Subcategory.

EPA transferred the proposed limitations for chromium and nickel to the Integrated Hot Forming Subcategory. EPA also used the data from sampling episode ESE09 to calculate the O&G and TSS standards for the Integrated Hot Forming Subcategory. (As explained in Section 12.1, industry did not supply any O&G data measured as HEM.) For the final rule, EPA will reconsider the exclusion of the TSS data from episode ISM64. Because the data are from the same facility and are similar to the data obtained during the sampling episode, EPA does not expect the limitations would change significantly by adding the additional TSS data (see DCN IS07057 in Section of 8.5 of the proposal record for summary statistics).

While EPA has proposed *no discharge of process wastewater pollutants to waters of the United States* for new sources in the Non-integrated Subcategory, EPA used the O&G and TSS data from this subcategory to develop the proposed standards for the new direct dischargers in the Integrated Hot Forming Subcategory. EPA has determined this is appropriate because the wastewaters are similar in both subcategories. EPA has proposed different types of limitations for the two subcategories based upon observed practices. Some facilities in the Non-integrated Subcategory do not discharge any wastewaters while all facilities in the Integrated Hot Forming Subcategory discharge wastewaters.

12.2.6 Subpart F: Steel Finishing Subcategory

The Steel Finishing Subcategory has two segments: the Carbon and Alloy Steel Segment, and the Stainless Steel Segment. As described in the following subsections, EPA evaluated two options: CARBON_BAT-1 (for the Carbon and Alloy Steel Segment) and SPECIALTY_BAT-1 (for the Stainless Steel Segment). The following two subsections describe the data for each segment.

CARBON_BAT-1

The proposed CARBON_BAT-1 option technology is the basis of the proposed limitations and standards for the direct and new indirect dischargers in the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory. This segment includes manufacturing processes such as acid pickling and cold forming (see Section 6 for the complete list). EPA selected two facilities corresponding to two sampling episodes (ESE04[15] and ESE05) and two self-monitoring episodes (ISM57 and ISM58) to calculate the proposed limitations for chromium, hexavalent chromium, lead, zinc, O&G, and TSS. (EPA proposed O&G and TSS standards only for new direct dischargers.) Both facilities treated a number of finishing operations in their model treatment systems: acid pickling, cold forming, alkaline cleaning, continuous annealing, electroplating, and hot dip coating. EPA determined that these data represent the pollutant concentrations for all processes in this segment because between the two facilities, all manufacturing processes in the subcategory are represented.

For chromium, EPA used the data from both sampling episodes and both self-monitoring episodes in calculating the proposed limitations.

For hexavalent chromium, EPA used the data from both sampling episodes in calculating the proposed limitations.[16] EPA excluded the hexavalent chromium data from self-monitoring episode ISM58 because of concerns about the analytical method (see Section 4.4.7 and DCN IS07058 in Section 8.5 of the proposal record). The other self-monitoring data did not include data for hexavalent chromium.

For lead and zinc, EPA used the data from both sampling episodes and self-monitoring episode ISM57 in calculating the proposed limitations. EPA excluded the data from

---

[15]EPA collected data for five days for this sampling episode. For four days, EPA obtained samples at a single location. On the fifth day, EPA could not sample at that location and instead obtained samples of the three wastestreams that combined at that location. EPA then field composited the samples to obtain a single composite sample representing that location. In this document, EPA has identified the samples for the five days with the same sample point. Elsewhere in the record, EPA may have used a different sample point number for the fifth day.

[16]EPA excluded a sample-specific detection limit of 100 ug/L that was a duplicate sample from episode ESE05. The corresponding duplicate had a sample-specific detection limit of 10 ug/L which was used in the calculations. EPA excluded the duplicate value of 100 ug/L because it was substantially greater than any detected value (the maximum was 15 ug/L) and because all other sample-specific detection limits were all equal to 10 ug/L.

episode ISM58 because of concerns about the analytical method (see Section 4.4.8 and DCN IS07058 in Section 8.5 of the proposal record).

For O&G, EPA used the O&G data measured as HEM from the two sampling episodes in calculating the proposed standards. (As explained in Section 12.1, industry did not supply any O&G data measured as HEM in its self-monitoring data.)

For TSS, EPA used all of the data from all four episodes in calculating the proposed standards.

SPECIALTY_BAT-1

The proposed SPECIALTY_BAT-1 option technology is the basis for the proposed limitations and standards for the direct and new indirect dischargers in the Stainless Steel Segment of the Steel Finishing Subcategory. EPA selected two facilities corresponding to one sampling episode (ESE06) and one self-monitoring episode (ISM59). EPA proposed limitations for ammonia as nitrogen, chromium, fluoride, hexavalent chromium, nickel, O&G, and TSS. (EPA proposed O&G and TSS limitations only for new sources that are direct dischargers.) In calculating the proposed limitations, EPA used all of the data from the sampling episode. In addition, EPA used the ammonia as nitrogen, chromium, hexavalent chromium, nickel, and TSS data from the self-monitoring episode. The self-monitoring episode did not include data for fluoride or O&G measured as HEM (see Section 12.1).

Episode ESE06 consists of data from electrolytic sodium sulfate descaling, acid pickling, and cold forming. Episode ISM59 consists of data from salt bath descaling, acid pickling, cold forming, continuous annealing, alkaline cleaning, and various other finishing operations (a small amount of stormwater is also processed in the treatment system). EPA determined that these data represent the pollutant concentrations for all processes in this segment because all processes in the subcategory are represented.

In developing the proposed limitations, EPA generally only used data from analytical methods approved for compliance monitoring or those that had been in use by EPA for decades in support of effluent guidelines development. The exceptions included industry supplied data from episode ISM59. The facility did not include any information on the analytical methods corresponding to the reported concentration values. However, because the data were collected at the sampling points specified for compliance monitoring, EPA has assumed that the methods were selected from the methods specified in or approved under 40 CFR Part 136 that facilities are required to use for compliance monitoring. See 40 CFR 122.44(I). For the final rule, EPA intends to contact the facility to confirm its assumption for these data.

For chromium, EPA noted differences between the two episodes for total chromium with episode ESE06 having detected measurements that were generally greater than the detected values from episode ISM59. (The values for episode ESE06 ranged from 69.5 to 298 ug/L and from 34 to 122 ug/L for episode ISM59.) The largest value from episode ESE06 was two times greater than any other value. This concentration value resulted from a batch

discharge from the chromium pretreatment step. EPA has no reason to conclude that this is not part of normal operations and thus has retained this value in calculating the proposed limitations.

For hexavalent chromium, the two episodes had substantially different concentration values. Episode ESE06 had detected measurements ranging from 66 to 215 ug/L. In contrast, episode ISM59 had detected measurements that were all less than the minimum value for episode ESE06. (The values for episode ISM59 ranged from 16 to 44 ug/L.) EPA notes that the data for episode ESE06 were generally high even on the days when the facility did not discharge from the chromium pretreatment step. EPA also notes that some hexavalent chromium values for episode ESE06 are greater than their corresponding chromium values (which theoretically should not occur). EPA used the data from both episodes in calculating the proposed limitations. For the final rule, EPA will review the data and process information to determine whether both datasets should be used in calculating the limitations.

12.2.7 Subpart G: Other Operations

The Other Operations Subcategory has three segments: the Direct Reduced Iron (DRI) Segment, the Forging Segment, and the Briquetting Segment. For the Briquetting Segment, EPA is proposing *no discharge of process wastewater pollutants to waters of the United States* as discussed in Section 8. The next two subsections describe the data used to calculate the proposed limitations for the remaining two segments.

DRI_BPT

The proposed DRI_BPT option technology is the basis for the proposed limitations for the direct dischargers in the DRI Segment of the Other Operations Subcategory. EPA selected data from one facility that had the model technology for TSS (and met the criteria in Section 12.1), which is the only pollutant that EPA is proposing to regulate. This treatment system treats water only from direct reduced ironmaking processes (a small amount of stormwater and equipment cleaning water is also treated in the treatment system). For this facility, EPA had data from one sampling episode (ESE10) and one self-monitoring episode (ISM65) that it used to calculate the proposed limitations for TSS. EPA included all of these data in calculating the proposed TSS limitations.

FORGING

For the Forging Segment, EPA proposed limitations for O&G and TSS for direct dischargers. EPA did not sample forging operations or obtain any forging self-monitoring data from facilities with the model technology. Because EPA has determined that the characteristics of forging operation wastewater are similar to hot forming operation wastewater (see Section 8), EPA transferred the proposed limitations from both segments of the Integrated and Stand-Alone Hot Forming Subcategory. Because, depending on the materials used, the forging operations can create wastestreams similar to either of the Hot Forming Segments, EPA averaged the proposed limitations from the two segments.

12.3 Data Substitutions

EPA used all of the data described in Section 12.2 in calculating the proposed limitations. In general, for these data, EPA used the reported measured value or sample-specific detection limit in its calculations. However, in a few cases, EPA substituted other values for reported values. These substitutions can be divided into three cases.

In the first case, EPA compared each laboratory-reported sample result to a baseline value (defined in Section 4). In some instances, EPA substituted a larger value for the measured value or sample-specific detection limit. This substitution is described in Sections 4.4.1 and 4.5.1.

In the second case, EPA compared the reported results to blank samples. If the process sample resulted in a concentration between the detection limit and ten times the amount detected in the blank sample, EPA considered the result to be non-detected and established a sample-specific detection limit equal to the baseline value (defined in Section 4). EPA made the substitutions because the presence of pollutant could be due to blank contamination. In calculating the proposed limitations, this substitution occurred only for chromium data collected during one sampling episode (ESE09) of the Integrated and Stand-Alone Hot Forming Subcategory.

The third case resulted from slight discrepancies in numerical representation that resulted from converting the database from one software package to another. As a result, values such as 0.01 are represented as 0.00999 in the database that EPA used in calculating the proposed limitations. This discrepancy is often associated with sample-specific detection limits. While any effect on the numerical results should be minimal, for the final rule, EPA will correct the database.

12.4 Data Aggregation

In some cases, EPA determined that two or more samples had to be mathematically aggregated to obtain a single value that could be used in other calculations. In some cases, this meant that field duplicates and grab samples were aggregated for a single sample point. In addition, for one facility, data were aggregated to obtain a single daily value representing the facility's effluent from multiple outfalls. Appendix D lists the data after these aggregations were completed and a single daily value was obtained for each day for each pollutant. (DCN IS07001 in Section 8.1 of the proposal record provides a list of the unaggregated data.)

In all aggregation procedures, EPA considered the censoring type associated with the data. EPA considered measured values to be *detected*. In statistical terms, the censoring type for such data was 'non-censored' (NC). Measurements reported as being less than some sample-specific detection limit (e.g., <10 mg/L) were censored and were considered to be *non-detected*

(ND). In the tables and data listings in this document and the record for the rulemaking, EPA has used the abbreviations NC and ND to indicate the censoring types.[17]

The distinction between the two censoring types is important because the procedure used to determine the variability factors considers censoring type explicitly. This estimation procedure modeled the facility data sets using the modified delta-lognormal distribution. In this distribution, data are modeled as a mixture of two distributions. Thus, EPA concluded that the distinctions between detected and non-detected measurements were important and should be an integral part of any data aggregation procedure. (See Appendix E for a detailed discussion of the modified delta-lognormal distribution.)

Because each aggregated data value entered into the modified delta-lognormal model as a single value, the censoring type associated with that value was also important. In many cases, a single aggregated value was created from unaggregated data that were all either detected or non-detected. In the remaining cases with a mixture of detected and non-detected unaggregated values, EPA determined that the resulting aggregated value should be considered to be detected because the pollutant was measured at detectable levels.

This section describes each of the different aggregation procedures. They are presented in the order that the aggregation was performed. That is, field duplicates were aggregated first, grab samples second, and finally multiple outfalls.

12.4.1 Aggregation of Field Duplicates

During the EPA sampling episodes, EPA collected a small number of field duplicates. Generally, ten percent of the number of samples collected were duplicated. Field duplicates are two samples collected for the same sampling point at approximately the same time, assigned different sample numbers, and flagged as duplicates for a single sample point at a facility.

Because the analytical data from each duplicate pair characterize the same conditions at that time at a single sampling point, EPA aggregated the data to obtain one data value for those conditions. The data value associated with those conditions was the arithmetic average of the duplicate pair.

In most cases, both duplicates in a pair had the same censoring type. In these cases, the censoring type of the aggregate was the same as the duplicates. In the remaining cases, one duplicate was a non-censored value and the other duplicate was a non-detected value. In these cases, EPA determined that the appropriate censoring type of the aggregate was 'non-censored' because the pollutant had been present in one sample. (Even if the other

[17]Laboratories can also report numerical results for specific pollutants detected in the samples as "right-censored." Right-censored measurements are those that are reported as being greater than the highest calibration value of the analysis (e.g., >1000 ug/L). None of the data used in calculating the proposed limitations included any right-censored data.

duplicate had a zero value[18], the pollutant still would have been present if the samples had been physically combined.) Table 12-1 summarizes the procedure for aggregating the analytical results from the field duplicates. This aggregation step for the duplicate pairs was the first step in the aggregation procedures for both influent and effluent measurements.

Table 12-1. Aggregation of Field Duplicates

If the field duplicates are:	Censoring type of average is:	Value of aggregate is:	Formulas for aggregate value of duplicates:
Both non-censored	NC	arithmetic average of measured values	$(NC_1 + NC_2)/2$
Both non-detected	ND	arithmetic average of sample-specific detection limits	$(DL_1 + DL_2)/2$
One non-censored and one non-detected	NC	arithmetic average of measured value and sample-specific detection limit	$(NC + DL)/2$

NC - non-censored (or detected). ND - non-detected. DL - sample-specific detection limit.

12.4.2 Aggregation of Grab Samples

During the EPA sampling episodes, EPA collected two types of samples: grab and composite. Typically, EPA collected composite samples. Of the pollutants proposed for regulation, O&G was the only one for which the chemical analytical method specifies that grab samples must be used. For O&G, EPA collected multiple (usually four) grab samples during a sampling day at a sample point. To obtain one value characterizing the pollutant levels at the sample point on a single day, EPA mathematically aggregated the measurements from the grab samples.

The procedure arithmetically averaged the measurements to obtain a single value for the day. When one or more measurements were non-censored, EPA determined that the appropriate censoring type of the aggregate was 'non-censored' because the pollutant was present. Table 12-2 summarizes the procedure.

[18]This is presented as a 'worst-case' scenario. In practice, the laboratories cannot measure 'zero' values. Rather they report that the value is less than some level (see Section 4).

Table 12-2. Aggregation of Grab Samples

If the grab or multiple samples are:	Censoring type of Daily Value is:	Daily value is:	Formulas for Calculating Daily Value:
All non-censored	NC	arithmetic average of measured values	$\frac{\sum_{i=1}^{n} NC_i}{n}$
All non-detected	ND	arithmetic average of sample-specific detection limits	$\frac{\sum_{i=1}^{n} DL_i}{n}$
Mixture of non-censored and non-detected values (total number of observations is n=k+m)	NC	arithmetic average of measured values and sample-specific detection limits	$\frac{\sum_{i=1}^{k} NC_i + \sum_{i=1}^{m} DL_i}{n}$

NC - non-censored (or detected). ND - non-detected. DL - sample-specific detection limit.

12.4.3 Aggregation of Data Across Outfalls ("Flow-Weighting")

After field duplicates and grab samples were aggregated, the data were further aggregated across sample points for different outfalls. This step was necessary for one facility (corresponding to two episodes: sampling episode ESE04 with data for three outfalls and self-monitoring episode ISM57 with data for five outfalls) where data from multiple sample points were aggregated to obtain a single daily value representing the episode's effluent from multiple outfalls. In aggregating values across sample points, if one or more of the values were non-censored, then the aggregated result was non-censored (because the pollutant was present in at least one stream). When all of the values were non-detected, then the aggregated result was considered to be non-detected. The procedure for aggregating data across streams is summarized in Table 12-3. The following example demonstrates the procedure for hypothetical pollutant X at an episode with three outfalls all from the model technology on day 1 of the sampling episode.

Example of calculating an aggregated flow-weighted value:

Day	Sample Point	Flow (gal)	Concentration (ug/L)	Censoring
1	SP-A	10,000,000	10	ND
1	SP-B	20,000,000	50	NC
1	SP-C	5,000,000	100	ND

Calculation to obtain aggregated, flow-weighted value:

$$\frac{(10{,}000{,}000\ \text{gal} \times 10\ \text{ug/L}) + (20{,}000{,}000\ \text{gal} \times 50\ \text{ug/L}) + (5{,}000{,}000\ \text{gal} \times 100\ \text{ug/L})}{10{,}000{,}000\ \text{gal} + 20{,}000{,}000\ \text{gal} + 5{,}000{,}000\ \text{gal}} = 45.7\ \text{ug/L} \quad (12\text{-}1)$$

Because one of the three values was non-censored, the aggregated value of 45.7 ug/L is non-censored.

Table 12-3. Aggregation of Data Across Streams

If the n observations are:	Censoring type is:	Formulas for value of aggregate
All non-censored	NC	$\frac{\sum_{i=1}^{n} NC_i \times flow_i}{\sum_{i=1}^{n} flow_i}$
All non-detected	ND	$\frac{\sum_{i=1}^{n} DL_i \times flow_i}{\sum_{i=1}^{n} flow_i}$
Mixture of k non-censored and m non-detected (total number of observations is n=k+m)	NC	$\frac{\sum_{i=1}^{k} NC_i \times flow_i + \sum_{i=1}^{m} DL_i \times flow_i}{\sum_{i=1}^{n} flow_i}$

NC - non-censored (or detected). ND - non-detected. DL - sample-specific detection limit.

12.5 Overview of Limitations

The preceding sections discuss the data selected as the basis for the proposed limitations and the data aggregation procedures EPA used to obtain daily values in its calculations. This section (12.5) provides a general overview of limitations before returning to the development of the proposed limitations for the iron and steel industry in Section 12.6. This section describes EPA's objective for daily maximum and monthly average limitations, the selection of percentiles for those limitations, and compliance with final limitations. EPA has included this discussion in Section 12 because these fundamental concepts are often the subject of comments on EPA's proposed effluent guidelines regulations and in EPA's contacts and correspondence with the iron and steel industry.

12.5.1 Objective

In establishing daily maximum limitations, EPA's objective is to restrict the discharges on a daily basis at a level that is achievable for a facility that targets its treatment at the long-term average. EPA acknowledges that variability around the long-term average results from normal operations. This variability means that occasionally facilities may discharge at a level that is greater than the long-term average. This variability also means that facilities may occasionally

discharge at a level that is considerably lower than the long-term average. To allow for these possibly higher daily discharges, EPA has established the daily maximum limitation. A facility that discharges consistently at a level near the daily maximum limitation would not be operating its treatment to achieve the long-term average, which is part of EPA's objective in establishing the daily maximum limitations. That is, targeting treatment to achieve the limitations may result in frequent values exceeding the limitations due to routine variability in treated effluent.

In establishing monthly average limitations, EPA's objective is to provide an additional restriction to help insure that facilities target their average discharges to achieve the long-term average. The monthly average limitation requires continuous dischargers to provide on-going control, on a monthly basis, that complements controls imposed by the daily maximum limitation. In order to meet the monthly average limitation, a facility must counterbalance a value near the daily maximum limitation with one or more values well below the daily maximum limitation. To achieve compliance, these values must result in a monthly average value at or below the monthly average limitation.

12.5.2 Selection of Percentiles

EPA calculates limitations based upon percentiles chosen with the intention, on one hand, to be high enough to accommodate reasonably anticipated variability within control of the facility and, on the other hand, to be low enough to reflect a level of performance consistent with the Clean Water Act requirement that these effluent limitations be based on the "best" technologies. The daily maximum limitation is an estimate of the 99th percentile of the distribution of the *daily* measurements. The monthly average limitation is an estimate of the 95th percentile of the distribution of the *monthly* averages of the daily measurements.

The 99th and 95th percentiles do not relate to, or specify, the percentage of time a discharger operating the "best available" or "best available demonstrated" level of technology will meet (or not meet) the limitations. Rather, the use of these percentiles relate to the development of limitations. (The percentiles used as a basis for the limitations are calculated using the products of the long-term averages and the variability factors as explained in the next section.) If a facility is designed and operated to achieve the long-term average on a consistent basis and the facility maintains adequate control of its processes and treatment systems, the allowance for variability provided in the limitations is sufficient to meet the requirements of the proposed rule. The use of 99 percent and 95 percent represents a need to draw a line at a definite point in the statistical distributions (100 percent is not feasible because it represents an infinitely large value) and a policy judgment about where to draw the line that would ensure that operators work hard to establish and maintain the appropriate level of control. In essence, in developing the proposed limitations, EPA has taken into account the reasonable anticipated variability in discharges that may occur at a well-operated facility. By targeting its treatment at the long-term average, a well-operated facility should be capable of complying with the limitations at all times because EPA has incorporated an appropriate allowance for variability into the limitations.

In conjunction with the statistical methods, EPA performs an engineering review to verify that the limitations are reasonable based upon the design and expected operation of the

control technologies and the facility process conditions. As part of that review, EPA examines the range of performance by the facility data sets used to calculate the limitations. Some facility data sets demonstrate the best available technology. Other facility data sets may demonstrate the same technology, but not the best demonstrated design and operating conditions for that technology. For these facilities, EPA will evaluate the degree to which the facility can upgrade its design, operating, and maintenance conditions to meet the limitations. If such upgrades are not possible, then the limitations are modified to reflect the lowest levels that the technologies can reasonably be expected to achieve.

12.5.3 Compliance with Limitations

EPA promulgates limitations that facilities are capable of complying with at all times by properly operating and maintaining their processes and treatment technologies. However, the issue of exceedances[19] or excursions is often raised by comments on proposed limitations (as has been EPA's experience with proposals for other industries). For example, comments often suggest that EPA include a provision that a facility is in compliance with permit limitations if its discharge does not exceed the specified limitations, with the exception that the discharge may exceed the monthly average limitations one month out of 20 and the daily average limitations one day out of 100. This issue was, in fact, raised in other rules, most notably in EPA's final Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) rulemaking. EPA's general approach there for developing limitations based on percentiles is the same in this proposal, and was upheld in Chemical Manufacturers Association v. U.S. Environmental Protection Agency, 870 F.2d 177, 230 (5th Cir. 1989). The Court determined that:

> EPA reasonably concluded that the data points exceeding the 99th and 95th percentiles represent either quality-control problems or upsets because there can be no other explanation for these isolated and extremely high discharges. If these data points result from quality-control problems, the exceedances they represent are within the control of the plant. If, however, the data points represent exceedances beyond the control of the industry, the upset defense is available.
> Id. at 230.

EPA's allowance for reasonable anticipated variability in its effluent limitations, coupled with the availability of the upset defense reasonably accommodates acceptable excursions. Any further excursion allowances would go beyond the reasonable accommodation of variability and would jeopardize the effective control of pollutant discharges on a consistent basis and/or bog down administrative and enforcement proceedings in detailed fact finding exercises, contrary to Congressional intent. See, e.g., Rep. No. 92-414, 92nd Congress, 2nd

[19]Values that exceed the limitations

Sess. 64, reprinted in A Legislative History of the Water Pollution Control Act Amendments of 1972 at 1482; Legislative History of the Clean Water Act of 1977 at 464-65.

EPA recognizes that the preceding discussion is inconsistent with Appendix A in two of the 1982 development documents. (The same appendix is attached to both documents.) This appendix incorrectly implies that EPA condones periodic violations of monthly average limitations in its statement that

> . . . it would be expected that 95 percent of the randomly observed 30-day average values from a treatment system discharging the pollutant at a known mean concentration will fall below this bound. Thus, a well operated plant would be expected, on the average, to incur approximately one violation of the 30-day average limitation during a 20 month period.

This statement does not accurately reflect EPA's interpretation of its 1982 regulations, nor of today's proposed limitations. Rather, EPA expects that facilities will comply with promulgated limitations *at all times*. If the exceedance is caused by an upset condition, the facility would have an affirmative defense to an enforcement action if the requirements of 40 CFR 122.41(n) are met. If the exceedance is caused by a design or operational deficiency, then EPA has determined that the facility's performance does not represent the appropriate level of control (best available technology for existing sources; best available demonstrated technology for new sources). For promulgated limitations and standards, EPA has determined that such exceedances can be controlled by diligent process and wastewater treatment system operational practices such as frequent inspection and repair of equipment, use of back-up systems, and operator training and performance evaluations.

12.6 Summary of Proposed Limitations

The proposed limitations for pollutants for each option are provided as 'daily maximums' and 'maximums for monthly averages' (except for pH as described below). Definitions provided in 40 CFR 122.2 state that the daily maximum limitation is the "highest allowable 'daily discharge'" and the maximum for monthly average limitation (also referred to as the "monthly average limitation") is the "highest allowable average of 'daily discharges' over a calendar month, calculated as the sum of all 'daily discharges' measured during a calendar month divided by the number of 'daily discharges' measured during that month." Daily discharges are defined to be the "'discharge of a pollutant' measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of samplings."

EPA has proposed five types of limitations for the iron and steel industry as follows:

Type 1: Proposed daily maximum and monthly average limitations expressed in terms of allowable pollutant discharge (pounds) per

unit of production (short tons). Most of the proposed limitations are of this type.

Type 2: Proposed daily maximum and monthly average limitations are expressed in terms of allowable pollutant discharge (pounds) per day. This second type is used for fume scrubber operations (both wet pollution and acid regeneration) in the Steel Finishing Subcategory.

Type 3: Proposed daily maximum limitations for 2,3,7,8-tetrachlorodibenzo-furan (TCDF) are expressed as less than the minimum level ("<ML") or ten parts per quadrillion using the analytical method for TCDF specified in 40 CFR Part 136. These proposed limitations are specified as daily maximums for the Sintering Segment of the Ironmaking Subcategory (and the Blast Segment when wastewaters are combined with sintering wastewater). EPA has not proposed monthly average limitations for this pollutant because EPA assumed that facilities will monitor for this pollutant only once a month.

Type 4: Proposed limitations for pH which are specified as a range of values between 6 and 9. These proposed limitations are discussed in Section IX.A in the preamble to the proposed rulemaking.

Type 5: For certain processes and discharge types (that is, some new sources and indirect dischargers), EPA has determined that there shall be *no discharge of process wastewater pollutants to waters of the United States.* This requirement is discussed in Section 7.

The remainder of Section 12 mainly describes the development of the limitations corresponding to Types 1 and 2. In this document and elsewhere, EPA refers to such limitations as 'production-normalized.' EPA has proposed production-normalized limitations in terms of daily maximums and maximum for monthly averages for all pollutants except total residual chlorine (TRC). For TRC, EPA has proposed only daily maximum limitations as explained in Section 12.9.

To derive the proposed production-normalization limitations, EPA used the modified delta-lognormal distribution to develop limitations based upon the concentration data ("concentration-based limitations"). Section 12.7 describes the calculations for the concentration-based limitations. Section 12.8 describes the conversion of these limitations to "production-normalized limitations" using the model flow rates described in Section 7.

12.7 Estimation of Concentration-Based Limitations

In estimating the concentration-based limitations (except TCDF which is described in the previous section), EPA determines an average performance level (the "option long-term average" discussed in the next section) that a facility with well-designed and operated model technologies (which reflect the appropriate level of control) is capable of achieving. This long-term average is calculated from the data from the facilities using the model technologies for the option (these data are described in Section 12.2). EPA expects that all facilities subject to the limitations will design and operate their treatment systems to achieve the long-term average performance level on a consistent basis because facilities with well-designed and operated model technologies have demonstrated that this can be done.

In the second step of developing a limitation, EPA determines an allowance for the variation in pollutant concentrations when processed through extensive and well designed treatment systems. This allowance for variance incorporates all components of variability including shipping, sampling, storage, and analytical variability. This allowance is incorporated into the limitations through the use of the variability factors (the "option variability factor" discussed in Section 12.7.4) which are calculated from the data from the facilities using the model technologies. If a facility operates its treatment system to meet the relevant long-term average, EPA expects the facility will be able to meet the limitations. Variability factors assure that normal fluctuations in a facility's treatment are accounted for in the limitations. By accounting for these reasonable excursions above the long-term average, EPA's use of variability factors results in limitations that are generally well above the actual long-term averages.

Facilities that are designed and operated to achieve long-term average effluent levels used in developing the limitation should be capable of compliance with the proposed limitations, which incorporate variability, at all times.

The following sections describe the calculation of the option long-term averages and option variability factors.

12.7.1 Calculation of Option Long-Term Averages

This section discusses the calculation of long-term averages by episode ("episode-specific long-term average") and by option ("option long-term average") for each pollutant. These long-term averages discussed in this section were used to calculate the proposed limitations.[20]

First, EPA calculated the episode-specific long-term average by using either the modified delta-lognormal distribution or the arithmetic average (see Appendix E). In Attachment

[20]For costing purposes, EPA used the arithmetic averages of the data. Because the costing analyses were performed earlier than the calculation of the proposed limitations, most of the data exclusions were not incorporated in the costing analyses. However, before incorporating the data exclusions into the proposed limitations, EPA concluded that the impact of the data exclusions on the costing analyses would not be sufficient to result in selection of a different option.

12-1 in Appendix F, EPA has listed the arithmetic average (column labeled 'Obs Mean') and the estimated episode-specific long-term average (column labeled 'Est LTA'). If EPA used the arithmetic average as the episode long-term average, then the two columns have the same value.

Second, EPA calculated the option long-term average for a pollutant as the *median* of the episode-specific long-term averages for that pollutant from selected episodes with the technology basis for the option (see Sections 12.1 and 12.2). The median is the midpoint of the values ordered (i.e., ranked) from smallest to largest. If there is an odd number of values (with n=number of values), then the value of the (n+1)/2 ordered observation is the median. If there are an even number of values, then the two values of the n/2 and [(n/2)+1] ordered observations are arithmetically averaged to obtain the median value.

For example, for subcategory Y option Z, if the four (i.e., n=4) episode-specific long-term averages for pollutant X are:

Facility	Episode-Specific Long-Term Average
A	20 mg/l
B	9 mg/l
C	16 mg/l
D	10 mg/l

then the ordered values are:

Order	Facility	Episode-Specific Long-Term Average
1	A	9 mg/l
2	B	10 mg/l
3	C	16 mg/l
4	D	20 mg/l

And the pollutant-specific long-term average for option Z is the median of the ordered values (i.e., the average of the 2nd and 3rd ordered values): (10+16)/2 mg/l = 13 mg/l.

The option long-term averages were used in developing the proposed limitations for each pollutant within each regulatory option.

12.7.2 Comparison of Option Long-Term Averages to Baseline Values

After calculating the option long-term averages for each pollutant, EPA compared these values to the baseline values provided in Section 4. If the option long-term average was less than the baseline value, EPA substituted the baseline value for the option long-term average.

(This comparison is described in more detail in Section 4.4.) Table 12-4 identifies the cases for which the baseline value was substituted for the calculated long-term average.[21]

Table 12-4. Option Long-Term Averages Replaced by the Baseline Values

Pollutant	Baseline Value (ug/L)	Subcategory	Option	Calculated Option Long-Term Average (ug/L)
Lead	50	Finishing	CARBON_BAT-1	2.0
		Integrated and Stand-Alone Hot Forming	CARBON_BAT-1	12.3
		Integrated Steelmaking	BAT-1	12.9
		Ironmaking	BAT-1	3.5
			PSES-1	33.0
		Non-Integrated Steelmaking and Hot Forming	CARBON_BAT-1	1.0
TSS	4,000	Finishing	SPECIALTY_BAT-1	3,454

12.7.3 Transfer of Option Long-Term Average

For the BAT-1 option in the Ironmaking Subcategory, EPA did not receive any data for phenol from the model technology. (See Section 12.2.2.1.) For this single case, EPA transferred the option long-term average from an option in the 1982 rulemaking. This long-term average (0.01 mg/L) was the same for both the sintering and ironmaking subcategories for the 1982 rule.

12.7.4 Calculation of Option Variability Factors

In developing the option variability factors used in calculating the proposed limitations, EPA first developed daily and monthly episode-specific variability factors using the modified delta-lognormal distribution. This estimation procedure is described in Appendix E. Attachment 12-2 in Appendix F lists the episode-specific variability factors.

After calculating the episode-specific variability factors, EPA calculated the option daily variability factor as the *mean* of the episode-specific daily variability factors for that pollutant in the subcategory and option. Likewise, the option monthly variability factor was the mean of the episode-specific monthly variability factors for that pollutant in the subcategory and option. Attachment 12-3 in Appendix F lists the option variability factors.

[21]EPA made this substitution only for the purposes of calculating the proposed limitations. Elsewhere in its evaluation of the industry (such as costing and benefits estimation), EPA used the values as calculated.

12.7.5 Transfers of Option Variability Factors

After estimating the option variability factors, EPA identified several pollutants for which variability factors could not be calculated in some options. This resulted when all episode datasets for the pollutant in the option had too few detected measurements to calculate episode-specific variability factors (see data requirements in Appendix E). For example, if a pollutant had all non-detected values for all of the episodes in an option, then it was not possible to calculate option variability factors. When EPA could not calculate the option variability factors or determined that the calculated option variability factors should be replaced, EPA selected variability factors from other sources to provide an adequate allowance for variability in the proposed limitations. This section describes these cases.

Table 12-5 lists the pollutants for which EPA was unable to calculate option variability factors. The following paragraphs describe EPA's determination for each case.

Table 12-5. Cases where Option Variability Factors Could Not be Calculated

Subcategory	Option	Pollutant	Source of Variability Factors
Cokemaking	BAT-1	Benzo(a)pyrene	naphthalene, same option
		Phenol	OCPSF phenol values from biological treatment (2.49705, 1.40602)
Steel Finishing	SPECIALTY_BAT-1	Oil & Grease	median of Oil & Grease variability factors from all non-cokemaking subcategories (see Table 12-6)
Ironmaking	PSES-1	Oil & Grease	
Other Operations	DRI_BPT	Oil & Grease	
Non-Integrated Steelmaking and Hot Forming	CARBON_BAT-1	Lead	median of lead VFs across subcategories and options where lead has proposed limitations

For benzo(a)pyrene in the BAT-1 option of the Cokemaking Subcategory, EPA transferred the option variability factors for naphthalene from the same option. EPA expects that these two pollutants would have similar variability in the effluent concentrations because they are chemically similar.

Likewise for phenol in the BAT-1 option of the Cokemaking Subcategory, EPA transferred the variability factors that were used to develop the promulgated limitations for the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) industry. These variability factors for phenol are listed in Table VII-66 'Individual Toxic Pollutant Variability Factors for BAT Subcategory One' on page VII-222 of the OCPSF Development Document.[22] EPA has determined that it is reasonable to transfer the variability factors from that industry to the

[22]U.S. Environmental Protection Agency. Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category. Volume I, Volume II. EPA 440/1-87/009, 1987.

Cokemaking Subcategory because of similarities in the model technologies. (Both OCPSF and iron and steel assume weekly monitoring in calculating the monthly variability factors.)

For O&G, because there were too few detected measurements, option variability factors could not be calculated for two options: SPECIALTY_BAT-1 in the Steel Finishing Subcategory and PSES-1 in the Ironmaking Subcategory. For these options, EPA used the median of the option variability factors from all subcategories where EPA proposes to regulate O&G, except the Cokemaking Subcategory. (These option variability factors are listed in Table 12-6.) EPA excluded the Cokemaking Subcategory from the median calculations because the BAT-1 option in cokemaking includes biological treatment, which is not a component of the other model technologies.

Table 12-6. O&G Long-Term Averages and Variability Factors

Subcategory	Option	Long-Term Average (mg/L)	Variability Factors	
			Daily	Monthly
Cokemaking	BAT-1	7.24	2.57	1.39
Steel Finishing	CARBON_BAT-1	6.28	1.19	1.07
	SPECIALTY_BAT-1	6.20	N/A	N/A
Integrated and Stand-Alone Hot Forming	CARBON_BAT-1	6.58	1.44	1.14
Non-Integrated Steelmaking and Hot Forming	SPECIALTY_BAT-1	9.20	3.07	1.56
Ironmaking	PSES-1	5.88	N/A	N/A
Median Variability Factors (excluding Cokemaking)			1.44	1.14

N/A - Variability Factors could not be calculated for this option.

For lead, EPA determined that the median of the lead variability factors should be used for the PSES-1 option of the Non-integrated Steelmaking and Hot Forming Subcategory. (See Table 12-7.) Further, EPA determined that these median variability factors should be applied to all subcategories where lead has proposed limitations. EPA made this determination because the variability factors vary widely (from 1.65 to 8.57 for the daily variability factors) from option to option, but the long-term averages are all equal to the same value of 50 ug/L. (This is because all of the calculated long-term averages were below the baseline value of 50 ug/L as explained in Section 12.7.2.) Before making this determination, EPA compared the largest detected value for each option to the proposed daily maximum limitation of 146 ug/L derived from the baseline value and the median variability factor. All of the detected concentrations were substantially below the proposed daily maximum limitation.

Table 12-7. Lead Long-Term Averages and Variability Factors

Subcategory	Option	Baseline Value (new LTA) ug/L	Maximum Detected Value (ug/L)	Calculated Long-Term Average (ug/L)	Variability Factors	
					Daily	Monthly
Steel Finishing	CARBON_BAT-1	50	12	2.00	1.65	1.11
Integrated and Stand-Alone Hot Forming	CARBON_BAT-1	50	12	12.85	6.80	2.35
Integrated Steel	BAT-1	50	33	26.78	1.75	1.22
Ironmaking	BAT-1	50	23	3.47	8.57	2.70
	PSES-1	50	68	33.05	2.92	1.52
Non-Integrated Steelmaking and Hot Forming	CARBON_BAT-1	50	all non-detected	1.0	n/a	n/a
				Median Variability Factors:	2.92	1.52

12.7.6 Summary of Steps Used to Derive Concentration-Based Limitations

This section summarizes the steps used to derive the proposed concentration-based limitations. For each pollutant in an option for a subcategory, EPA performed the following steps in calculating the proposed concentration-based limitations:

Step 1 EPA calculated the *episode-specific long-term averages and daily and monthly variability factors* for all selected episodes with the model technology for the option in the subcategory. (See Section 12.2 for selection of episodes and Attachment 12-2 in Appendix F for episode-specific long-term averages and variability factors.)

Step 2 EPA calculated the *option long-term average* as the median of the episode-specific long-term averages. (See Attachment 12-3 in Appendix F.)

Step 3 EPA calculated the *option variability factors* for each pollutants as the mean of the episode-specific variability factors from the episodes with the model technology. (See Attachment 12-3 in Appendix F.) The option daily variability factor is the mean of the episode-specific daily variability factors. Similarly, the option monthly variability factor is the mean of the episode-specific monthly variability factors.

Step 4 For the pollutants for which Steps 1 and 3 failed to provide option variability factors, EPA determined variability factors on a case-by-case basis. (See Table 12-5.)

Step 5 EPA calculated each proposed concentration-based *daily maximum limitation* for a pollutant using the product of the option long-term average and the option daily variability factor. (See Attachment 12-3 in Appendix F.)

Step 6 EPA calculated each proposed concentration-based *monthly average limitation* for a pollutant using the product of the option long-term average and the option monthly variability factor. (See Attachment 12-3 in Appendix F.)

Step 7 EPA *compared* the proposed daily maximum limitations to the data used to develop the limitations. EPA performed this comparison to determine if EPA used appropriate distributional assumptions for the data used to develop the limitations, in other words, whether the curves EPA used provide a reasonable "fit" to the actual effluent data.[23] (See DCN IS07030 in Section 8.3 of the proposal record.)

The next section describes the conversion of the concentration-based limitations to the production-normalized limitations that are provided in the proposed regulation.

12.8 Conversion to Production-Normalized Limitations

The previous discussions about the limitations were based upon concentration data. However, except for 2,3,7,8-TCDF and pH (see Section 12.6), EPA proposed limitations expressed as pounds per short ton (lbs/ton) and pounds per day (lbs/day). The current Part 420 regulation and other previous mass-based regulations have presented pollutant limitations in terms of kilograms of allowable pollutant discharge per thousand kilograms of production (kg/kkg), also expressed as pounds of allowable pollutant discharge per thousand pounds of production (lbs/1,000 lbs). Today's proposed regulation presents pollutant limitations in terms of pounds of allowable pollutant discharge per ton of production (lbs/ton). The Agency made this change to express the limitations in terms of the production value that is a standard throughout the industry. In section XIII.B of the preamble to the proposed rule, the Agency has requested comments on this format.

This section describes the conversion from concentration-based limitations to the production-normalized limitations in the proposed regulation. This section also provides EPA's methodology for determining the number of significant digits to use for the proposed production-normalized limitations.

12.8.1 Conversion from Concentration-Based Limitations

In calculating the proposed production-normalized limitations, EPA used the concentration-based limitations, the production flow rates, and one of two conversions factors.

[23]EPA believes that the fact that EPA performs such an analysis before proposing limitations may give the impression that EPA expects occasional exceedances of the limitations. This conclusion is incorrect. EPA promulgates limitations that facilities are capable of complying with at all times by properly operating and maintaining their treatment technologies. This concept is explained in greater detail in DCN IS07030 in Section 8.3 of the proposal record.

The concentration-based limitations are calculated as described in the previous section and are listed in Attachment 12-3 in Appendix F. The following paragraphs briefly describe the production flow rates and the conversion factors used to calculate the production-normalized limitations.

The production flow rates used in the calculation are expressed as production-normalized flow rates (PNFs) in terms of gallons of water discharged per ton of production (gpt) for all operations except certain fume scrubbers (wet air pollution control devices and acid regeneration for steel finishing operations) where the flow rates are expressed in gallons per minute (gpm). The production-normalized flow rates are provided in Attachment 12-4 in Appendix F (the derivation of these flow rates is explained in Section 7).

EPA used two different conversion factors depending on whether the production-normalized flow rates were expressed as gallons per ton (gpt or gal/ton) or gallons per minute (gpm or gal/min). Both conversion factors assume that the concentration-based limitations are expressed as micrograms per liter (ug/L).[24] These two conversion factors are listed below:

Conversion factor 1: used to obtain proposed limitations expressed as pounds per ton (lb/ton) for all processes except fume scrubbers and acid regeneration:

$$\text{ConversionFactor 1} = \frac{3.7854\text{L}}{\text{gal}} \times \frac{\text{lb}}{453.593\times10^{6}\text{mg}} = 8.3454\times10^{-9}\ \frac{\text{L/gal}}{\text{mg/lb}} \qquad (12\text{-}2)$$

Conversion Factor 2: used to obtain proposed limitations expressed as pounds per day (lb/day) for fume scrubbers and acid regeneration processes:

$$\text{Conversion Factor 2} = \text{Conversion Factor 1}\times\frac{60\ \text{min}}{\text{hr}}\times\frac{24\ \text{hr}}{\text{day}} = 1.2017\times10^{-5}\ \frac{\text{L/gal}}{\text{mg/lb}}\ \frac{\text{min}}{\text{day}} \qquad (12\text{-}3)$$

The following is an example of applying the first conversion factor:

> For the Ironmaking Subcategory option BAT-1, suppose the concentration based daily maximum limitation is 100 ug/L. Using the production value of 75 gpt for the Ironmaking Subcategory, the production-normalized daily maximum limitation ($limit1_{pn}$) is:

$$Limit1_{pn} = 100\frac{\mu g}{L}\times 75\frac{gal}{short\ ton}\times 8.3454\times10^{-9}\ \frac{L/gal}{\mu g/lb} = 0.0000626\frac{lb}{ton} \qquad (12\text{-}4)$$

[24]To convert concentration-based limitations expressed as milligrams per liter (mg/L) rather than ug/L, both conversion factors were multiplied by 1000.

EPA used the production flows and conversion factors to calculate each production-normalized limitation using the following basic equation:

Production-normalized limitation =
Concentration-based limitation × Production-normalized flow rate × conversion factor

12.8.2 Significant Digits for Production-Normalized Limitations

After completing the conversions described in the previous section, EPA rounded the proposed production-normalized limitations to three significant digits. EPA used a rounding procedure where values of five and above are rounded up and values of four and below are rounded down. For example, a value of 0.003455 would be rounded to 0.00346, while a value of 0.003454 would be rounded to 0.00345. The production-normalized limitations listed in Attachment 12-5 in Appendix F have three significant digits.

12.9 Transfers of Limitations

In some cases, EPA was either unable to calculate a limitation using the available data for an option or determined that the treatment provided by facilities employing the option did not represent the appropriate level of treatment for the model technologies. In these cases, EPA based the proposed limitations for one option upon data from another option or from the 1982 regulation. In effect, EPA has transferred the limitations from one option to another. Table 12-8 identifies each case and the section that provides EPA's rationale for the transfer.

Table 12-8. Transfers of Proposed Limitations

Target Subcategory/Option	Transfers discussed in Section:	Source of Limit Transfer	Pollutant
Cokemaking By-Product/BAT-3	12.2.1.1	BAT-1 (same subcategory)	Benzo(a)pyrene Oil & Grease Mercury Naphthalene Phenol Selenium Thiocyanate TSS
Cokemaking By-Product/BAT-3 (cont.)	12.2.1.1	1982 Regulation (ironmaking/sinter subcategories)	TRC[1]
Ironmaking/ BAT-1	12.2.2.1	PSES-1 (same subcategory)	2378-TCDF (Sintering Subcategory only) Oil & Grease
		1982 Regulation (ironmaking/sinter subcategories)	TRC[1] TSS
Integrated and Stand-Alone Hot Forming / SPECIALTY_BAT-1 (Stainless Steel Segment)	12.2.4.2	Non-Integrated Steelmaking and Hot Forming / SPECIALTY_BAT-1	Chromium Oil & Grease Nickel TSS
Other Operations/Forging	12.2.7.2	Average of the proposed BAT-1 limitations for the two options (CARBON_BAT-1 and SPECIALTY_BAT-1) in the Integrated and Stand-Alone Hot Forming Subcategory	Oil & Grease TSS

[1]EPA proposed only daily maximum limitations for TRC because the 1982 regulations do not include monthly average limitations.

For the proposed limitations transferred from other options (rather than the 1982 regulation), EPA transferred the concentration-based limitations (listed in Attachment 12-3 in Appendix F) and converted them to production-normalized limitations using the appropriate production values identified in Attachment 12-4 in Appendix F. (The proposed limitations for 2,3,7,8-TCDF were not converted to production-normalized limitations because the limitations are expressed as less than the minimum level ("<ML") or ten parts per quadrillion using the analytical method for TCDF specified in 40 CFR Part 136.)

For the proposed limitations transferred from the 1982 regulation, EPA adjusted the production-normalized limitations for the proposed production-normalized flow (listed in Section 12-4) and the change in units from the pounds per 1000 pounds in the 1982 regulation to the proposed pounds per ton. For example, in converting the total residual chlorine (TRC) daily maximum limitation ('limit1') of 0.000146 lb/1000 lb from the Ironmaking Subcategory to the Cokemaking Subcategory, EPA adjusted for the production-normalized flows by using the ratio of the proposed production-normalized flow of 158 gal/ton for the Cokemaking Subcategory to the production-normalized flow of 70 gal/ton used in 1982 to develop the ironmaking limitation. EPA then multiplied by 2 to convert from lb/1000 lb to lb/ton. After these conversion, EPA obtained the proposed value of 0.000165 lb/ton:

TRC proposed daily maximum limitation for cokemaking

$$= 0.000146 \ \frac{\text{lb}}{1000 \text{ lb}} \times \frac{158 \ \frac{\text{gal}}{\text{ton}}}{70 \ \frac{\text{gal}}{\text{ton}}} \times \left(2 \times \frac{1000 \text{ lb}}{\text{ton}} \right) = 0.000165 \ \frac{\text{lb}}{\text{ton}} \qquad (12\text{-}5)$$

As explained in Section 12.2, EPA has concluded that the transfers of these proposed limitations are appropriate after considering the technology bases. As such, EPA has every reason to conclude that facilities employing the option technology could achieve the proposed limitations.

In the proposed regulation, EPA modified the expression of some limitations (such as BPT limitations for most subcategories) from those in the 1982 regulation. EPA has done this so that the limitations correspond to the proposed subcategorization described in Section 6. In this modification, EPA has expressed the limitations in terms of lb/ton rather than lb/1000 lb (or kg/1000 kg) used in the 1982 regulation. The corresponding numerical values are now twice as large as those in the 1982 regulation. However, while the numerical values in the proposed regulation are greater than those in the 1982 regulation, they are mathematically equivalent because of the change in the units from lb/1000 lb to lb/ton. For example, a limitation of 0.0300 lb/1000 lb in the 1982 regulation is the same as 0.0600 lb/ton in the proposed regulation. The Agency made this change to express the limitations in terms of the production value that is a standard throughout the industry. In section XIII.B of the preamble to the proposed rule, the Agency has requested comments on this format.

SECTION 13

NON-WATER QUALITY ENVIRONMENTAL IMPACTS

Sections 304(b) and 306 of the Clean Water Act require EPA to consider non-water quality environmental impacts, including energy requirements, associated with effluent limitations guidelines and standards. In accordance with these requirements, EPA has considered the potential impacts of the proposed regulation on energy consumption, air emissions, and solid waste generation. Agency estimates of these impacts for each subcategory are presented in Table 13-1 and summarized in Sections 13.1, 13.2, and 13.3.

13.1 Energy Requirement Impacts

Table 13-1 summarizes energy requirements, as reported in the industry surveys, by subcategory. Table 13-2 presents the incremental energy requirements for each option within each subcategory. EPA determined the incremental energy requirements only for those new treatment units that would be necessary to upgrade to the model treatment systems. The energy requirements for each option are discussed in the subsections below. In general, additional energy requirements are a result of the electric motors in new or upgraded cooling water recycle and treatment systems to drive water pumps, chemical mixers, aeration equipment such as blowers and compressors, and cooling tower fans. Energy requirements are calculated by summing the total horsepower (HP) needed for each recycling or treatment step, converting horsepower to kilowatts (kW), and multiplying by the operational time (hours). The equation below shows the conversion from total system horsepower to annual electrical usage (Reference 13-1) in kilowatt-hours per year (kWh/yr).

$$\text{Energy Required} = 0.7456 \frac{\text{kW}}{\text{HP}} \times \text{HP} \times \text{HPY} \qquad (13\text{-}1)$$

where:

HP = Total horsepower required by additional equipment
HPY = Hours per year of equipment operation.

13.1.1 Cokemaking Subcategory

This subcategory contains 14 direct dischargers and eight indirect dischargers. Additional energy requirements are shown in Table 13-2 for BAT-1 (tar removal, ammonia distillation, and biological treatment) and BAT-2 (tar removal, ammonia distillation, cyanide precipitation, and biological treatment) can be attributed to two direct dischargers installing aerobic biological nitrification basins and seven installing cyanide precipitation. The significant increase in energy requirements between BAT-2 and BAT-3 is a result of alkaline chlorination being added to all 14 direct dischargers. Added energy requirements for BAT-4 are for pumping effluent from the alkaline chlorination system through 12 new multimedia filtration and carbon adsorption systems.

None of the eight indirect dischargers are expected to install additional equipment to comply with PSES-1 (tar removal, flow equalization and ammonia distillation) and, therefore, there will be no additional energy requirements. Additional energy requirements for PSES-2, 0.3 million kWh/yr, are based on four facilities adding cyanide precipitation and multimedia filtration. For PSES-3, EPA estimated additional energy requirements totaling 12 million kWh/yr based on five facilities installing indirect cooling, flow equalization, and biological treatment. EPA estimated additional energy requirements for PSES-4, 17 million kWh/yr for five facilities installing indirect cooling, flow equalization, biological treatment, and alkaline chlorination, plus three facilities installing alkaline chlorination only.

Neither of the two non-recovery cokemaking facilities generate wastewater and, therefore, EPA estimates there will be no additional energy requirements for that segment.

13.1.2 Ironmaking Subcategory

There are 13 direct dischargers in this subcategory. EPA estimates that the additional energy requirements shown in Table 13-2 for BAT-1 (high-rate recycle and blowdown treatment) are the result of two new high-rate recycle systems. The treatment and recycle systems include solids removal using scale pits, roughing clarifiers or multimedia filters, induced draft cooling towers to lower the water temperature, and pump stations to return the treated and cooled water to the ironmaking process. EPA estimates that the indirect discharging ironmaking facilities will not need to add treatment units to upgrade to the model PSES-1 treatment system.

13.1.3 Integrated Steelmaking Subcategory

This category includes 20 direct dischargers. The Agency estimates that the additional energy requirements shown in Table 13-2 are a result of one new high-rate continuous caster recycle system and nine chemical precipitation systems for treatment of blowdown water. The treatment and recycle systems include solids removal using a classifier and clarifier, induced draft cooling towers for vacuum degassing and continuous casting wastewater, and pump stations to return the treated and cooled water to the steelmaking process. Chemical precipitation systems remove metals from the recycle system blowdown water and include reaction tanks with mixers, clarifiers, thickeners, and filter presses. EPA estimates that direct dischargers in this subcategory will use approximately 8 million kWh/yr of additional energy requirements to upgrade to the BAT model system. EPA estimates that indirect discharging integrated steelmaking facilities will not need additional treatment units to upgrade to the model PSES-1 treatment system and, therefore, no additional energy requirements are expected.

13.1.4 Integrated and Stand-Alone Hot Forming Subcategory

This subcategory includes 44 direct dischargers and 10 indirect dischargers. BAT-1 for the integrated and stand-alone hot forming mills requires the greatest amount of additional electrical energy of the proposed subcategories (see Table 13-2). EPA estimates that 169 million kWh/yr of additional electricity will be required to comply with the BAT-1 model system, an increase of 29 percent. The Agency estimates that 12 sites would install high-rate recycle systems

to replace existing partial or once-through treatment systems and two of these mills will install new recycle systems consisting of roughing clarifiers with oil removal, multimedia filtration, induced draft cooling towers, and pump stations to recycle the treated and cooled water to the steelmaking process. EPA estimates that an additional seven mills will install new multimedia filters for removal of suspended solids from recycle system blowdown water. A number of mills will recycle in excess of a total of 20,000 gallons per minute (gpm) of wastewater, in the Agency's estimate.

For PSES-1, EPA expects two carbon manufacturing facilities to install a multimedia filter and another stainless steel manufacturing facility to install a cooling water recycle system consisting of a roughing clarifier, multimedia filter, cooling tower, and pump station. As shown in Table 13-2, EPA estimated that indirect dischargers will require an additional 1 million kWh/yr of additional electricity to comply with this model option.

13.1.5 Non-Integrated Steelmaking and Hot Forming Subcategory

This subcategory has 43 direct dischargers, 19 indirect dischargers, and 34 zero dischargers. The additional 8 million kilowatt-hours of energy that EPA estimates is required for BAT-1 (see Table 13-2) for the non-integrated steelmaking and hot forming operations are primarily due to the addition of multimedia filters to remove suspended solids from cooling water recycle system blowdown. EPA estimates that 13 carbon and stainless steel sites will install multimedia filtration systems as a result of the regulation. The Agency also estimates that two sites manufacturing carbon steel products will install new high-rate recycle systems as well as multimedia filters for blowdown treatment to meet BAT-1 requirements.

EPA estimated no additional energy requirements for sites to comply with pretreatment standards for the two indirect discharging non-integrated steelmaking and hot forming sites manufacturing stainless steel.

13.1.6 Steel Finishing Subcategory

This subcategory has 69 direct dischargers, 45 indirect dischargers, and 27 zero dischargers. EPA estimates that one carbon finishing facility will consume approximately 2 million kWh/yr of additional energy (see Table 13-2) to reduce its recycle system blowdown to meet the proposed production-normalized flow rates (PNF). EPA expects the proposed pretreatment standards (PSES-1) for the steel finishing subcategory to increase energy requirements by approximately 0.1 million kilowatt-hours per year.

13.1.7 Other Operations Subcategory

The Other Operations Subcategory includes two direct reduced ironmaking (DRI) facilities, 14 forging facilities, and 4 briquetting facilities. EPA estimates that additional power would be required for one DRI facility under BPT. All forging operations currently have the BPT in place and, therefore, no additional energy is required. The briquetting facilities do not

discharge process wastewater, and EPA does not expect facilities in this segment to install additional treatment equipment.

13.1.8 Energy Requirements Summary

Based on information provided in the industry surveys, the iron and steel industry currently consumes approximately 3.2 billion kWh/yr of electricity for wastewater treatment. EPA estimates that compliance with the proposed Iron and Steel regulation will result in a net increase in energy consumption of 231 million kWh/yr of electricity for the entire industry, or approximately 7 percent. As described previously, the projected increase in energy consumption is primarily due to the incorporation of components such as pumps, mixers, blowers, and fans.

In 1997, the United States consumed approximately 3,122 billion kilowatt hours of electricity (Reference 13-2). The 231-million-kWh/yr increase in electricity as a result of the proposed regulation corresponds to approximately 0.007 percent of the national requirements. The increase in energy requirements due to the implementation of the proposed rule will in turn increase air emissions from the electric power generation facilities. The increase in air emissions is expected to be proportional to the increase in energy requirements, or approximately 0.007 percent.

13.2 Air Emission Impacts

Various subcategories within the iron and steel industry generate process waters that contain significant concentrations of organic and inorganic compounds, some of which are listed as Hazardous Air Pollutants (HAPs) in Title III of the Clean Air Act Amendments of 1990. The Agency developed National Emission Standards for Hazardous Air Pollutants (NESHAPs) under Section 112 of the Clean Air Act, which addresses air emissions of HAPs for certain manufacturing operations. Subcategories within the iron and steel industry where NESHAPs are applicable include cokemaking (58 FR 57898, October 1993) and steel finishing with chromium electroplating (60 FR 4948, January 1995).

For the Cokemaking Subcategory, EPA is currently developing maximum achievable control technology (MACT) standards for pushing, quenching, and battery stacks operations. Like effluent limitations guidelines and standards, MACT standards are technology-based. The Clean Air Act sets maximum control requirements on which MACT standards can be based for new and existing sources. By-products recovery operations in the Cokemaking Subcategory remove the majority of HAPs through processes that collect or produce tar, heavy and light oils, ammonium sulfate, anhydrous ammonia, and elemental sulfur. Ammonia, hydrogen sulfide, and hydrogen cyanide removal by steam stripping could generate a potential air quality issue if uncontrolled; however, these stripping operations at cokemaking facilities capture vapors and return them to the coke oven gas, which is combusted to heat the coke ovens and for other uses.

Biological treatment of cokemaking wastewater can potentially emit HAPs if significant concentrations of volatile organic compounds (VOCs) are present. To estimate the

maximum air emissions from biological treatment, EPA multiplied the individual concentrations of all VOCs in cokemaking wastewater entering the biological treatment system by the maximum design flow (2.52 million gallons per day) and the maximum operational period (365 days/year) reported in the industry surveys to determine annual VOC loadings to the biological treatment unit. The Agency determined the concentrations of the individual VOCs entering the biological treatment system from the EPA sampling data. Table 13-3 shows the average influent concentration of the individual VOCs and the annual pollutant loadings based on a biological treatment system influent flow of 1,750 gallons per minute. Even with the conservative assumption that all the VOCs entering the biological treatment system are emitted to the atmosphere (no biological degradation), the maximum VOC emission rate would be approximately 1,800 pounds or 0.9 tons per year. This is well below threshold levels that would classify the site as a major source of VOCs (i.e., 25 tons for the combination of all HAPs, or 10 tons for any individual HAP).

For integrated and non-integrated steelmaking operations, the only organic pollutant of concern (POC) detected in untreated basic oxygen furnace (BOF) wastewater from stainless steel product manufacturing was phenol. Phenol was detected at relatively low concentrations (0.012 mg/L to 0.33 mg/L). Because phenol is a semivolatile organic compound with a low Henry's Law constant, it is not expected to partition to the air. No volatile pollutants of concern were detected in any of the steelmaking wastewater. The other primary pollutants in the steelmaking process wastewater are suspended solids, dissolved metals, and oils. Under ambient conditions, these pollutants show insignificant volatilization because of their vapor pressure, even in open-top treatment units.

Wet air pollution control (WAPC) equipment is commonly used in a number of the iron and steel subcategories to control air emissions. None of the proposed pollution prevention, recycling, or wastewater technology options will have a negative impact on the performance of these WAPC systems. In fact, some of the proposed pollution prevention alternatives may enhance the performance of these systems by reducing pollutant loadings. Therefore, EPA does not expect any adverse air impacts to occur as a result of the proposed regulation.

13.3 Solid Waste Impacts

A number of the proposed treatment technologies will generate solid waste, including Resource Conservation and Recovery Act (RCRA) hazardous and nonhazardous sludge and waste oil. Most solid waste generated by the iron and steel industry is nonhazardous, except for certain treatment sludges generated by electroplating operations in the steel finishing industry and iron-cyanide sludge generated during treatment of cokemaking wastewater. Nonhazardous solid wastes include sludge from biological treatment systems for cokemaking wastewater and sludge from multimedia filtration, chemical precipitation, and clarification systems from iron and steelmaking wastewater. Federal and state regulations require iron and steel facilities to manage their RCRA hazardous and nonhazardous sludges to prevent releases to the environment.

The following subsections provide both current sludge generation rates estimated from the industry surveys and the incremental increases expected as a result of the proposed

regulation for each iron and steel subcategory. Incremental increases in sludge generation are based on the pollutant loading and removal information provided in Section 10. Based on the information summarized in Table 13-1, EPA estimates that annual sludge generation across the entire iron and steel industry will increase by 0.5 percent as a result of the proposed regulation.

13.3.1 Cokemaking Subcategory

Biological nitrification, proposed as the primary technology basis for ammonia, phenolics, and biochemical oxygen demand (BOD) removal from cokemaking wastewater, combined with technologies such as cyanide precipitation and multimedia filtration, will produce a wastewater treatment sludge requiring disposal or further processing. Table 13-4 shows additional sludge generation for the entire cokemaking industry by technology option.

EPA estimates that compliance with BAT-1 and BAT-3 will generate approximately 130 tons (dry) per year of additional biological treatment sludge. BAT-3 adds alkaline chlorination following biological treatment to remove residual cyanide and ammonia to BAT-1; however, alkaline chlorination is not expected to generate significant amounts of additional sludge. Based on the industry survey data, EPA estimates that the cokemaking industry currently generates more than 23,000 tons per year (dry) of biological treatment sludge. As such, the increased biological treatment sludge generated by the BAT-1 and BAT-3 treatment options is approximately 0.6 percent of the total sludge currently generated by the industry.

Sludge generation calculated for BAT-2 is a result of both biological treatment for ammonia, phenolics, and BOD removal and chemical precipitation to remove cyanide. Based on the pollutant loading and removal data presented in Section 10, EPA estimates that compliance with BAT-2 will generate an additional 12 tons per year (dry) of iron-cyanide sludge, in addition to the 130 tons per year (dry) of biological treatment sludge. Based on the industry survey data, EPA estimates that the cokemaking industry currently generates approximately 460 tons per year (dry) of iron-cyanide sludge. Compliance with BAT-2 will increase iron-cyanide sludge production throughout the cokemaking industry by 3 percent. The nonhazardous biological treatment sludge can be disposed of in a Subtitle D landfill, recycled to the coke ovens for incineration, or land applied. Depending on RCRA hazardous characterization results (40 CFR 262.11), iron-cyanide sludge collected from the cyanide precipitation process may be disposed of in a Subtitle C or Subtitle D landfill.

BAT-4 generates the largest amount of sludge, 370 tons per year (dry), due to the removal and treatment of total suspended solids (TSS) by the multimedia filters following biological treatment and alkaline chlorination.

EPA does not expect any of the eight indirect dischargers to install additional equipment to comply with PSES-1 (tar removal, flow equalization and ammonia distillation) and, therefore, no additional sludge is expected. EPA estimates that four facilities will add cyanide precipitation and multimedia filtration to comply with PSES-2 generating approximately 100 tons per year (dry) of additional sludges. The Agency expects approximately 2,990 additional tons of

sludge per year (dry) to be generated, based on five facilities installing new biological treatment systems to comply with PSES-3 and PSES-4.

Neither of the two non-recovery cokemaking facilities generate wastewater and, therefore, are not expected to generate additional sludge.

Table 13-1 shows that the selected options (BAT-3 and PSES-3) would increase biological sludge generation by approximately 3,100 tons per year. Information provided in the industry survey shows that 65 percent of all biological sludge is sent to the coke batteries for incineration, while 15 percent is land applied and 20 percent is landfilled.

13.3.2 Ironmaking Subcategory

Additional wastewater treatment sludge will be generated by the blast furnace ironmaking and sintering operations as a result of compliance with both BAT-1 and PSES-1. BAT-1, which includes solids removal in the high-rate recycle system, as well as chemical precipitation, settling, and multimedia filtration for treatment of blowdown water, will generate approximately 4,430 additional tons/year (dry) of wastewater treatment sludge, as shown in Table 13-4. PSES-1, which includes the same solids-generating treatment units as BAT-1, with the exception of multimedia filtration following chemical precipitation and settling of high-rate recycle blowdown, is expected to generate an additional 230 tons per year (dry) of wastewater treatment sludge.

The data provided in Table 13-1 shows that blast furnace ironmaking and sintering operations generated approximately 86,000 tons (dry) of mill scale, grit, and sludge in 1997. The proposed BAT-1 and PSES-1 options for blast furnace ironmaking and sintering would increase annual sludge generation by 4,700 tons/year, an increase of approximately 5 percent. Information provided in the industry surveys shows that 36 percent of the mill scale and sludges generated by the Ironmaking Subcategory is disposed of by landfilling. The remainder is recycled to sinter or briquetting, or sent off site to a commercial recycler.

13.3.3 Integrated Steelmaking Subcategory

To comply with the proposed BAT-1 effluent limits, EPA estimates that one direct discharger will install a new continuous caster recycle water system and nine facilities will install chemical precipitation to treat blowdown water, resulting in additional 3,560 tons/year (dry) of wastewater treatment sludge (Table 13-4). Indirect discharging integrated steelmaking facilities have the model equipment in place and, therefore, EPA does not expect them to generate additional sludge. As shown in Table 13-1, integrated steelmaking operations currently generate approximately 940,000 tons/year of mill scale, sludges, and filter cakes. The additional generation of sludge represents a 0.4 percent increase.

13.3.4 Integrated Steelmaking and Stand-Alone Hot Forming Subcategory

To comply with the proposed BAT-1 effluent limits, the Agency estimates that 12 sites will install high-rate recycle systems to replace existing partial or once-through treatment systems. EPA estimates that two of these mills will install new recycle systems consisting of roughing clarifiers and multimedia filters that will generate sludges. EPA also estimates that another seven facilities manufacturing carbon steel products will install multimedia filtration systems to remove suspended solids and metals from recycle system blowdown water. Treatment of multimedia filter backwash water will produce an additional 12,500 tons/year of wastewater treatment sludge (Table 13-4). EPA estimates that, to comply with PSES-1, a carbon steel manufacturing facility will install a new multimedia filter. A stainless steel manufacturing facility will install a roughing clarifier and multimedia filter, generating an additional 930 tons per year of sludge.

Incremental sludge production (Table 13-1) is estimated to be 12,500 tons per year or a 5 percent increase over the current mill scale, sludge, and filter cake production amounts generated by this subcategory.

13.3.5 Non-Integrated and Stand-Alone Hot Forming Subcategory

EPA estimates that 13 carbon and stainless steel sites will install multimedia filtration systems as a result of the regulation. The Agency also estimates that two non-integrated steelmaking and hot forming facilities manufacturing carbon products will install new high-rate recycle systems as well as multimedia filters for blowdown treatment to meet BAT-1 requirements. These solids removal systems are expected to generate an additional 1,300 tons/year of dry wastewater treatment sludge, as shown in Table 13-4.

EPA is proposing to revise PSES-1 for non-integrated and stand-alone hot forming operations manufacturing stainless steel products. EPA estimates that an additional 70 tons per year of treatment sludge will be generated by three non-integrated and stand-alone hot forming operations manufacturing stainless steel products, based on the pollutant loading and removal data presented in Section 10. Additional sludge generation is a result of improved treatment performance for existing treatment systems.

Treatment sludges from BAT-1 and PSES-1 will increase solid waste production by approximately 0.05 percent over the current 2,537,000 tons per year (see Table 13-1).

13.3.6 Steel Finishing Subcategory

Both RCRA hazardous and nonhazardous sludges are generated at steel finishing facilities. RCRA sludge may be classified as hazardous as a result of listing or characterization based on the following information:

- If the site performs electroplating operations, the sludge resulting from treatment of this wastewater is a RCRA F006 listed hazardous waste (40

CFR 260.11). If wastewater from other operations is mixed with the electroplating wastewater and treated, all sludges generated from the treatment of the combined wastewater are also RCRA F006 listed hazardous wastes.

- Sludge generated from the treatment of wastewater associated with tin plating on carbon steel and zinc plating on carbon steel is not a RCRA listed hazardous waste.

- If the sludge from wastewater treatment exceeds the standards for the Toxicity Characteristic Leaching Procedure (i.e., is hazardous), or exhibits other RCRA-defined hazardous characteristics (i.e., reactive, corrosive, or flammable), it is considered a characteristic hazardous waste (40 CFR 261.24).

Based on information collected during site visits and sampling episodes to iron and steel operations, the Agency believes that the majority of sludge generated at steel finishing sites would not be classified as hazardous. Information provided in the industry surveys indicates that less than 5 percent of the total sludges and solid waste generated by finishing facilities is hazardous under RCRA.

For carbon and alloy and stainless steel finishing sites, BAT-1 consists of in-process controls to limit water usage and recycle process chemicals, plus end-of-pipe wastewater treatment. Wastewater treatment includes oil removal, chromium reduction when necessary, multiple-stage pH control for metals precipitation, and solids removal by gravity clarification. EPA estimates that the 69 direct discharging steel finishing facilities (both carbon and alloy and stainless steel) will improve the performance of their metals removal systems, resulting in approximately 2,200 tons per year (dry) of additional treatment sludge (Table 13-4). For PSES-1, EPA estimates that an additional 77 tons per year of wastewater treatment sludge will be generated as a result of six steel finishing facilities installing chemical precipitation and/or clarification systems.

EPA estimates steel finishing facilities currently generate over 690,000 tons per year (dry) of sludge. The proposed BAT-1 option for steel finishing would increase annual sludge generation by approximately 0.3 percent.

13.3.7 Other Operations Subcategory

Other operations include DRI, forging, and briquetting processes. Based on the current equipment in place at DRI and forging facilities, EPA believes that one DRI facility complying with BPT will generate additional sludge; however, the amount of sludge generated cannot be disclosed because it contains confidential business information.

13.4 References

13-1. Perry's Chemical Engineers Handbook, Sixth Edition. McGraw Hill Press, 1984.

13-2. Energy Information Administration. Electric Power Annual 1998 Volume I, Table A1.

Table 13-1

Summary of Pollutant Removals, Energy Requirements, and Sludge Generation for the Selected Option by Subcategory

Energy Usage and Sludge Generation	Subcategory							
	Cokemaking	Ironmaking	Integrated Steelmaking	Integrated and Stand-Alone Hot Forming[a]	Non-Integrated Steelmaking and Hot Forming[a]	Steel Finishing[a]	Other	Total
Selected options	BAT-3 PSES-3	BAT-1 PSES-1	BAT-1 PSES-1	BAT-1	BAT-1 PSES-1[b]	BAT-1	BPT PSES-1	NA
Current energy usage[c] (million kilowatt hours/year)	101	520	520	580	350	840	280	3,191
Incremental energy usage (million kilowatt hours/year)	33	11	8	169	8	2	nd	231
% increase in energy requirement	22	2	1.5	29	2.4	0.2	0	7
Current sludge generation[c] (tons/year)	23,000	86,000	940,000	273,000	2,537,000	690,000	664,000	5,189,000
Incremental sludge generation (tons/year)	3,100	4,700	3,600	12,500	1,400	2,200	nd	27,500
% increase in sludge generation	14	5	0.4	5	0.05	0.3	2	0.5

[a]Includes carbon, alloy, and stainless steel manufacturing.
[b]PSES for stainless steel manufacturing only.
[c]U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Survey (Detailed and Short Surveys).
NA - Not applicable.
nd - Not disclosed because it contains confidential business information.

Table 13-2

Incremental Energy Requirements by Subcategory and Option

Subcategory	Incremental Energy Required (million kWh/yr)							
	BAT-1	BAT-2	BAT-3	BAT-4	PSES-1	PSES-2	PSES-3	PSES-4
Cokemaking	5	5	21	24	0	0.3	12	17
Ironmaking	11	NA	NA	NA	0	0.08	NA	NA
Integrated Steelmaking	8	NA	NA	NA	0	NA	NA	NA
Integrated and Stand-Alone Hot Forming[a]	169	NA	NA	NA	1	NA	NA	NA
Non-Integrated Steelmaking and Hot Forming	8[a]	NA	NA	NA	0[b]	NA	NA	NA
Steel Finishing[a]	2	NA	NA	NA	0.1	NA	NA	NA
Other[c]	0[d]	NA	NA	NA	NA	NA	NA	NA

[a]Includes carbon, alloy, and stainless steel products.
[b]Stainless steel products only.
[c]Other operations include direct reduced iron (DRI), briquetting, and forging. Of these segments, DRI would require additional energy for BPT; however, the incremental requirement contains confidential business information and cannot be presented.
[d]Based on BPT for direct reduced iron and forging.
NA - Not applicable.

Table 13-3

Estimated Maximum VOC Emission Rate From Biological Treatment of Cokemaking Wastewater

Compound	Influent Concentration (mg/L)[a]	Flow Rate (gpm)[b]	Estimated Emission Rate (lbs/yr)
Benzene	nd	nd	nd
Acetone	nd	nd	nd
Acrylonitrile	nd	nd	nd
Carbon disulfide	nd	nd	nd
1,1,2,2-TCA	nd	nd	nd
Total			**1,808**

[a]U.S. EPA Iron and Steel Industry Wastewater Sampling Program, 1997-1999.
[b]U.S. EPA, U.S. EPA Collection of 1997 Iron and Steel Industry Data (Detailed and Short Surveys).
nd - Not disclosed to prevent compromising confidential business information.

Table 13-4

Incremental Sludge Generation by Subcategory and Option

Subcategory	Incremental Sludge Generation (tons/year dry)							
	BAT-1	BAT-2	BAT-3	BAT-4	PSES-1	PSES-2	PSES-3	PSES-4
Cokemaking	130	142	130	370	0	100	2,990	2,990
Ironmaking	4,430	NA	NA	NA	230	NA	NA	NA
Integrated Steelmaking	3,560	NA	NA	NA	0	NA	NA	NA
Integrated and Stand-Alone Hot Forming[a]	12,500	NA	NA	NA	930	NA	NA	NA
Non-Integrated Steelmaking and Hot Forming	1,300[a]	NA	NA	NA	70[b]	NA	NA	NA
Steel Finishing[a]	2,180	NA	NA	NA	77	NA	NA	NA
Other[c]	0[d]	NA	NA	NA	NA	NA	NA	NA

[a]Includes carbon, alloy and stainless steel products.
[b]Stainless steel products only.
[c]Other operations include DRI, briquetting, and forging. Of these segments, DRI would generate additional sludge; however, the incremental sludge generation contains confidential business information and cannot be presented.
[d]BPT for DRI and forging.
NA - Not applicable.

SECTION 14

SELECTED OPTIONS AND PROPOSED EFFLUENT LIMITATIONS AND STANDARDS

As discussed in Section 2, EPA must promulgate six types of effluent limitations guidelines and standards for each major industrial category, as appropriate:

- Best Practicable Control Technology Currently Available (BPT);
- Best Control Technology for Conventional Pollutants (BCT);
- Best Available Technology Economically Achievable (BAT);
- New Source Performance Standards (NSPS);
- Pretreatment Standards for Existing Sources (PSES); and
- Pretreatment Standards for New Sources (PSNS).

BPT, BCT, BAT and NSPS limitations regulate only those sources that discharge effluent directly into waters of the United States. PSES and PSNS limitations restrict pollutant discharges for those sources that discharge effluent indirectly through sewers flowing to publicly owned treatment works (POTWs). Sections 14.1 and 14.2 discuss BPT and BCT effluent limitations guidelines, respectively. Section 14.3 discusses BAT, NSPS, PSES, and PSNS technology bases and effluent limitations guidelines and standards.

14.1 BPT

As discussed in Section 2, BPT generally represents the average of the best performances of facilities within the industry, grouped to reflect various ages, sizes, processes, or other common characteristics. BPT focuses on end-of-pipe treatment rather than process changes or internal controls, except when the process changes or internal controls are common industry practice. EPA is required under Section 304(b) of the Clean Water Act (CWA) to perform a limited cost-benefit balance when setting BPT limitations to ensure that costs are not wholly out of proportion to the effluent reduction benefits achieved; the Agency is not required to quantify benefits in monetary terms. See Weyerhaueser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978). When balancing BPT costs with effluent reduction benefits, EPA considers the volume and nature of existing wastewater discharges, the volume and nature of discharges expected after the application of BPT, the general environmental effects of pollutants discharged, and the cost and economic impact of required pollution control.

14.1.1 Manufacturing Operations New to the Iron and Steel Category

EPA is proposing BPT limitations for non-recovery cokemaking, sintering operations with dry air pollution controls, direct reduced ironmaking, briquetting, and forging operations because there are no BPT limitations in the 1982 Iron and Steel regulation applicable to these operations.

The Agency is proposing zero discharge of process wastewater pollutants to waters of the United States as the BPT limitations for non-recovery cokemaking, sintering operations with dry air pollution controls, and briquetting.

The proposed BPT limitations for the Direct Reduced Ironmaking Segment of the Other Operations Subcategory are based on model treatment consisting of solids removal, clarification, high-rate recycle, and blowdown filtration. EPA set BPT limitations for total suspended solids (TSS); the Agency has determined that the controlling TSS will incidentally remove all other pollutants of concern (POCs) considered for regulation in this subcategory, including oil and grease (O&G). EPA estimates that application of the proposed BPT limitations would result in no facility closures. The following table presents the proposed BPT limitations.

Other Operations Subcategory
BPT Limitations for Direct Reduced Ironmaking Segment

Pollutant	BPT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Total suspended solids (TSS)	0.0200	0.00929

The proposed BPT limitations for the Forging Segment of the Other Operations Subcategory are based on high-rate recycle and oil/water separation. EPA estimates that application of the proposed BPT limitations would result in a 72 percent reduction of O&G in direct discharges from forging operations, with no facility closures. The following table presents the proposed BPT limitations.

Other Operations Subcategory
BPT Limitations for Forging Segment

Pollutant	BPT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.0149	0.00889
Total suspended solids (TSS)	0.0235	0.0118

14.1.2 Manufacturing Operations Currently Regulated

For manufacturing operations currently subject to BPT limitations in the 1982 rule, the Agency is not proposing to revise BPT limitations for TSS and O&G. Table 14-1 presents these BPT limitations. For electric arc furnace (EAF) operations, the 1982 Steelmaking Subcategory requires zero discharge for BPT in the semi-wet operations but allows discharge for BPT in the wet operations. Since wet EAFs no longer exist in the United States, the proposed

rule is requiring zero discharge for all EAFs. For continuous electroplating operations currently subject to BPT limitations under 40 CFR Part 433 but proposed for regulation under the revised iron and steel rule, EPA has assigned BPT limitations for TSS and O&G based on the limitations at Part 433 for those operations.

EPA recognizes the difficulty in implementing the proposed regulation if BPT limitations remain unchanged and reflect a different subcategorization: permit writers and industry representatives would be required to implement the existing 40 CFR Part 433 BPT limitations for electroplating and the 1982 iron and steel BPT limitations for 12 subcategories and more than 50 segments, in addition to the proposed BAT limitations for 7 subcategories and far fewer segments. Consequently, EPA developed the following alternative approach for codifying BPT limits. EPA solicits comment on this alternative approach.

Alternative Approach: Codify BPT Limitations as the TSS and O&G Concentrations Used to Develop the 1982 Iron and Steel Rule

To simplify the Iron and Steel regulation and ease the implementation of BPT limitations in the National Pollutant Discharge Elimination System (NPDES) permit program, EPA is considering replacing the 1982 mass-based BPT limitations for TSS and O&G with corresponding concentration-based limitations. The concentration-based BPT limitations would equal the treated effluent concentrations used to develop the 1982 regulation for all operations that EPA proposes to regulate under the Iron and Steel rule. These concentrations are shown as the daily maximum and maximum monthly average TSS and O&G concentrations (mg/L) for the 12 subcategories of the 1982 regulation (Reference 14-1). For electroplating operations currently regulated under Part 433, EPA would set the corresponding BPT concentration limitations equal to either the concentrations at Part 433 or the concentrations for steel finishing operations in the 1982 regulation (Reference 14-1).

Under this alternative approach, the TSS and O&G concentrations from the 1982 regulation would be codified as BPT limitations in the seven subcategories of the proposed regulation to simplify the regulation and ease implementation. Permit writers and industry representatives would not have to then classify operations under both the complicated subcategorization and segmentation of the 1982 regulation and the less complicated subcategorization and segmentation of the proposed regulation.

Under this alternative approach, permit writers would develop NPDES permit effluent limitations by first applying the corresponding BAT limitations for priority and nonconventional pollutants for each internal or external process wastewater outfall. Then, the permit writer would develop mass effluent limitations for TSS and O&G by applying the respective concentration-based BPT effluent limitations guidelines to a reasonable measure of actual process wastewater discharge flow, taking into account process wastewater regulated by the Iron and Steel rule and process wastewater that may be unregulated by the Iron and Steel rule (see proposed regulation at 40 CFR Part 420.03(f)). As with BAT limitations, the Agency intends that only the mass limitations derived for TSS and O&G as described above should be included in NPDES permits.

Depending upon site-specific circumstances, this alternative approach could result in either more or less stringent limitations for TSS and O&G than would be derived from the 1982 BPT limitations. For example, if a facility has (1) process wastewater discharge flow rates that are lower than the model BPT production-normalized flow rates used to develop the 1982 regulation and (2) no unregulated process wastewater, the resulting TSS and O&G permit limitations would be more stringent in proportion to the lower discharge flow. On the other hand, if the facility had higher process wastewater discharge flow rates or a substantial volume of unregulated process wastewater, the resulting effluent limitations would be higher in proportion to the higher discharge flow. The Agency has determined that, in many instances, the volume of regulated process wastewater that is either currently discharged or will be discharged to comply with BAT limitations will be somewhat less than model BPT flow rates. Consequently, EPA expects that the resulting NPDES permit effluent limitations for TSS and O&G will be somewhat more stringent but still within the range of those derived from the current BPT limitations.

The Agency has determined that there would be no additional costs to comply with NPDES permit effluent limitations derived with this alternative approach. To calculate the costs to achieve BPT limitations, EPA considered both the incremental investment costs and incremental operation and maintenance costs to achieve BAT limitations, where appropriate. EPA would not expect facilities to incur additional monitoring costs associated with concentration-based BPT limitations because facilities already monitor for these pollutants under the 1982 regulation; EPA does not propose to establish any new monitoring requirements for conventional pollutants. Nonetheless, for the purpose of calculating the cost per pound of conventional pollutants removed, EPA estimated both the costs associated with implementing BPT technologies (even though they are already subsumed in the BAT costs) and the total pounds of pollutants removed by these technologies. The estimated costs and removals reflect only the subcategories and segments for which EPA is considering revising BPT limitations. The total estimated cost is $53.8 million (1997 pretax total annualized cost[1]) for a total estimated removal of 30.3 million pounds of conventional pollutants. EPA determined that the total cost is reasonable in relation to the effluent reduction benefits. If EPA were to adopt this alternative approach, the Agency would revise BCT limitations to reflect the new BPT levels because nothing more stringent than those levels appears to pass the BCT cost-reasonableness test. (See Section 14.2 for more information on BCT limitations).

14.2 BCT

As discussed in Section 2, the BCT methodology promulgated in 1986 (51 FR 24974) sets forth the Agency's consideration of costs in establishing BCT effluent limitations guidelines. BCT is not an additional set of limitations; it replaces BAT for the control of conventional pollutants. EPA evaluates the reasonableness of BCT candidate technologies (those that are technologically feasible) by applying a two-part cost reasonableness test:

[1]EPA annualized the costs presented in Section 9 for presentation in this section (Reference 14-2).

- POTW test: EPA calculates the cost per pound of conventional pollutant removed by industrial dischargers in upgrading from BPT to a BCT candidate technology, and then compares this cost to the cost per pound of conventional pollutant removed in upgrading POTWs from secondary treatment. The upgrade cost to industry must be less than the POTW benchmark of $0.25 per pound (in 1976 dollars).

- Industry cost-effectiveness test: The ratio of the incremental BPT to BCT cost divided by the BPT cost for the industry must be less than 1.29 (i.e., the cost increase must be less than 29 percent).

EPA may propose BCT limitations only if a candidate BCT technology passes both parts of the cost-reasonableness test.

In developing BCT limitations for the Iron and Steel Category, EPA considered whether any existing technologies achieve greater removals of conventional pollutants than the technologies that form the basis for BPT and whether those technologies are cost-reasonable according to the prescribed BCT cost test. The Agency identified no existing technologies that (1) achieve greater removals of conventional pollutants than the technologies that form the basis for BPT and (2) pass the BCT cost-reasonableness test. Accordingly, EPA proposes to establish BCT effluent limitations that are equal to BPT limitations in the 1982 Iron and Steel rule. For non-recovery cokemaking, sintering operations with dry air pollution controls, direct reduced ironmaking, briquetting, and forging operations, EPA proposes to establish BCT effluent limitations that are equal to the BPT limitations the Agency is proposing for these operations. (See Section 14.1 for more information on BPT limitations.)

14.3 BAT, NSPS, PSES, and PSNS

Sections 14.3.1 through 14.3.7 discuss the selected technology options and corresponding mass-based effluent limitations guidelines and standards for each iron and steel subcategory. EPA developed these proposed effluent limitations guidelines and standards using production-normalized flow rates and long-term effluent data corresponding to selected technology options. For more information on the evaluation of production-normalized flow rate and long-term average data, refer to Sections 7 and 12. The overall technology bases for the development of BAT, NSPS, PSES, and PSNS are discussed below.

BAT

As discussed in Section 2, BAT represents the best economically achievable performance of facilities in an industrial category. BAT may include process changes or internal controls, even when they are not common industry practice. The statutory assessment of BAT considers costs but does not require a balance of costs with effluent reduction benefits. See Weyerhauser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978). EPA has, however, given substantial weight to the reasonableness of costs in developing BAT limitations. The Agency considered the volume and nature of existing wastewater discharges, the volume and nature of

discharges expected after the application of BAT, the general environmental effects of pollutants discharged, and the cost and economic impact of required pollution control. Despite this expanded consideration of costs, the primary determinant of BAT is effluent reduction capability. Under the CWA, the achievement of BAT has become the principal national means of controlling toxic water pollution.

EPA has determined that the selected BAT model technologies (discussed in Section 8) are technically feasible and economically achievable (Reference 14-2) for the respective segments to which they apply. EPA has determined, for the reasons described in Section 13, that none of the proposed technology options presents unacceptable adverse non-water quality environmental impacts. EPA considered age, size, processes, and other engineering factors pertinent to facilities in the proposed segments when evaluating technology options. None of these factors provided a basis for selecting different technologies than those EPA proposes as its model BAT technologies.

NSPS

As discussed in Section 2, NSPS reflect effluent reductions that are achievable based on the best available demonstrated control technology. EPA is required to consider the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies to reduce pollution to the maximum extent feasible for NSPS. For the proposed Iron and Steel rule, the Agency generally considered BAT model treatment systems to be the demonstrated NSPS model treatment systems because most of the BATs are considered to represent the best demonstrated technologies.

In selecting its proposed NSPS technologies, EPA considered all of the factors specified in CWA Section 306, including the cost of achieving effluent reductions. The model NSPS technologies that form the basis for the proposed standards are well demonstrated and used within the iron and steel industry. Based on this demonstration, EPA has concluded that costs associated with implementing NSPS do not present a barrier to entry. The Agency also considered energy requirements and other non-water quality environmental impacts for the proposed NSPS options and concluded that these impacts are acceptable and no greater than the impacts expected from the proposed BAT technology options. EPA, therefore, concluded that the proposed NSPS constitute the best available demonstrated control technology.

PSES/PSNS

As discussed in Section 2, PSES and PSNS are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. EPA has determined that several priority and nonconventional pollutants present in untreated iron and steel industry process wastewater pass through POTWs and may limit POTW sludge disposal alternatives or interfere with biological treatment at POTWs. (See Section 11 for more information on the Agency's POTW pass-through analyses.) Accordingly, EPA is proposing pretreatment standards for metals and other priority and nonconventional pollutants. When developing pretreatment standards, EPA considered the cost of achieving effluent

reductions, the age and size of equipment and facilities involved, the processes employed, potential process changes, the location of facilities, non-water quality environmental impacts (including energy requirements), and the engineering aspects of applying pretreatment technologies in relation to the POTWs. None of these factors provided a basis for selecting different technologies than those EPA proposes as its model PSES technologies.

The Agency is proposing PSNS based on the same considerations made for PSES. EPA considered all of the factors specified in CWA Section 306, including the cost of achieving effluent reductions, when selecting its proposed PSNS technologies. The model PSNS technologies that form the basis for the proposed standards are well demonstrated and used within the iron and steel industry. Based on this demonstration, EPA concluded that costs associated with implementing PSNS do not present a barrier to entry.

14.3.1 Cokemaking

BAT--By-Product Recovery Segment

EPA is proposing BAT-3 for the By-Product Recovery Segment of the Cokemaking Subcategory. The BAT-3 model treatment sequence consists of oil and tar removal, flow equalization prior to ammonia stripping, free and fixed ammonia stripping, indirect cooling, flow equalization before biological treatment, biological treatment, sludge dewatering, and alkaline chlorination.

As discussed in Section 8, EPA evaluated four BAT options for the By-Product Recovery Segment. The Agency determined that each option would result in the following additional water usage reductions and pollutant removals:

- BAT-1 would reduce current annual water usage by 1.6 million gallons and increase the current removal of priority and nonconventional pollutants by 14 percent;
- BAT-2 would achieve the same flow reduction as BAT-1, but BAT-2 includes cyanide precipitation treatment that would increase the cyanide removal achieved through BAT-1 by 17 percent;
- BAT-3 would achieve the same flow reduction as BAT-1, but BAT-3 includes alkaline chlorination treatment that would increase the cyanide removal achieved through BAT-1 by 50 percent; and
- BAT-4 would achieve the same flow reduction as BAT-1 and pollutant removals that are nearly equivalent to those achieved through BAT-3.

The Agency determined that each BAT option would result in the following additional annual pollutant removals (in toxic pound equivalents[2]) and associated compliance costs (in 1997 dollars):

- BAT-1 would remove 56,300 toxic pound equivalents per year at an annualized compliance cost of $0.9 million. EPA estimates that BAT-1 would cause no facility closures.

- BAT-2 would increase the pollutant removal achieved through BAT-1 by 26 percent and increase the annualized compliance cost by $3.3 million. EPA estimates that BAT-2 would cause no facility closures.

- BAT-3 would remove 0.43 million toxic pound equivalents per year at an annualized compliance cost of $8.6 million. EPA estimates that BAT-3 would cause one facility closure.

- BAT-4 would achieve pollutant removals that are nearly equivalent to those achieved through BAT-3 at an annualized compliance cost of $15.2 million. EPA estimates that BAT-4 would cause one facility closure.

EPA determined that all four BAT options are economically achievable (Reference 14-2). The Agency did not select BAT-1 or BAT-2 because BAT-3 would achieve higher pollutant removals at an economically achievable cost. EPA did not select BAT-4 because BAT-3 achieves nearly equivalent pollutant removals at a significantly lower cost. The Agency determined that BAT-3 is the best available technology economically achievable for the By-Product Recovery Segment of the Cokemaking Subcategory. The following table presents proposed BAT limitations.

[2]EPA converted the pollutant loads presented in Section 10 into toxic equivalents for the regulatory options presented in this section. The Agency estimated toxic-weighted pollutant removals by multiplying pounds of a pollutant removal by an assigned toxic weighting factor to obtain the "pound equivalent" pollutant removals. The assigned toxic weighting factor for each pollutant is based on the pollutant's relative toxicity to copper. The toxic weighting factors assigned to each pollutant of concern can be found in the Iron and Steel Administrative Record and the Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (Reference 14-2).

Cokemaking Subcategory
BAT Limitations for By-Product Recovery Segment

Pollutant	BAT Limitations (lbs/ton of product)	
	Maximum Daily	**Maximum Monthly Average**
Ammonia as nitrogen	0.00137	0.000618
Benzo-*a*-pyrene	0.0000909	0.0000304
Cyanide	0.0104	0.00394
Mercury	0.000000864	0.000000523
Naphthalene	0.000103	0.0000345
Phenol	0.0000332	0.0000187
Selenium	0.000185	0.000159
Thiocyanate	0.00164	0.00115
Total residual chlorine[a]	0.000659	---

[a]Applicable only when chlorination is practiced.

EPA is proposing the following additional allowances for pollutant loadings based on the production-normalized flow for the treatment systems:

- Increased loadings, not to exceed 9.5 percent of the above limitations, for process wastewater from wet desulfurization systems if such systems generate process wastewater;

- Increased loadings, not to exceed 6.3 percent of the above limitations, for process wastewater from control measures necessary for compliance with by-product recovery coke plant National Emission Standards for Hazardous Air Pollutants (NESHAPs) if such systems generate process wastewater; and

- Increased loadings for process wastewater from other wet air pollution control systems (WAPCs) (not including coal charging and coke pushing emission controls), coal tar processing operations, and coke plant ground-water remediation systems if such systems generate process wastewater that is co-treated with by-product recovery cokemaking process wastewater.

See Section 7 for more information on the Agency's determination of these additional allowances for pollutant loadings.

NSPS--By-Product Recovery Segment

The treatment technologies that form the basis for NSPS for the By-Product Recovery Segment of the Cokemaking Subcategory are the same as the BAT-3 model technologies. EPA has determined that BAT-3 is the best demonstrated technology for new sources in the By-Product Recovery Segment; therefore, the Agency has set proposed NSPS limitations for the By-Product Segment equal to BAT-3 limitations (see previous table for BAT limitations). To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the By-Product Recovery Segment: TSS and O&G. The following table presents these additional limitations.

Cokemaking Subcategory--By-Product Recovery Segment
NSPS Limitations for TSS and O&G[a]

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.0246	0.0132
Total suspended solids (TSS)	0.0665	0.0337

[a]Proposed NSPS limitations for the By-Product Recovery Segment of the Cokemaking Subcategory include the BAT limitations presented in the previous table in addition to these limitations for TSS and O&G.

EPA is proposing the same additional allowances for proposed pollutant loadings for NSPS as the Agency is proposing for BAT.

PSES--By-Product Recovery Segment

EPA is co-proposing PSES-1 and PSES-3 for the By-Product Recovery Segment of the Cokemaking Subcategory. The PSES-1 model treatment sequence consists of tar removal, flow equalization, and free and fixed ammonia stripping. The PSES-3 model treatment sequence consists of oil and tar removal, flow equalization prior to ammonia stripping, free and fixed ammonia stripping, indirect cooling, flow equalization before biological treatment, biological treatment, and sludge dewatering.

As discussed in Section 8, EPA evaluated four PSES options for the By-Product Recovery Segment of the Cokemaking Subcategory. The Agency determined that the application of PSES options would result in the following additional annual pollutant removals (in toxic pound equivalents) and associated compliance costs (in 1997 dollars):

- PSES-1 would remove 3,400 toxic pound equivalents per year at an annualized compliance cost of $0.3 million;

- PSES-2 would increase the pollutant removal achieved through PSES-1 by 2,200 toxic pound equivalents per year and increase the annualized compliance cost by $1.9 million;

- PSES-3 would increase the pollutant removal achieved through PSES-2 by 42,900 toxic pound equivalents per year and increase the annualized compliance cost by $2.8 million; and

- PSES-4 would increase the pollutant removal achieved through PSES-3 by 2,900 toxic pound equivalents per year and increase the annualized compliance cost by $3.5 million.

In consideration of the significant additional costs required to achieve the pollutant removals under PSES-4, EPA determined that PSES-3 is the best technology option for the By-Product Recovery Segment. However, the Agency is co-proposing PSES-1 because this option may result in similar pollutant removals at a lower cost. Both options provide controls for POTW pass-through pollutants and are economically achievable (neither option would result in a facility closure). Between proposal and promulgation of the Iron and Steel rule, the Agency plans to further evaluate setting PSES equal to BAT-3, which contains the same technical components as PSES-4. The following table presents proposed PSES limitations for the By-Product Recovery Segment of the Cokemaking Subcategory.

Cokemaking Subcategory
PSES Limitations for By-Product Recovery Segment

Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)			
	Maximum Daily		Maximum Monthly Average	
	PSES-1	PSES-3	PSES-1	PSES-3
Ammonia as nitrogen	0.0845	0.00539	0.0559	0.00357
Cyanide	0.0244	0.00616	0.0128	0.00422
Naphthalene	0.00268	0.000103	0.000869	0.0000345
Phenol	2.13	0.0000332	0.720	0.0000187
Selenium	0.00125	0.000185	0.00104	0.000159
Thiocyanate	0.402	0.00164	0.317	0.00115

EPA is proposing the same additional allowances for proposed pollutant loadings for PSES-3 as the Agency is proposing for BAT and NSPS. For PSES-1, EPA is proposing the following additional allowances for pollutant loadings based on the production-normalized flow for the treatment systems:

- Increased loadings, not to exceed 13.9 percent of the above limitations, for process wastewater from wet desulfurization systems if such systems generate process wastewater;

- Increased loadings, not to exceed 9.3 percent of the above limitations, for process wastewater from control measures necessary for compliance with by-product recovery coke plant NESHAPs if such systems generate process wastewater; and

- Increased loadings for process wastewater from other WAPC systems (not including coal charging and coke pushing emission controls), coal tar processing operations, and coke plant ground-water remediation systems if such systems generate process wastewater that is co-treated with by-product recovery cokemaking process wastewater.

PSNS--By-Product Recovery Segment

The treatment technologies that form the basis for PSNS for the By-Product Recovery Segment of the Cokemaking Subcategory are the same as the PSES-3 model technologies; therefore, EPA has set proposed PSNS limitations for the By-Product Recovery Segment equal to PSES-3 limitations (see previous table for PSES-3 limitations). EPA is also proposing the same additional allowances for proposed pollutant loadings for PSNS as the Agency is proposing for PSES. Between proposal and promulgation of the Iron and Steel rule, EPA plans to further evaluate setting PSNS equal to BAT-3, which has the same technical components as PSES-4.

BAT/NSPS/PSES/PSNS--Non-Recovery Segment

EPA has determined that non-recovery cokemaking operations do not discharge process wastewater. Process area storm water and nonprocess wastewater in the form of boiler blowdown are typically disposed of by coke quenching. Therefore, EPA is proposing zero discharge of process wastewater pollutants to waters of the United States and POTWs as BAT, NSPS, PSES, and PSNS for the Non-Recovery Segment of the Cokemaking Subcategory.

14.3.2 Ironmaking

BAT

EPA is proposing BAT-1 for the Ironmaking Subcategory. BAT-1 model treatment consists of high-rate recycle using a clarifier for solids removal, sludge dewatering, a cooling tower, and blowdown treatment with chemical precipitation for metals removal, alkaline chlorination, and multimedia filtration. The application of BAT-1 would reduce current annual water usage by 5 percent and reduce total loadings of priority and nonconventional pollutants by 68 percent. EPA has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures.

The proposed BAT limitations presented in the following tables apply to process wastewater from sintering operations with WAPCs and all blast furnace ironmaking operations, whether these wastewater discharges are treated separately or co-treated. Section 15 discusses the compliance monitoring point for 2,3,7,8-tetrachlorodibenzofuran (TCDF). The Agency is proposing zero discharge of process wastewater pollutants to waters of the U.S. as BAT for sintering operations with dry air pollution controls.

Ironmaking Subcategory
BAT Limitations for Sintering Operations[a]

Pollutant	BAT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Ammonia as nitrogen	0.000652	0.000293
Cyanide	0.00493	0.00187
Lead	0.0000913	0.0000476
Phenol	0.0000463	0.0000157
2,3,7,8-TCDF	<ML[b]	---
Total residual chlorine[c]	0.000313	---
Zinc	0.000116	0.0000457

[a]BAT limitations in this table apply only to sintering operations with WAPCs.
[b]Ten parts per quadrillion (10×10^{-12} g/L).
[c]Applicable only when chlorination is practiced.

Ironmaking Subcategory
BAT/NSPS Limitations for Blast Furnace Operations

Pollutant	BAT/NSPS Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Ammonia as nitrogen	0.000217	0.0000977
Cyanide	0.00164	0.000623
Lead	0.0000304	0.0000159
Phenol	0.0000154	0.00000523
2,3,7,8-TCDF[a]	<ML[b]	---
Total residual chlorine[c]	0.000104	---
Zinc	0.0000387	0.0000152

[a]Applicable only when blast furnace process wastewater and sintering process wastewater discharges are co-treated.
[b]Ten parts per quadrillion (10×10^{-12} g/L).
[c]Applicable only when chlorination is practiced.

NSPS

The treatment technologies that form the basis for NSPS for the Ironmaking Subcategory are the same as the BAT-1 model technologies. EPA has determined that BAT-1 is the best demonstrated technology for new sources in the Ironmaking Subcategory; therefore, EPA has set proposed NSPS limitations for the Ironmaking Subcategory equal to BAT-1 limitations (see previous table for BAT limitations). The Agency has determined that BAT-1 represents the best demonstrated technologies for the Ironmaking Subcategory. Section 15 discusses the compliance monitoring point for 2,3,7,8-TCDF. As with BAT, the Agency is proposing zero discharge of process wastewater pollutants to waters of the U.S. as NSPS for sintering operations with dry air pollution controls.

To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the Ironmaking Subcategory: TSS and O&G. The following tables presents these additional limitations for sintering and blast furnace operations.

Ironmaking Subcategory--Sintering Operations[a]
NSPS Limitations for TSS and O&G[b]

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.00531	0.00420
Total suspended solids (TSS)	0.0251	0.00939

[a]NSPS limitations in this table apply only to sintering operations with WAPCs.
[b]Proposed NSPS limitations for sintering operations in the Ironmaking Subcategory include the BAT limitations presented in the previous table for sintering operations in addition to these limitations for TSS and O&G.

Ironmaking Subcategory--Blast Furnace Operations
NSPS Limitations for TSS and O&G[a]

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.00177	0.00140
Total suspended solids (TSS)	0.00836	0.00313

[a]Proposed NSPS limitations for blast furnace operations in the Ironmaking Subcategory include the BAT limitations presented in the previous table for blast furnace operations in addition to these limitations for TSS and O&G.

PSES

EPA is proposing PSES-1 for the Ironmaking Subcategory. PSES-1 model treatment consists of high-rate recycle using a clarifier for solids removal, sludge dewatering, a cooling tower, and blowdown treatment with chemical precipitation for metals removal. This option is economically achievable and provides controls for POTW pass-through pollutants. Section 15 discusses the compliance monitoring point for 2,3,7,8-TCDF.

Although setting PSES equal to BAT-1 would achieve additional removal of ammonia-N through alkaline chlorination, EPA has determined that all POTWs receiving wastewater from ironmaking operations are removing ammonia-N to levels comparable to the levels that would be achieved through BAT-1. Between proposal and promulgation of the Iron and Steel rule, the Agency plans to further evaluate setting PSES for the Ironmaking Subcategory equal to BAT-1. The Agency is proposing zero discharge of process wastewater pollutants to POTWs as PSES for sintering operations with dry air pollution controls.

The Agency is proposing regulatory flexibility to waive ammonia-N pretreatment standards for ironmaking operations if the indirect discharger certifies to its pretreatment control authority under 40 CFR 403.12 that it discharges process wastewater to a POTW with the capability to achieve ammonia-N removals that, when considered together with the indirect discharger's removals, are at least equivalent to those expected under proposed BAT.

Ironmaking Subcategory
PSES/PSNS Limitations for Sintering Operations[a]

Pollutant	Pretreatment Standards for Existing and New Sources (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Ammonia as nitrogen[b]	0.000652	0.000293
Lead	0.0000913	0.0000476
2,3,7,8-TCDF	<ML[c]	---
Zinc	0.000116	0.0000457

[a]PSES limitations in this table apply only to sintering operations with WAPCs.
[b]Not applicable when the discharger meets the requirements for a waiver of ammonia-N limitations.
[c]Ten parts per quadrillion (10×10^{-12} g/L).

Ironmaking Subcategory
PSES/PSNS Limitations for Blast Furnace Operations

Pollutant	Pretreatment Standards for Existing and New Sources (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Ammonia as nitrogen[a]	0.000217	0.0000977
Lead	0.0000304	0.0000159
2,3,7,8-TCDF[b]	<ML[c]	---
Zinc	0.0000387	0.0000152

[a]Not applicable when the discharger meets the requirements for a waiver of ammonia-N limitations.
[b]Applicable only when blast furnace process wastewater and sintering process wastewater discharges are co-treated.
[c]Ten parts per quadrillion (10×10^{-12} g/L).

PSNS

The treatment technologies that form the basis for PSNS for the Ironmaking Subcategory are the same as the PSES-1 model technologies; therefore, EPA has set proposed PSNS limitations for the Ironmaking Subcategory equal to PSES-1 limitations (see previous tables for PSES limitations). Section 15 discusses the compliance monitoring point for 2,3,7,8-TCDF. The Agency's proposed waiver of pretreatment standards for ammonia-N applies to both PSES and PSNS (see the description of PSES for the Ironmaking Subcategory for more information). Between proposal and promulgation of the Iron and Steel rule, the Agency plans to further evaluate setting PSNS for the Ironmaking Subcategory equal to BAT-1. As with PSES, the Agency is proposing zero discharge of process wastewater pollutants to POTWs as PSNS for sintering operations with dry air pollution controls.

14.3.3 Integrated Steelmaking

BAT/NSPS/PSES/PSNS

EPA is proposing BAT-1 as BAT, NSPS, PSES, and PSNS for the Integrated Steelmaking Subcategory. BAT-1 model treatment consists of solids removal, scale pit with oil skimming (continuous casting only), sludge dewatering, multimedia filtration (continuous casting only), a cooling tower (vacuum degassing and continuous casting), high-rate recycle, and blowdown treatment with chemical precipitation for metals removal. The model technology option for process wastewater associated with vacuum degassing or continuous casting also includes cooling towers.

EPA has determined that BAT-1 represents the best demonstrated technology for BAT, NSPS, PSES, and PSNS for the Integrated Steelmaking Subcategory. The application of BAT-1 would reduce current annual water usage by 83 percent and reduce total loadings of priority and nonconventional pollutants by 66 percent. BAT-1 provides control of POTW pass-

through pollutants for PSES and PSNS. EPA has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures.

The following table presents proposed BAT, NSPS, PSES, and PSNS limitations for the Integrated Steelmaking Subcategory. These limitations apply to wastewater from basic oxygen furnaces with semi-wet, wet-suppressed combustion, or wet-open combustion pollution controls; vacuum degassing; and continuous casting operations conducted at integrated iron and steel mills. The limitations apply to wastewater discharges from these operations whether they are treated separately or co-treated. The Agency proposes zero discharge of process wastewater pollutants to waters of the United States and POTWs as BAT, NSPS, PSES, and PSNS for ladle metallurgy operations (other than vacuum degassing) in the Integrated Steelmaking Subcategory.

Integrated Steelmaking Subcategory
BAT/NSPS/PSES/PSNS Limitations

Pollutant	Limitations for BAT, NSPS, PSES, and PSNS (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Basic Oxygen Furnaces		
Semi-wet Air Pollution Controls		
Lead	0.0000122	0.00000634
Zinc	0.0000140	0.00000795
Wet-suppressed Combustion		
Lead	0.0000243	0.0000127
Zinc	0.0000279	0.0000159
Wet-open Combustion		
Lead	0.0000243	0.0000127
Zinc	0.0000279	0.0000159
Vacuum degassing		
Lead	0.0000183	0.00000951
Zinc	0.0000209	0.0000119
Continuous Casting		
Lead	0.0000243	0.0000127
Zinc	0.0000279	0.0000159

14.3.4 Integrated and Stand-Alone Hot Forming

BAT--Carbon and Alloy Segment

EPA is proposing BAT-1 for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. BAT-1 model treatment consists of high-rate recycle using a scale pit with oil skimming, a roughing clarifier with oil removal, sludge dewatering, a multimedia filter for polishing, and treatment of blowdown with multimedia filtration. The following table presents proposed BAT limitations for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory.

Integrated and Stand-Alone Hot Forming Subcategory
BAT Limitations for Carbon and Alloy Steel Segment

Pollutant	BAT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Lead	0.000122	0.0000634
Zinc	0.000131	0.0000907

EPA is proposing two different approaches for implementing BAT-1 for the Carbon and Alloy Steel Segment because the selected option may not be economically achievable in April 2002, when the Agency is scheduled to take final action on the proposed Iron and Steel rule. BAT Option A and BAT Option B differ in the amount of time facilities would have to achieve proposed BAT limitations.

Under BAT Option A, each existing direct discharger in the Carbon and Alloy Steel Segment would be subject to the proposed BAT limitations as soon these limitations are incorporated into the facility's NPDES permit, as required by CWA section 301(b)(2). The Agency has determined that BAT Option A is economically achievable; a facility-level economic analysis projects no facility closures. A firm-level economic analysis, however, does project that one or more firms may experience financial distress (e.g., loss of financial independence, sale of assets, or the likelihood of bankruptcy) as a result of the aggregate compliance costs--including the compliance costs for the Integrated and Stand-Alone Hot Forming Subcategory--of the Iron and Steel rule. The Agency's facility-level analysis indicates that facilities would be expected to remain viable after compliance and would possess value as continuing concerns. Therefore, EPA expects that a firm would respond to financial distress through the sale of assets, rather than through the declaration of bankruptcy, which is far more disruptive in terms of economic impacts on the subcategory as a whole. For example, job losses would be more limited and any community impacts associated with job losses would likewise be less severe from the sale of a facility owned by a distressed firm when compared with the impacts associated with a bankruptcy-induced closure. The Agency has determined that this projected level of financial distress is not

significant and, therefore, has determined that Option A is economically achievable for the Carbon and Alloy Steel Segment as a whole.

EPA has estimated that affected facilities could spend $21.2 million in total annualized costs to comply with BAT limitations based on BAT-1. When these costs are considered together with other estimated costs that firms could incur if the Iron and Steel rule is promulgated as proposed, the cumulative costs of the Iron and Steel rule could jeopardize the corporate financial health of one or more firms. While EPA considers these possible impacts acceptable for the proposed Iron and Steel rule, the Agency recognizes that new information received after proposal, including information regarding changes in the financial health of the industry due to changes in the national economy and foreign trade, might lead EPA to reach a different conclusion at promulgation in April 2002. Therefore, EPA is proposing a second BAT approach for the Carbon and Alloy Steel Segment.

BAT Option B is designed to minimize the possible adverse economic impacts of the proposed BAT option for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. The Agency is considering BAT Option B in the event that BAT Option A is not economically achievable for the Carbon and Alloy Steel Segment as a whole when the Iron and Steel rule is promulgated.

As described above, BAT Option A would make each existing direct discharger in the Carbon and Alloy Steel Segment subject to the proposed BAT limitations as soon these limitations are incorporated into the facility's NPDES permit. Although it is common practice for permit writers to concurrently issue administrative orders and permits based on a new or revised effluent guidelines, the decision to do so is left to the discretion of the permit writers. Therefore, EPA cannot assume the availability of such relief when estimating the costs and impacts of the proposed Iron and Steel rule. Under BAT Option B, existing direct dischargers in the Carbon and Alloy Steel Segment could receive additional time to comply with proposed BAT limitations.

Under BAT Option B, EPA would codify BAT limitations containing three separate components; these components would become progressively more stringent over time. Although applied in stages, the limitations would represent a continuum of progress that all facilities under BAT Option B would be required to achieve by a later date determined by the Agency. The three components are described below:

- **First component.** Each facility in the Carbon and Alloy Steel Segment would be immediately subject to "stage 1" BAT limitations for each regulated pollutant. These limitations would be based on the facility's existing effluent quality or the facility's current technology-based permit limitations, whichever would represent the more stringent limitations for each regulated pollutant. The Agency expects that the permitting authority would express "stage 1" BAT limitations in numeric format for each facility on a case-by-case basis. Existing effluent quality would be determined at the internal monitoring point for wastewater discharged from the hot forming wastewater treatment plant.

- **Second component.** Each facility in the Carbon and Alloy Steel Segment would be subject to enforceable interim milestones developed by the permitting authority on the basis of best professional judgment to reflect reasonable progress toward compliance with the "stage 2" BAT limitations. EPA intends that these milestones would be expressed as narrative or numeric conditions in the facility's NPDES permit and would reflect each step in a facility's progress toward achievement of "stage 2" performance requirements.

- **Third component.** Each facility in the Carbon and Alloy Steel Segment would be subject to the ultimate ("stage 2") BAT limitations based on the model BAT technology by a date determined by the Agency.

Under the first component, each facility would be subject to these limitations as soon as they were placed in the facility's NPDES permit. The "stage 1" BAT limitations would ensure that, at a minimum, existing effluent quality is maintained while each facility moves toward achieving "stage 2" BAT limitations. Because "stage 1" limitations would reflect a level of technology that is either already used or has been previously identified as BAT for each facility, EPA would conclude at promulgation that the technology bases for "stage 1" limitations are both technically available and economically achievable. If EPA were to promulgate such limitations, the Agency would consider whether the application of these limitations would result in any adverse non-water quality environmental impacts and would also consider the other statutory factors specified in CWA section 304(b)(2)(B) and 306. EPA believes that "stage 1" limitations would be the best available technology economically achievable for facilities in the Carbon and Alloy Steel Segment if compliance with these limitations allows these facilities to focus resources on the research, development, testing, and installation of technologies ultimately needed to achieve "stage 2" limitations. "Stage 1" limitations thus would reflect "reasonable further progress toward the national goal of eliminating the discharge of all pollutants," as called for by CWA section 301(b)(2)(A). "Stage 1" limitations would also reasonably represent the first component of the BAT continuum of progress if the Agency were to determine that the model BAT technology is not economically achievable at promulgation.

EPA would promulgate "stage 2" limitations based on the model BAT technology for the Carbon and Alloy Steel Segment. Under Option B, facilities would be subject to "stage 2" limitations by a later date set by the Agency (e.g., April 30, 2007). EPA would select a date by determining--based on the administrative record at promulgation--when the model BAT technology would be economically achievable for the Carbon and Alloy Steel Segment as a whole. Thus, if EPA concludes at the time of promulgation that five years would be sufficient time to allow facilities to raise the capital necessary to implement the model BAT technology in a way that ensures its economic achievability, then EPA would specify a "stage 2" compliance date five years from promulgation.

EPA recognizes that some facilities in the Carbon and Alloy Steel Segment are already achieving or are capable of achieving limitations approaching "stage 2" limitations. Consequently, "stage 1" limitations for each facility would correspond to that level of

achievement, as judged by the permitting authority based on monitoring data supplied by the facility. In this way, EPA would ensure that limitations were derived from the best available technology economically achievable for the segment as a whole, even if that technology varies on a facility-to-facility basis during the interim period before the "stage 2" limitations apply.

EPA acknowledges that the uncertainties in the iron and steel market and the financial circumstances of individual firms may make it difficult to project the economic achievability of particular technologies in future years, even in the comparative near term. The Agency would expect to take into account a variety of factors, including the costs of the BAT model technology over a specified number of years, the expected industry price and revenue cycle, the economic impact of other EPA regulations (if applicable within the time frame) on the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory, and resulting aggregate costs, closures, and firm failures.

In the effluent limitations guidelines and standards for the pulp, paper and paperboard industry, EPA adopted an approach similar to BAT Option B as part of its Voluntary Advanced Technology Incentives Program (see 40 CFR 430.24(b)). Facilities choosing to participate in the Voluntary Advanced Technology Incentives Program could enroll at one of three levels, or tiers, each with its own set of limits and time frames for compliance, and each based on a different model BAT technology (with technologies becoming more advanced as the time periods for compliance were extended). For each tier, EPA promulgated voluntary advanced technology BAT limitations that consisted of three separate components. Together, the three components combined to represent BAT for any bleached papergrade kraft and soda mill that elected to participate in the voluntary incentives program. The first component consisted of "stage 1" existing effluent quality limitations that were similar in principle to the "stage 1" limitations described above for BAT Option B (see 40 CFR 430.24(b)(1)). The second component consisted of enforceable interim milestones developed by the permitting authority using best professional judgement to reflect reasonable interim milestones toward achievement of the ultimate BAT limitations (see 40 CFR 430.24(b)(2)). The program also included numeric six-year milestone limitations that would apply to facilities that enrolled in Incentives Tiers with deadlines of 2009 and 2014 (see 40 CFR 430.24(b)(3)). The third component consisted of numeric "stage 2" effluent limitations that reflected the limitations achievable by the model BAT technology for the particular tier. Taken together, these three components constitute reasonable further progress toward the national goal of eliminating the discharge of all pollutants and, for this reason, represent BAT.

The incremental approach of BAT Option B is authorized by CWA section 301(b)(2)(A), which expressly requires BAT to result in reasonable further progress toward the national goal of eliminating pollutant discharges. Although environmental improvements would be realized only incrementally under BAT Option B, each facility would be continuously subject to and required to comply immediately with BAT limitations as they progressively unfold, including each interim BAT limitation or permit condition representing that progress.

EPA's promulgation of BAT Option B as a package of progressively more stringent limitations and conditions is consistent with the use of BAT as a "beacon to show what

is possible." See Kennecott v. EPA, 780 F.2d 445, 448 (4th Cir. 1985). Using BAT Option B, EPA would promulgate forward-looking effluent limitations guidelines and standards for the Carbon and Alloy Steel Segment as a whole. The application of BAT Option B would also promote a form of technological progress that is consistent with Congressional intent that BAT should aspire to "increasingly higher levels of control" (Reference 14-3).

The application of BAT Option B would also be consistent with the overall goals of the CWA (see CWA Section 101(a)). Agencies have considerable discretion to interpret statutes to promote Congressional objectives: "[T]he breadth of agency discretion is, if anything, at zenith when the action . . . relates primarily to . . . the fashioning of policies, remedies and sanctions, including enforcement and voluntary compliance programs[,] in order to arrive at maximum effectuation of Congressional objectives." See U.S. Steelworkers of America v. Marshall, 647 F.2d 1189, 1230-31 n.64 (D.C. Cir. 1980) (upholding OSHA rule staggering lead requirements over 10 years) (quoting Niagara Mohawk Power Corp. v. FPC, 379 F.2d 153, 159 (D.C. Cir. 1967)), cert. denied, 453 U.S. 9113 (1981). The codification of progressively more stringent BAT limitations advances not only the general goal of the CWA, but also advances the explicit goals of the BAT program. See Chevron, U.S.A., Inc. v. NRDC, 467 U.S. 837, 843-44 (1984).

The movement toward elimination of pollutant discharges in stages is also consistent with the overarching structure of the effluent limitations guidelines and standards program. Congress originally envisioned that the sequence of attaining BPT limits in 1977 and BAT limits in 1983 would result in "levels of control which approach and achieve the elimination of the discharge of pollutants" (Reference 14-3). This two-step approach produced dramatic improvements in water quality but did not achieve the elimination of pollutant discharges. Therefore, EPA periodically revisits and revises effluent limitations guidelines and standards with the intention each time of making further progress toward the national goal. The current proposal of the Iron and Steel rule represents the third set of effluent limitations guidelines and standards proposed for the iron and steel industry. Achieving these incremental improvements through successive rulemakings carries a substantial cost: the rulemaking process can be highly complex, in large part because of the massive record compiled to support the Agency's decisions and because of the substantial costs associated with achieving each additional increment of environmental improvement. If EPA were to adopt BAT Option B for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory, the Agency would achieve the goals that Congress envisioned for the BAT program at considerably less cost: one rulemaking that looks both at the present and into the future.

Finally, like other agencies, EPA has inherent authority to phase in regulatory requirements in appropriate cases. EPA has used this authority in other contexts. For example, EPA recently phased in, over two years, Toxic Substances Control Act (TSCA) rules pertaining to lead-based paint activities. See 40 CFR 746.239 and 61 FR 45788, 45803 (Aug. 29, 1996). Similarly, the Occupational Safety and Health Administration phased in, over 10 years, a series of progressively more stringent lead-related controls. See 29 CFR 1910.1025 (1979 ed.). In upholding that rule, the U.S. Court of Appeals for the D.C. Circuit noted that "the extremely remote deadline at which the [sources] are to meet the final [permissible exposure limits] is

perhaps the single most important factor supporting the feasibility of the standard." See United Steelworkers of America v. Marshall, 647 F.2d at 1278.

EPA recognizes that CWA sections 301(b)(2)(C) & (D) require BAT limits to be achieved "in no case later than three years after the date such limits are promulgated under section 304(b), and in no case later than March 31, 1989." (Section 301(b)(2)(F), which refers to BAT limitations for nonconventional pollutants, also contains the March 31, 1989 date but uses as its starting point the date the limitations are "established.") This language does not speak to whether EPA can promulgate BAT limitations that are phased in over time so that a direct discharger at all times is subject to and must comply immediately with particular BAT limitations applicable to them at any given point in time. Because Section 301(b)(2) provides no clear direction, EPA must make a reasonable interpretation of the CWA. See Chevron, U.S.A., Inc. v. NRDC, 467 U.S. at 843-44. The Agency has determined that subjecting facilities to progressively more stringent BAT limitations over time would be the best way of achieving reasonable further progress toward eliminating all pollutant discharges, as intended by Congress. Using BAT Option B, EPA would achieve environmental reductions beyond those that would be achievable if EPA proposed a BAT option based only on what is immediately attainable. The Agency estimates that the total annualized compliance cost for BAT Option B would be $13.3 million, which represents a savings of $7.9 million over BAT Option A.

NSPS--Carbon and Alloy Steel Segment

The treatment technologies that form the basis for NSPS for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory are the same as the BAT-1 model technologies. EPA has determined that BAT Option A is the best demonstrated technology for new sources in the Carbon and Alloy Steel Segment; therefore, the Agency is proposing BAT Option A as the basis for NSPS limitations for the Carbon and Alloy Steel Segment (see previous table for BAT limitations). To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the Carbon and Alloy Steel Segment: TSS and O&G. The following table presents these additional limitations.

Integrated and Stand-Alone Hot Forming Subcategory--Carbon and Alloy Steel Segment NSPS Limitations for TSS and O&G

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Lead	0.000122	0.0000634
Oil and grease (O&G)	0.00793	0.00628
Total suspended solids (TSS)	0.0182	0.0124
Zinc	0.000131	0.0000907

PSES--Carbon and Alloy Steel Segment

EPA is not proposing PSES limitations for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. EPA evaluated PSES-1 model treatment, which consists of high-rate recycle using a scale pit with oil skimming, roughing clarifier with oil removal, sludge dewatering, a multimedia filter for polishing, and treatment of blowdown with multimedia filtration. Although the application of PSES-1 would reduce current annual wastewater flow by 74 percent and reduce total loadings of priority and nonconventional pollutants by 53 percent, EPA has determined that nationally applicable PSES are unnecessary at this time because the Carbon and Alloy Steel Segment covers only 7 facilities, and the application of PSES-1 would result in an average annual removal of only 21 toxic pound equivalents[3] per facility. The Agency has determined that a case-by-case application of local pretreatment limitations would more appropriately address individual toxic parameters present at these facilities.

PSNS--Carbon and Alloy Steel Segment

EPA is not proposing PSNS limitations for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory for the same reasons the Agency is not proposing PSES limitations for this segment. In addition, EPA does not foresee the construction of any new indirectly discharging facilities that would be covered under this segment. Additionally, EPA has determined that it would not be practicable for a direct discharger covered under the Carbon and Alloy Steel Segment to become an indirect discharger because the flow rates from the facility would be too great for treatment in a POTW.

[3]These removals are much lower than those achieved by other categorical pretreatment standards promulgated by EPA. For example, annual per-facility toxic pound equivalents for the Organic, Chemical, Plastics, and Synthetic Fibers (OCPSF), Electroplating, Battery Manufacturing, and Porcelain Enameling rules range from 6,747 to 14,960. EPA recently chose not to promulgate pretreatment standards for two industrial categories: Industrial Laundries (see 64 FR 45072) and Landfills (see 65 FR 3008) because the industrial laundries standards would remove only 32 and the landfill standards would remove only 14 annual per-facility toxic pound equivalents.

BAT--Stainless Steel Segment

EPA is proposing BAT-1 for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. BAT-1 model treatment consists of high-rate recycle using a scale pit with oil skimming, a roughing clarifier with oil removal, sludge dewatering, a multimedia filter for polishing, and treatment of blowdown with multimedia filtration. EPA has determined that this option is economically achievable (Reference 14-2); no facility closures would result from the application of BAT-1.

Integrated and Stand-Alone Hot Forming Subcategory
BAT Limitations for Stainless Steel Segment

Pollutant	BAT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Chromium	0.0000808	0.0000362
Nickel	0.000275	0.000144

NSPS--Stainless Steel Segment

The treatment technologies that form the basis for NSPS for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed NSPS limitations for the Stainless Steel Segment equal to BAT-1 limitations (see previous table for BAT limitations). To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the Stainless Steel Segment: TSS and O&G. The following table presents these additional limitations.

Integrated and Stand-Alone Hot Forming Subcategory--Stainless Steel Segment
NSPS Limitations for TSS and O&G[a]

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.0236	0.0119
Total suspended solids (TSS)	0.0265	0.0109

[a]Proposed NSPS limitations for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory include the BAT limitations presented in the previous table in addition to these limitations for TSS and O&G.

PSES--Stainless Steel Segment

EPA is not proposing PSES limitations for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory. Although the application of PSES-1 would reduce current annual wastewater flow by 90 percent and reduce total loadings of priority and nonconventional pollutants by 66 percent, EPA has determined that PSES are unnecessary at this time because the Stainless Steel Segment covers only 3 facilities, and the application of PSES-1 would result in an average annual removal of only 4 toxic pound equivalents per facility. These removals are much lower than those achieved by other categorical pretreatment standards promulgated by EPA (see the description of PSES for the Carbon and Alloy Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory, footnote number 3, for more information). The Agency has determined that a case-by-case application of local pretreatment limitations would more appropriately address individual toxic parameters present at these facilities.

PSNS--Stainless Steel Segment

EPA is not proposing PSNS limitations for the Stainless Steel Segment of the Integrated and Stand-Alone Hot Forming Subcategory for the same reasons the Agency is not proposing PSES limitations for this segment.

14.3.5 Non-Integrated Steelmaking and Hot Forming Subcategory

BAT--Carbon and Alloy Steel Segment

EPA is proposing BAT-1 for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. BAT-1 model treatment consists of solids removal, scale pit with oil skimming (continuous casting and hot forming only), sludge dewatering, a cooling tower, multimedia filtration, high-rate recycle, and treatment of blowdown with multimedia filtration. The application of BAT-1 would reduce current annual wastewater flow by 90 percent and reduce total loadings of priority and nonconventional pollutants by 72 percent. BAT-1 would remove 39,100 toxic pound equivalents per year at an annualized compliance cost of $3.1 million (in 1997 dollars). The Agency has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures.

The following table presents proposed BAT limitations for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. The Agency proposes zero discharge of process wastewater pollutants to waters of the U.S. as BAT for electric arc furnaces and ladle metallurgy operations (other than vacuum degassing) in the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory.

Non-Integrated Steelmaking and Hot Forming Subcategory
BAT Limitations for Carbon and Alloy Steel Segment

Pollutant	BAT Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Vacuum Degassing and Continuous Casting[a]		
Lead	0.0000122	0.00000634
Zinc	0.0000101	0.00000450
Hot Forming		
Lead	0.0000609	0.0000317
Zinc	0.0000506	0.0000225

[a]Limitations are applicable to each vacuum degassing or continuous casting operation on site.

NSPS--Carbon and Alloy Steel Segment

EPA proposes zero discharge of process wastewater pollutants to waters of the U.S. as NSPS for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. NSPS model process wastewater and water pollution control technologies include treatment and high-rate recycle systems, management of process area storm water, and disposal of low-volume blowdown streams by evaporation through controlled application on EAF slag, direct cooling of electrodes in electric arc furnaces, and other evaporative uses.

Operators of 24 existing non-integrated steel facilities have reported zero discharge of process wastewater. These facilities are located in the following states: Alabama, Arizona, Georgia, Illinois, Indiana, Louisiana, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Utah, and Washington. Under the Non-Integrated Steelmaking and Hot Forming Subcategory, these facilities produce the following carbon, alloy, and stainless steel products: bars, beams, billets, flats, plate, rail, rebar, rod, sheet, slabs, small structurals, strip, and specialty sections.

Consequently, the Agency has determined that zero discharge is well demonstrated and appropriate as NSPS for non-integrated steelmaking and hot forming operations that are located in any area of the United States and manufacture any product. EPA has determined that there is no barrier to entry for new sources to achieve this option; the wastewater treatment technologies and water management practices necessary to achieve zero discharge can be designed and implemented at new facilities.

PSES--Carbon and Alloy Steel Segment

EPA is proposing not to revise PSES limitations for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. As presented in the following table, EPA is recodifying 1982 PSES to fit the revised subcategorization and segmentation of the proposed rule. EPA is reserving PSES for semi-wet EAF steelmaking operations and proposing zero discharge of process wastewater pollutants to POTWs as PSES for ladle metallurgy operations (other than vacuum degassing) within the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. For hot forming operations, any existing source that discharges to POTWs must comply with 40 CFR Part 403.

Although the application of PSES-1 would reduce current annual wastewater flow by 7 percent and reduce total loadings of priority and nonconventional pollutants by 4.3 percent, EPA has determined that PSES are unnecessary at this time because the Carbon and Alloy Steel Segment covers only 15 facilities, and the application of PSES-1 would result in an average annual removal of only 3 toxic pound equivalents per facility. These removals are much lower than those achieved by other categorical pretreatment standards promulgated by EPA (see Section 14.3.4, footnote number 3, for more information). The Agency has determined that a case-by-case application of local pretreatment limitations would more appropriately address individual toxic parameters present at these facilities.

Non-Integrated Steelmaking and Hot Forming
PSES for Carbon and Alloy Steel Segment

Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)[a]	
	Maximum Daily	Maximum Monthly Average
Vacuum Degassing and Continuous Casting[b]		
Lead	0.0001878	0.0000626
Zinc	0.000282	0.0000938

[a]For hot forming operations, any existing source subject to regulation under the Carbon and Alloy Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory that introduces pollutants into a POTW must comply with 40 CFR Part 403.
[b]Limitations are applicable to each vacuum degassing or continuous casting operation on site.

PSNS--Carbon and Alloy Steel Segment

EPA proposes zero discharge of process wastewater pollutants to waters of the United States and POTWs as both NSPS and PSNS for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. The Agency has determined that there is no barrier to entry for new sources to achieve this option; the wastewater treatment technologies and water management practices necessary to achieve zero discharge can be designed and implemented at new facilities. See the discussion of NSPS for this segment for more information on the Agency's basis for selecting zero discharge.

BAT--Stainless Steel Segment

EPA is proposing BAT-1 for the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. BAT-1 model treatment consists of solids removal, scale pit with oil skimming (continuous casting and hot forming only), sludge dewatering, a cooling tower, multimedia filtration high-rate recycle, and treatment of blowdown with multimedia filtration. The application of BAT-1 would reduce current annual water usage by 50 percent and reduce total loadings of priority and nonconventional pollutants by 29 percent. BAT-1 would remove 1,560 toxic pound equivalents at an annualized compliance cost of $0.1 million (in 1997 dollars). The Agency has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures.

The following table presents proposed BAT limitations for the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. The Agency proposes zero discharge of process wastewater pollutants to waters of the United States as BAT for EAFs and ladle metallurgy operations (other than vacuum degassing) within the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory.

Non-Integrated Steelmaking and Hot Forming Subcategory
BAT/PSES Limitations for Stainless Steel Segment

Pollutant	BAT/PSES Limitations (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Vacuum Degassing and Continuous Casting[a]		
Chromium	0.00000808	0.00000362
Nickel	0.0000275	0.0000144
Hot Forming		
Chromium	0.0000404	0.0000181
Nickel	0.000137	0.0000720

[a]Limitations are applicable to each vacuum degassing or continuous casting operation on site.

NSPS--Stainless Steel Segment

EPA proposes zero discharge of process wastewater pollutants to waters of the United States as NSPS for the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. The Agency has determined that zero discharge is demonstrated and appropriate as NSPS for non-integrated steelmaking and hot forming operations that are located in any area of the United States and manufacture any product. EPA has determined that there is no barrier to entry for new sources to achieve this option; the wastewater treatment technologies and water management practices necessary to achieve zero discharge can be designed and implemented at new facilities. See the description of NSPS for the Carbon and Alloy Steel

Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory for more information on the Agency's basis for selecting zero discharge as NSPS for this subcategory.

PSES--Stainless Steel Segment

The treatment technologies that form the basis for PSES for the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed PSES limitations for the Stainless Steel Segment equal to BAT-1 limitations. Application of this option would reduce current annual wastewater flow by 85 percent and reduce total loadings of priority and nonconventional pollutants by 20 percent. The Agency has determined that this option provides controls for POTW pass-through pollutants and is economically achievable (application of this option would cause no facility closures). As with BAT, the Agency proposes zero discharge of process wastewater pollutants to POTWs as PSES for EAFs and ladle metallurgy operations in the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory.

PSNS--Stainless Steel Segment

EPA proposes zero discharge of process wastewater pollutants to waters of the United States and POTWs as both NSPS and PSNS for the Stainless Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory. The Agency has determined that there is no barrier to entry for new sources to achieve this option; the wastewater treatment technologies and water management practices necessary to achieve zero discharge can be designed and implemented at new facilities. See the description of NSPS for the Carbon and Alloy Steel Segment of the Non-Integrated Steelmaking and Hot Forming Subcategory for more information on the Agency's basis for selecting zero discharge as NSPS for this subcategory.

14.3.6 Steel Finishing

BAT--Carbon and Alloy Steel Segment

EPA is proposing BAT-1 for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory. BAT-1 model treatment consists of recycle of fume scrubber water, countercurrent rinses, a diversion tank, oil removal, hexavalent chrome reduction (where applicable), equalization, chemical precipitation for metals removal, clarification, and sludge dewatering. The application of BAT-1 would reduce current annual wastewater flow by 65 percent and reduce total loadings of priority and nonconventional pollutants by 25 percent. BAT-1 would remove 22,410 toxic pound equivalents per year at an annualized compliance cost of $4.0 million (in 1997 dollars). The Agency has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures. The following tables present proposed BAT limitations for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory.

Steel Finishing Subcategory
Maximum Daily BAT Limitations for Carbon and Alloy Steel Segment

Process Operation	BAT Effluent Limitations (lbs/ton of product)[a,b]			
	Maximum Daily			
	Cr^{+6}	Cr	Pb	Zn
(i) Acid pickling--hydrochloric				
(A) Bar, billet, rod, coil	0.0000508	0.000227	0.000596	0.000637
(B) Pipe, tube	0.000106	0.000472	0.00124	0.00133
(C) Plate	0.00000363	0.0000162	0.0000426	0.0000455
(D) Strip, sheet	0.00000518	0.0000231	0.0000609	0.0000650
(ii) Acid pickling--sulfuric				
(A) Bar, billet, rod, coil	0.0000290	0.000130	0.000341	0.000364
(B) Pipe, tube	0.0000518	0.000231	0.000609	0.000650
(C) Plate	0.00000363	0.0000162	0.0000426	0.0000455
(D) Strip, sheet	0.0000238	0.000106	0.000280	0.000299
(iii) Acid regeneration[c]				
(A) Fume scrubbers	0.0149	0.0666	0.175	0.187
(iv) Alkaline cleaning				
(A) Pipe, tube	0.00000207	0.00000925	0.0000243	0.0000260
(B) Strip, sheet	0.0000363	0.000162	0.000426	0.000455
(v) Cold forming				
(A) Direct application-single stand	0.000000311	0.00000139	0.00000365	0.00000390
(B) Direct application-multiple stands	0.0000285	0.000127	0.000335	0.000357
(C) Recirculation-single stand	0.000000104	0.000000463	0.00000122	0.00000130
(D) Recirculation-multiple stands	0.00000259	0.0000116	0.0000304	0.0000325
(E) Combination-multiple stands	0.0000148	0.0000662	0.000174	0.000186
(vi) Continuous annealing lines	0.00000207	0.00000925	0.0000243	0.0000260
(vii) Electroplating				
(A) Plate	0.00000363	0.0000162	0.0000426	0.0000455
(B) Strip, sheet: tin, chromium	0.000114	0.000509	0.00134	0.00143
(C) Strip, sheet: zinc, other metals	0.0000570	0.000255	0.000669	0.000715
(viii) Hot coating				
(A) Galvanizing, terne, and other metals	0.0000570	0.000255	0.000669	0.000715
(ix) Wet air pollution control devices[3]				
(A) Fume scrubbers	0.00224	0.00999	0.0263	0.0281

Cr^{+6} - Hexavalent chromium.
Cr - Chromium.
Pb - Lead.
Zn - Zinc.
[a]Limitations for hexavalent chromium are applicable only when hexavalent chromium is present in untreated wastewater as a result of process or other operations.
[b]Limitations for chromium are applicable only when chromium is present in untreated wastewater as a result of process or other operations.
[c]Limitations are in pounds per day.

Steel Finishing Subcategory
Maximum Monthly Average BAT Limitations for Carbon and Alloy Steel Segment

Process Operation	BAT Effluent Limitations (lbs/ton of product)[a,b]			
	Maximum Monthly Average			
	Cr^{+6}	Cr^{2}	Pb	Zn
(i) Acid pickling--hydrochloric				
(A) Bar, billet, rod, coil	0.0000463	0.000117	0.000311	0.000262
(B) Pipe, tube	0.0000963	0.000243	0.000647	0.000546
(C) Plate	0.00000330	0.00000834	0.0000222	0.0000187
(D) Strip, sheet	0.00000472	0.0000119	0.0000317	0.0000267
(ii) Acid pickling--sulfuric				
(A) Bar, billet, rod, coil	0.0000264	0.0000668	0.000178	0.000150
(B) Pipe, tube	0.0000472	0.000119	0.000317	0.000267
(C) Plate	0.00000330	0.00000834	0.0000222	0.0000187
(D) Strip, sheet	0.0000217	0.0000548	0.000146	0.000123
(iii) Acid regeneration[c]				
(A) Fume scrubbers	0.0136	0.0343	0.0913	0.0770
(iv) Alkaline cleaning				
(A) Pipe, tube	0.00000189	0.00000477	0.0000127	0.0000107
(B) Strip, sheet	0.0000330	0.0000834	0.000222	0.000187
(v) Cold forming				
(A) Direct application-single stand	0.000000283	0.000000715	0.00000190	0.00000160
(B) Direct application-multiple stands	0.0000260	0.0000656	0.000174	0.000147
(C) Recirculation-single stand	0.0000000944	0.000000238	0.000000634	0.00000535
(D) Recirculation-multiple stands	0.00000236	0.00000596	0.0000159	0.0000134
(E) Combination-multiple stands	0.0000135	0.0000341	0.0000907	0.0000765
(vi) Continuous annealing lines	0.00000189	0.00000477	0.0000127	0.0000107
(vii) Electroplating				
(A) Plate	0.00000330	0.00000834	0.0000222	0.0000187
(B) Strip, sheet: tin, chromium	0.000104	0.000262	0.000698	0.000588
(C) Strip, sheet: zinc, other metals	0.0000519	0.000131	0.000349	0.000294
(viii) Hot coating				
(A) Galvanizing, terne, and other metals	0.0000519	0.000131	0.000349	0.000294
(ix) Wet air pollution control devices[c]				
(A) Fume scrubbers	0.00204	0.00515	0.0137	0.0116

Cr^{+6} - Hexavalent chromium.
Cr - Chromium.
Pb - Lead.
Zn - Zinc.
[a]Limitations for hexavalent chromium are applicable only when hexavalent chromium is present in untreated wastewater as a result of process or other operations.
[b]Limitations for chromium are applicable only when chromium is present in untreated wastewater as a result of process or other operations.
[c]Limitations are in pounds per day.

The permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and nonprocess wastewater (e.g., oily wastewater from hot forming mill basements and roll shops, tramp oil from mill oil collection systems, utility wastewater, and groundwater remediation wastewater) if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and generate an increase in effluent volume. Such increased mass discharges are to be calculated as a percentage increase over the otherwise applicable mass discharge based on increased effluent volume.

NSPS--Carbon and Alloy Steel Segment

The treatment technologies that form the basis for NSPS for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed NSPS limitations for the Carbon and Alloy Steel Segment equal to BAT-1 limitations (see previous tables for BAT limitations). To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory: TSS and O&G. The following table presents these additional limitations.

Steel Finishing--Carbon and Alloy Steel Segment
NSPS Limitations for TSS and O&G[a]

Process Operation	New Source Performance Standards (lbs/ton of product)			
	Oil and Grease (O&G)		Total Suspended Solids (TSS)	
	Maximum Daily	Maximum Monthly Average	Maximum Daily	Maximum Monthly Average
(i) Acid pickling--hydrochloric				
(A) Bar, billet, rod, coil	0.0307	0.0274	0.0566	0.0308
(B) Pipe, tube	0.0638	0.0571	0.118	0.0641
(C) Plate	0.00219	0.00196	0.00405	0.00220
(D) Strip, sheet	0.00313	0.00280	0.00578	0.00314
(ii) Acid pickling--sulfuric				
(A) Bar, billet, rod, coil	0.0175	0.0157	0.0324	0.0176
(B) Pipe, tube	0.0313	0.0280	0.0578	0.0314
(C) Plate	0.00219	0.00196	0.00405	0.00220
(D) Strip, sheet	0.0144	0.0129	0.0266	0.0145
(iii) Acid regeneration[b]				
(A) Fume scrubbers	9.01	8.07	16.6	9.05
(iv) Alkaline cleaning				
(A) Pipe, tube	0.00125	0.00112	0.00231	0.00126
(B) Strip, sheet	0.0219	0.0196	0.0405	0.0220

Process Operation	New Source Performance Standards (lbs/ton of product)			
	Oil and Grease (O&G)		Total Suspended Solids (TSS)	
	Maximum Daily	Maximum Monthly Average	Maximum Daily	Maximum Monthly Average
(v) Cold forming				
(A) Direct application-single stand	0.000188	0.000168	0.000347	0.000189
(B) Direct application-multiple stands	0.0172	0.0154	0.0318	0.0173
(C) Recirculation-single stand	0.0000626	0.0000560	0.000116	0.0000628
(D) Recirculation-multiple stands	0.00156	0.00140	0.00289	0.00157
(E) Combination-multiple stands	0.00895	0.00801	0.0165	0.00899
(vi) Continuous annealing lines	0.00125	0.00112	0.00231	0.00126
(vii) Electroplating				
(A) Plate	0.00219	0.00196	0.00405	0.00220
(B) Strip, sheet: tin, chromium	0.0688	0.0616	0.127	0.0691
(C) Strip, sheet: zinc, other metals	0.0344	0.0308	0.0636	0.0346
(viii) Hot coating				
(A) Galvanizing, terne, and other metals	0.0344	0.0308	0.0636	0.0346
(ix) Wet air pollution control devices[b]				
(A) Fume scrubbers	1.35	1.21	2.50	1.36

[a]Proposed NSPS Limitations for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory include the BAT limitations presented in the previous tables in addition to these limitations for TSS and O&G.
[b]Limitations are in pounds per day.

As with BAT, the permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and nonprocess wastewater if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and generate an increase in effluent volume.

PSES--Carbon and Alloy Steel Segment

EPA is not proposing PSES limitations for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory. As presented in the following table, EPA is recodifying 1982 PSES to fit the revised subcategorization and segmentation of the proposed rule. Under this proposal, the PSES limitations in the 1982 Iron and Steel rule will continue to apply for all manufacturing processes in this segment except electroplating. PSES limitations for electroplating are currently included in 40 CFR Part 433. Unlike the limitations at 40 CFR Part 420, these limitations are concentration-based. To ensure a consistent basis for facilities conducting electroplating in addition to other steel finishing operations, EPA is proposing to convert the existing concentration-based limitations at Part 433.into mass-based limitations by multiplying the proposed BAT production normalized flow rate and the appropriate conversion factor. Nine pollutants, some of which do not apply to electroplating operations at iron and steel facilities, are regulated under PSES at Part 433. EPA proposes to specify PSES limitations for

four of these pollutants: chromium, lead, nickel, and zinc; these four metals were identified as pollutants of concern for electroplating manufacturing operations in Section 7.

EPA evaluated PSES-1 model treatment for this segment; this model treatment is the same as the model treatment for BAT-1. Although the application of PSES-1 would reduce current annual wastewater flow by 30 percent and reduce total loadings of priority and nonconventional pollutants by 10 percent, EPA has determined that nationally applicable PSES are unnecessary at this time because the application of PSES-1 would result in an average annual removal of only 12 toxic pound equivalents per facility. These removals are much lower than those achieved by other categorical pretreatment standards promulgated by EPA (see Section 14.3.4, footnote number 3, for more information).

Steel Finishing Subcategory
PSES Limitations for Carbon and Alloy Steel Segment

Process Operation	Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)[a]	
		Maximum Daily	Maximum Monthly Average
Sulfuric acid pickling (spent acid solutions and rinse water)			
Rod, wire, and coil	Lead	0.001052	0.000350
	Zinc	0.001402	0.000468
Bar, billet, and bloom	Lead	0.000338	0.0001126
	Zinc	0.000450	0.0001502
Strip, sheet, and plate	Lead	0.001052	0.000226
	Zinc	0.001402	0.000300
Pipe, tube, and other products	Lead	0.000384	0.000626
	Zinc	0.00510	0.000834
Hydrochloric acid pickling (spent acid solutions and rinse water)			
Rod, wire, and coil	Lead	0.00184	0.000614
	Zinc	0.00246	0.000818
Strip, sheet, and plate	Lead	0.00384	0.000350
	Zinc	0.00510	0.000468
Pipe, tube, and other products	Lead	0.0000188	0.001276
	Zinc	0.0000126	0.001702
Cold rolling			
Recirculation - single stand	Lead	0.0000188	0.0000062
	Zinc	0.0000126	0.0000042
Recirculation - multiple stands	Lead	0.0000938	0.0000312
	Zinc	0.0000626	0.0000208
Combination	Lead	0.001126	0.000376
	Zinc	0.000752	0.000250
Direct application - single stand	Lead	0.000338	0.0001126
	Zinc	0.000226	0.0000752
Direct application - multiple stands	Lead	0.001502	0.000500
	Zinc	0.001002	0.000334

Process Operation	Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)[a]	
		Maximum Daily	Maximum Monthly Average
Cold worked pipe and tube mills - using water	Lead	0.0000188	0.0000062
	Zinc	0.0000126	0.0000042
Cold worked pipe and tube mills - using oil solutions	Lead	0.0000188	0.0000062
	Zinc	0.0000126	0.0000042
Electroplating[b]	Chromium	2.77	1.71
	Lead	0.69	0.43
	Nickel	3.98	2.38
	Zinc	2.61	1.48
Hot coating			
Galvanizing, terne coating, and other coatings - strip, sheet, and miscellaneous products	Cr^{+6}	0.000300	0.0001002
	Lead	0.00226	0.000752
	Zinc	0.00300	0.001000
Galvanizing and other coatings - wire products and fasteners	Cr^{+6}	0.001202	0.000400
	Lead	0.00902	0.00300
	Zinc	0.01202	0.00400
Sulfuric acid pickling line fume scrubbers [c,d]	Lead	0.0810	0.0271
	Zinc	0.1080	0.0361
Hydrochloric acid pickling line fume scrubbers [c,d]	Lead	0.0810	0.0271
	Zinc	0.1080	0.0361
Acid regeneration (absorber vent scrubbers) [c,d]	Lead	0.539	0.1802
	Zinc	0.719	0.240
Hot coating line fume scrubbers [2,3]	Cr^{+6}	0.01078	0.003586
	Lead	0.0810	0.0271
	Zinc	0.1080	0.0361

Cr^{+6} - Hexavalent chromium.
[a]The limitations for hexavalent chromium are applicable only to galvanizing operations that discharge wastewater from the chromate rinse step.
[b]Limitations are in milligrams per liter.
[c]Limitations are applicable to each fume scrubber associated with a process operation.
[d]Limitations are in pounds per day.

PSNS--Carbon and Alloy Steel Segment

The treatment technologies that form the basis for PSNS for the Carbon and Alloy Steel Segment of the Steel Finishing Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed PSNS limitations for the Carbon and Alloy Steel Segment equal to BAT-1 limitations (see tables above for BAT limitations).

As with BAT, the permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and nonprocess wastewater if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and generate an increase in effluent volume.

BAT--Stainless Steel Segment

EPA is proposing BAT-1 for the Stainless Steel Segment of the Steel Finishing Subcategory. BAT-1 model treatment consists of recycle of fume scrubber water, countercurrent rinses, acid purification, a diversion tank, oil removal, hexavalent chrome reduction (where applicable), equalization, chemical precipitation for metals removal, clarification, and sludge dewatering. The application of BAT-1 would reduce current annual wastewater flow by 47 percent and reduce total loadings of priority and nonconventional pollutants by 45 percent. BAT-1 would remove 69,700 toxic pound equivalents at an annualized compliance cost of $0.2 million (in 1997 dollars). The Agency has determined that BAT-1 is economically achievable (Reference 14-2); application of this option would cause no facility closures. The following tables present proposed BAT limitations for the Stainless Steel Segment of the Steel Finishing Subcategory.

Steel Finishing Subcategory
Maximum Daily BAT Limitations for Stainless Steel Segment

Process Operation	BAT Limitations (lbs/ton of product)[a,b]				
	Maximum Daily				
	NH_3[c]	Cr^{+6}	Cr	F	Ni
(i) Acid pickling and other descaling					
(A) Bar, billet	0.0437	0.000318	0.000500	0.0446	0.000147
(B) Pipe, tube	0.146	0.00107	0.00167	0.149	0.000494
(C) Plate	0.00665	0.0000484	0.0000760	0.00679	0.0000224
(D) Strip, sheet	0.133	0.000969	0.00152	0.136	0.000449
(ii) Acid regeneration[d]	---			---	
(A) Fume scrubbers		0.199	0.313		0.0923
(iii) Alkaline cleaning	---			---	
(A) Pipe, tube		0.0000277	0.0000434		0.0000128
(B) Strip, sheet		0.00346	0.00543		0.00160
(iv) Cold forming	---			---	
(A) Direct application-single stand		0.0000484	0.0000760		0.0000224
(B) Direct application-multiple stands		0.000381	0.000597		0.000176
(C) Recirculation-single stand		0.00000415	0.00000652		0.00000192
(D) Recirculation-multiple stands		0.0000221	0.0000348		0.0000103
(E) Combination-multiple stands		0.000198	0.000311		0.0000917
(v) Continuous annealing	---			---	
		0.0000277	0.0000434		0.0000128

Process Operation	BAT Limitations (lbs/ton of product)[a,b]				
	Maximum Daily				
	NH_3[c]	Cr^{+6}	Cr	F	Ni
(vi) Wet air pollution control devices[d]					
(A) Fume scrubbers	4.10	0.0299	0.0469	4.19	0.0138

NH_3 - Ammonia nitrogen.
Cr^{+6} - Hexavalent chromium.
Cr - Chromium.
F - Fluoride.
Ni - Nickel.
[a]Limitations for hexavalent chromium are applicable only when hexavalent chromium is present in untreated wastewater as a result of process or other operations.
[b]Limitations for chromium are applicable only when chromium is present in untreated wastewater as a result of process or other operations.
[c]Between proposal and promulgation of the Iron and Steel rule, the Agency plans to further evaluate the regulation of ammonia-N under the Stainless Steel Segment of the Steel Finishing Subcategory.
[d]Limitations are in pounds per day.

Steel Finishing Subcategory
Maximum Monthly Average BAT Limitations for Stainless Steel Segment

Process Operation	BAT Limitations (lbs/ton of product)[a,b]				
	Maximum Monthly Average				
	NH_3[c]	Cr^{+6}	Cr	F	Ni
(i) Acid pickling and other descaling					
(A) Bar, billet	0.0287	0.000196	0.000280	0.0356	0.000104
(B) Pipe, tube	0.0960	0.000655	0.000939	0.119	0.000347
(C) Plate	0.00436	0.0000298	0.0000427	0.00542	0.0000158
(D) Strip, sheet	0.0873	0.000595	0.000854	0.108	0.000315
(ii) Acid regeneration[d]	---			---	
(A) Fume scrubbers		0.122	0.176		0.0649
(iii) Alkaline cleaning	---			---	
(A) Pipe, tube		0.0000170	0.0000244		0.00000901
(B) Strip, sheet		0.00213	0.00305		0.00113
(iv) Cold forming	---			---	
(A) Direct application-single stand		0.0000298	0.0000427		0.0000158
(B) Direct application-multiple stands		0.000234	0.000335		0.000124
(C) Recirculation-single stand		0.00000255	0.00000366		0.00000135
(D) Recirculation-multiple stands		0.0000136	0.0000195		0.00000721
(E) Combination-multiple stands		0.000122	0.000174		0.0000644
(v) Continuous annealing	---	0.0000170	0.0000244	---	0.00000901

Process Operation	BAT Limitations (lbs/ton of product)[a,b]				
	Maximum Monthly Average				
	NH_3[c]	Cr^{+6}	Cr	F	Ni
(vi) Wet air pollution control devices[d]					
(A) Fume scrubbers	2.69	0.0184	0.0263	3.34	0.00973

NH_3 - Ammonia nitrogen.
Cr^{+6} - Hexavalent chromium.
Cr - Chromium.
F - Fluoride.
Ni - Nickel.
[a]Limitations for hexavalent chromium are applicable only when hexavalent chromium is present in untreated wastewater as a result of process or other operations.
[b]Limitations for chromium are applicable only when chromium is present in untreated wastewater as a result of process or other operations.
[c]Between proposal and promulgation of the Iron and Steel rule, the Agency plans to further evaluate the regulation of ammonia-N under the Stainless Steel Segment of the Steel Finishing Subcategory.
[d]Limitations are in pounds per day.

The permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and non-process wastewater (e.g., oily wastewater from hot forming mill basements and roll shops, tramp oil from mill oil collection systems, utility wastewater, and groundwater remediation wastewater) if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and cause an increase in effluent volume. Such increased mass discharges are to be calculated as a percentage increase over the otherwise applicable mass discharge based on increased effluent volume.

NSPS--Stainless Steel Segment

The treatment technologies that form the basis for NSPS for the Stainless Steel Segment of the Steel Finishing Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed NSPS limitations for the Stainless Steel Segment equal to BAT-1 limitations (see previous tables for BAT limitations). To ensure that the regulations for new sources represent the most stringent numerical values attainable through the application of the best available control technology for all pollutants, EPA is proposing NSPS limitations for two pollutants not regulated under BAT for the Stainless Steel Segment of the Steel Finishing Subcategory: TSS and O&G. The following table presents these additional limitations.

Steel Finishing Subcategory--Stainless Steel Segment
NSPS Limitations for TSS and O&G[a]

Process Operation	New Source Performance Standards (lbs/ton of product)			
	Oil and Grease (O&G)		Total Suspended Solids (TSS)	
	Maximum Daily	Maximum Monthly Average	Maximum Daily	Maximum Monthly Average
(i) Acid pickling and other descaling				
(A) Bar, billet	0.0172	0.0136	0.0242	0.0121
(B) Pipe, tube	0.0576	0.0456	0.0809	0.0406
(C) Plate	0.00262	0.00207	0.00368	0.00184
(D) Strip, sheet	0.0523	0.0414	0.0735	0.0369
(ii) Acid regeneration[b]				
(A) Fume scrubbers	10.8	8.52	15.1	7.59
(iii) Alkaline cleaning				
(A) Pipe, tube	0.00149	0.00118	0.00210	0.00105
(B) Strip, sheet	0.187	0.148	0.263	0.132
(iv) Cold forming				
(A) Direct application-single stand	0.00262	0.00207	0.00368	0.00184
(B) Direct application-multiple stands	0.0206	0.0163	0.0289	0.0145
(C) Recirculation-single stand	0.000224	0.000177	0.000315	0.000158
(D) Recirculation-multiple stands	0.00120	0.000947	0.00168	0.000843
(E) Combination-multiple stands	0.0107	0.00846	0.0150	0.00754
(v) Continuous annealing	0.00149	0.00118	0.00210	0.00105
(vi) Wet air pollution control devices[b]				
(A) Fume scrubbers	1.61	1.28	2.27	1.14

[a]Proposed NSPS Limitations for the Stainless Steel Segment of the Steel Finishing Subcategory include the BAT limitations presented in the previous tables in addition to these limitations for TSS and O&G.
[b]Limitations are in pounds per day.

As with BAT, the permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and nonprocess wastewater if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and generate an increase in effluent volume.

PSES--Stainless Steel Segment

EPA is not proposing PSES limitations for the Stainless Steel Segment of the Steel Finishing Subcategory. As presented in the following table, EPA is re-codifying 1982 PSES to fit the revised subcategorization and segmentation of the proposed rule.

EPA evaluated PSES-1 model treatment for the Stainless Steel Segment of the Steel Finishing Subcategory; this model treatment is the same as the model treatment for BAT-1.

The application of PSES-1 would reduce current annual wastewater flow by 23 percent and reduce total loadings of priority and nonconventional pollutants by 10 percent. However, 548 of the 653 total annual toxic pound equivalents that would be removed through PSES-1 are attributable to one parameter--fluoride--from one iron and steel facility. Without considering this parameter, the annual per-facility pollutant removal through PSES-1 drops from 46 to only 7 toxic pound equivalents. This removal is much lower than those achieved by other categorical pretreatment standards promulgated by EPA (see Section 14.3.4, footnote number 3, for more information). Consequently, EPA has determined that it would be more appropriate for the pretreatment control authority for that facility to control pollutant release through its pretreatment control mechanism than for the Agency to implement a national pretreatment standard.

Steel Finishing Subcategory
PSES Limitations for Stainless Steel Segment

Process Operation	Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)	
		Maximum Daily	Maximum Monthly Average
Salt bath descaling - oxidizing			
Batch - sheet and plate	Chromium	0.00584	0.00234
	Nickel	0.00526	0.001752
Batch - rod and wire	Chromium	0.00350	0.001402
	Nickel	0.00316	0.001052
Batch - pipe and tube	Chromium	0.01418	0.00568
	Nickel	0.01276	0.00426
Continuous	Chromium	0.00276	0.001102
	Nickel	0.00248	0.000826
Salt bath descaling - reducing			
Batch	Chromium	0.00204	0.000678
	Nickel	0.00244	0.000814
Continuous	Chromium	0.01138	0.0038
	Nickel	0.01366	0.00456

Process Operation	Pollutant	Pretreatment Standards for Existing Sources (lbs/ton of product)	
		Maximum Daily	Maximum Monthly Average
Combination acid pickling (spent acid solutions and rinse water)			
Rod, wire, and coil	Chromium	0.00426	0.001704
	Nickel	0.00384	0.001276
Bar, billet, and bloom	Chromium	0.001920	0.000768
	Nickel	0.001728	0.000576
Strip, sheet, and plate - continuous	Chromium	0.01252	0.00500
	Nickel	0.01126	0.00376
Strip, sheet, and plate - batch	Chromium	0.00384	0.001536
	Nickel	0.00346	0.001152
Pipe, tube, and other products	Chromium	0.00644	0.00258
	Nickel	0.00578	0.001928
Cold rolling			
Recirculation - single stand	Chromium	0.0000418	0.00000168
	Nickel	0.0000376	0.0000126
Recirculation - multiple stands	Chromium	0.000208	0.0000836
	Nickel	0.0001878	0.0000626
Combination	Chromium	0.00250	0.001002
	Nickel	0.00226	0.000752
Direct application - single stand	Chromium	0.000752	0.000300
	Nickel	0.000676	0.000226
Direct application - multiple stands	Chromium	0.00334	0.001336
	Nickel	0.0030	0.001002
Cold worked pipe and tube mills - using water	Chromium	0.0000418	0.0000168
	Nickel	0.0000376	0.0000126
Cold worked pipe and tube mills - using oil solutions	Chromium	0.0000418	0.0000168
	Nickel	0.0000376	0.0000126
Fume scrubber [a,b]	Chromium	0.1802	0.0719
	Nickel	0.1617	0.0539

[1]Limitations are applicable to each fume scrubber associated with a process operation.
[2]Limitations are in pounds per day.

PSNS--Stainless Steel Segment

The treatment technologies that form the basis for PSNS for the Stainless Steel Segment of the Steel Finishing Subcategory are the same as the BAT-1 model technologies; therefore, EPA has set proposed PSNS limitations for the Stainless Steel Segment of the Steel Finishing Subcategory equal to BAT-1 limitations (see tables above for BAT limitations). As with BAT, the permit authority may allow for increased mass discharges on a site-specific basis to account for unregulated process wastewater and nonprocess wastewater if these wastewater streams are co-treated with wastewater regulated under the Steel Finishing Subcategory and generate an increase in effluent volume.

14.3.7 Other Operations

BAT--Direct Reduced Ironmaking Segment

EPA is reserving BAT limitations for the Direct Reduced Ironmaking Segment of the Other Operations Subcategory because the Agency has identified no priority or nonconventional pollutants of concern for this segment.

NSPS--Direct Reduced Ironmaking Segment

The treatment technologies that form the basis for NSPS for the Direct Reduced Ironmaking Segment of the Other Operations Subcategory are the same as the BPT-1 model treatment technologies for this segment, which consist of solids removal, sludge dewatering, a cooling tower, high-rate recycle, and treatment of blowdown with multimedia filtration. The following table presents the proposed NSPS limitations.

Other Operations Subcategory
NSPS Limitations for Direct Reduced Ironmaking Segment

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Total suspended solids (TSS)	0.0200	0.00929

PSES--Direct Reduced Ironmaking Segment

EPA is reserving PSES limitations for the Direct Reduced Ironmaking Segment of the Other Operations Subcategory because the Agency has identified no POTW pass-through pollutants for this segment.

PSNS--Direct Reduced Ironmaking Segment

EPA is reserving PSNS limitations for the Direct Reduced Ironmaking Segment of the Other Operations Subcategory because the Agency has identified no POTW pass-through pollutants for this segment.

BAT--Forging Segment

EPA is reserving BAT limitations for the Forging Segment of the Other Operations Subcategory because the Agency has identified no priority or nonconventional pollutants of concern for this segment.

NSPS--Forging Segment

The treatment technologies that form the basis for NSPS for the Forging Segment of the Other Operations Subcategory are the same as the BPT-1 model treatment technologies for this segment, which are based on high rate recycle and oil/water separation. The following table presents the proposed NSPS limitations.

Other Operations Subcategory
NSPS Limitations for Forging Segment

Pollutant	New Source Performance Standards (lbs/ton of product)	
	Maximum Daily	Maximum Monthly Average
Oil and grease (O&G)	0.0149	0.00889
Total suspended solids (TSS)	0.0235	0.0118

PSES--Forging Segment

EPA is reserving PSES limitations for the Forging Segment of the Other Operations Subcategory because the Agency has identified no POTW pass-through pollutants for this segment.

PSNS--Forging Segment

EPA is reserving PSNS limitations for the Forging Segment of the Other Operations Subcategory because the Agency has identified no POTW pass-through pollutants for this segment.

BAT/NSPS/PSES/PSNS--Briquetting Segment

EPA proposes zero discharge of process wastewater pollutants to waters of the U.S. and POTWs as BAT, NSPS, PSES, and PSNS for the Briquetting Segment of the Other Operations Subcategory.

14.4 References

14-1. U.S. Environmental Protection Agency. Development Document for Effluent Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA/440/1-82/024. Washington, D.C., May 1982, Volume I, Table I-1, pp. 13 to 17.

14-2. U.S. Environmental Protection Agency. Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category. EPA 821-B-00-009. Washington, D.C., December 2000.

14-3. Statement of Senator Muskie (Oct. 4, 1972), reprinted in A Legislative History of the Water Pollution Control Act Amendments of 1972 ("1972 Leg. Hist."), 170.

Table 14-1

Limitations for Best Practicable Control Technology Currently Available (BPT) Under 1982 Rule

Subcategory	Process Wastewater Source	Pollutant	Maximum daily[a]	Maximum Monthly Average[a]
Cokemaking	By-product cokemaking (iron and steel coke plants)[b]	O&G TSS	0.0654 0.506	0.0218 0.262
	By-product cokemaking (Merchant coke plants)[c]	O&G TSS	0.0698 0.540	0.0232 0.280
	Non-recovery cokemaking	[d]	[d]	[d]
Ironmaking	Sintering operations (with wet air pollution controls)	O&G TSS	0.0300 0.150	0.0100 0.050
	Blast furnaces	O&G TSS	--- 0.156	--- 0.0520
	Sintering operations (with dry air pollution controls)	[d]	[d]	[d]
Integrated Steelmaking	Basic oxygen furnaces (1) Semi-wet air pollution control[e]	O&G TSS	--- ---	--- ---
	(2) Wet-open combustion	O&G TSS	--- 0.137	--- 0.0458
	(3) Wet-suppressed combustion	O&G TSS	--- 0.0624	--- 0.0208
	Vacuum degassing	O&G TSS	--- 0.0312	--- 0.0104
	Continuous casting	O&G TSS	0.0468 0.156	0.0156 0.052
	Ladle metallurgy	(d)	(d)	(d)

Table 14-1 (Continued)

Subcategory	Process Wastewater Source	Pollutant	Maximum daily[a]	Maximum Monthly Average[a]
Integrated and Stand-Alone Hot Forming	Primary mills, carbon and specialty (1) Without scarfing	O&G TSS	0.0748 0.300	--- 0.112
	(2) With scarfing	O&G TSS	0.442 0.111	--- 0.166
	Section mills, carbon and specialty (1) Carbon	O&G TSS	0.179 0.714	--- 0.268
	(2) Specialty	O&G TSS	0.112 0.448	--- 0.128
	Flat mills (1) Hot strip and sheet, carbon and specialty	O&G TSS	0.214 0.854	--- 0.320
	Plate mills (1) Carbon	O&G TSS	0.114 0.454	--- 0.170
	(2) Specialty	O&G TSS	0.0500 0.200	--- 0.0752
	Pipe and tube mills, carbon and specialty	O&G TSS	0.106 0.424	--- 0.159
Nonintegrated Steelmaking and Hot Forming	Electric arc furnaces	(e)	(e)	(e)
	Vacuum degassing	O&G TSS	--- 0.0312	--- 0.0104
	Continuous casting	O&G TSS	0.0468 0.156	0.0156 0.052
	Hot forming mills	O&G TSS	0.0748 0.300	--- 0.112
	Ladle metallurgy	(d)	(d)	(d)

Table 14-1 (Continued)

Subcategory	Process Wastewater Source	Pollutant	Maximum daily[a]	Maximum Monthly Average[a]
Steel Finishing	Salt bath descaling-oxidizing (1) Batch, sheet and plate	O&G TSS	NA 0.408	NA 0.175
	(2) Batch, rod	O&G TSS	NA 0.246	NA 0.105
	(3) Batch, pipe and tubes	O&G TSS	NA 0.992	NA 0.426
	(4) Continuous	O&G TSS	NA 0.193	NA 0.0826
	Salt bath descaling-reducing (1) Batch	O&G TSS	NA 0.190	NA 0.0814
	(2) Continuous	O&G TSS	NA 1.06	NA 0.456
	Acid pickling-sulfuric (1) Rod, coil	O&G TSS	0.0700 0.164	0.0234 0.070
	(2) Bar, billet, bloom	O&G TSS	0.0226 0.0526	0.00750 0.0226
	(3) Strip, sheet and plate	O&G TSS	0.0450 0.105	0.0150 0.045
	(4) Pipe, tubes and other products	O&G TSS	0.125 0.292	0.0418 0.125
	Acid pickling-hydrochloric (1) Rod, coil	O&G TSS	0.123 0.286	0.0408 0.123
	(2) Strip, sheet and plate	O&G TSS	0.0700 0.164	0.0234 0.070
	(3) Pipe, tubes and other products	O&G TSS	0.256 0.596	0.0852 0.256

Table 14-1 (Continued)

Subcategory	Process Wastewater Source	Pollutant	Maximum daily[a]	Maximum Monthly Average[a]
Steel Finishing (cont.)	Acid pickling-combination			
	(1) Rod, coil	O&G	0.128	0.0426
		TSS	0.298	0.128
	(2) Bar, billet, bloom	O&G	0.0576	0.0192
		TSS	0.134	0.0576
	(3) Strip, sheet and plate-continuous	O&G	0.376	0.125
		TSS	0.876	0.376
	(4) Strip, sheet and plate-batch	O&G	0.115	0.0384
		TSS	0.268	0.115
	(5) Pipe, tubes and other products	O&G	0.193	0.0644
		TSS	0.450	0.193
	Cold rolling mills			
	(1) Recirculation-single stand	O&G	0.00104	0.000418
		TSS	0.0025	0.00125
	(2) Recirculation-multiple stands	O&G	0.0522	0.00208
		TSS	0.0125	0.00626
	(3) Combination	O&G	0.0626	0.0250
		TSS	0.150	0.0752
	(4) Direct application-single stand	O&G	0.0188	0.00752
		TSS	0.045	0.0226
	(5) Direct application-multiple stands	O&G	0.0834	0.0334
		TSS	0.200	0.100
	Alkaline cleaning			
	(1) Batch	O&G	0.0626	0.0208
		TSS	0.146	0.0626
	(2) Continuous	O&G	0.0876	0.0292
		TSS	0.204	0.0876
	Hot coating: galvanizing, terne, other metals			
	(1) Strip, sheet and miscellaneous products	O&G	0.150	0.0500
		TSS	0.350	0.150
	Electroplating	O&G	52[f]	26[f]
		TSS	60[f]	31[f]

Table 14-1 (Continued)

Subcategory	Process Wastewater Source	Pollutant	Maximum daily[a]	Maximum Monthly Average[a]
Steel Finishing (cont.)	Fume scrubbers: acid pickling, alkaline cleaning, hot coating, other	O&G TSS	5.39[g] 12.58[g]	1.76[g] 5.39[g]
	Absorber vent scrubber: hydrochloric acid regeneration	O&G TSS	35.86[g] 84.04[g]	11.99[g] 35.86[g]

Sources: 40 CFR Part 420 and Part 433.
O&G - Oil and grease.
TSS - Total suspended solids.
NA - Not applicable.

[a]Pounds per ton of product.
[b]For iron and steel coke plants, increased loadings, not to exceed 11 percent of the above limitations, shall be provided for process wastewaters from wet desulfurization systems, but only to the extent such systems generate process wastewaters.
[c]For merchant coke plants, increased loadings, not to exceed 10 per cent of the above limitations, shall be provided for process wastewaters from wet desulfurization systems, but only to the extent such systems generate process wastewaters.
[d]For these segments, except as provided in 40 CFR 125.30 through 125.32, any existing point source must have no discharge of process wastewater pollutants to waters of the United States.
[e]1982 regulation allowed for no discharge of process wastewater from this operation.
[f]Limitations transferred from 40 CFR Part 433 and expressed in milligrams per liter.
[g]Values are expressed in pounds per day for this operation.

SECTION 15

IMPLEMENTATION OF PART 420 THROUGH THE NPDES AND PRETREATMENT PROGRAMS

Sections 301, 304, 306 and 307 of the Clean Water Act (CWA) provide that EPA must promulgate national effluent limitations guidelines and standards of performance for major industrial categories for three classes of pollutants:

- Conventional pollutants, which include total suspended solids (TSS), oil and grease (O&G), biochemical oxygen demand (BOD_5), fecal coliform, and pH;
- Designated priority pollutants (e.g., toxic metals such as chromium, lead, nickel, and zinc; toxic organic constituents such as benzene, benzo-*a*-pyrene, and naphthalene); and
- Nonconventional pollutants, which are designated as neither conventional nor priority pollutants (e.g., ammonia as nitrogen, thiocyanate, fluoride, iron, and 2,3,7,8-tetrachlorodibenzofuran (TCDF)).

40 CFR Part 420, as well as other categorical effluent regulations promulgated by EPA, contains six types of effluent limitations guidelines and standards:

- Best Practicable Control Technology Currently Available (BPT);
- Best Control Technology for Conventional Pollutants (BCT);
- Best Available Technology Economically Achievable (BAT);
- New Source Performance Standards (NSPS);
- Pretreatment Standards for Existing Sources (PSES); and
- Pretreatment Standards for New Sources (PSNS).

BPT, BCT, BAT, and NSPS limitations regulate only those sources that discharge effluent directly into waters of the United States. PSES and PSNS limitations restrict pollutant discharges for those sources that discharge indirectly through sewers flowing to publicly owned treatment works (POTWs).

15.1 NPDES Permit Program

Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES permit program is designed to limit the discharge of pollutants into navigable waters of the United States through a combination of various requirements, including technology-based and water-quality-based effluent limitations. The proposed Iron and Steel regulation contains the categorical technology-based effluent limitations guidelines and standards applicable to the iron and steel industry to be used by permit writers to

derive NPDES permit technology-based effluent limitations. Water-quality-based effluent limitations (WQBELs) are based on receiving water characteristics, designated water uses, and ambient water quality standards. WQBELs are derived independently from the technology-based effluent limitations set out in Part 420. The CWA requires NPDES permits to contain the more stringent of the technology-based and the water-quality-based effluent limitations applicable to a given discharge.

Section 402(a)(1) of the CWA provides that, in the absence of promulgated effluent limitations guidelines or standards, the Administrator or the Administrator's designee, including designated state permit authorities, may establish effluent limitations for specific dischargers on a case-by-case basis. Federal NPDES permit regulations provide that these limits may be established using "best professional judgement" (BPJ), taking into account any proposed effluent limitations guidelines and standards and other relevant scientific, technical, and economic information. Where EPA has promulgated technology-based effluent limitations guidelines and standards, any more stringent effluent limitations must be either WQBELs or technology-based effluent limitations derived under regulations established independently by the permit authority.

Section 301 of the CWA, as amended by the Water Quality Act of 1987, required that BPT effluent limitations were to be achieved by July 1, 1977. BAT effluent limitations for priority and nonconventional pollutants and BCT effluent limitations for conventional pollutants were to be achieved as expeditiously as possible, but not later than three years from date of promulgation, and in no case later than March 31, 1989 (see §125.3). Because EPA will promulgate revisions to Part 420 after March 31, 1989 (after the statutory BAT compliance date for priority pollutants), effluent limitations based on the revised effluent limitations guidelines must be included in the next NPDES permits issued after promulgation of the regulation with no compliance schedule.

The NPDES permit program defines *major dischargers* as those that, by nature of their size and operations, can have a significant impact on human health or the environment. EPA classified most direct dischargers in the iron and steel industry as major dischargers because they are relatively large industrial complexes that have caused or have the potential to cause adverse water quality impacts. NPDES permits for major dischargers are issued and renewed according to the federal NPDES regulations as well as regulations enacted by permit authorities to maximize opportunity for public review and comment. Chapter 11 of the U.S. EPA NPDES Permit Writer's Manual (Reference 15-1) discusses the administrative process for drafting and issuing NPDES permits, including preparation of the draft permit and fact sheet, construction of the administrative record, notification of the public, consideration of public comments, and issuance of the final permit. The NPDES permit fact sheet or statement of basis sets out the regulatory and technical bases for the terms and conditions in the permit.

The NPDES permit regulations allow modification of permit effluent limitations derived from the effluent limitations guidelines through the following specific variances and other procedures:

- Section 301(c), economic variance from BAT;
- Section 301(g), water-quality-related variance from BAT for nonconventional pollutants;
- Section 316(a), thermal variance from BPT, BCT, and BAT;
- Fundamentally different factors variance (40 CFR Part 125, Subpart D); and
- Net credits (40 CFR Part 122.45(g)).

Although EPA has not promulgated final regulations that establish criteria for applying for and evaluating applications for Section 301(c) and 301(g) variances, the Agency has published guidance materials for permit authorities regarding such variances. Variances under Section 316(a) for thermal discharges are not at issue in the 1982 regulation or the proposed regulation because EPA has not promulgated or proposed effluent limitations guidelines and standards for thermal discharges. See the sections below, the guidance materials, and 40 CFR Part 125 for further information regarding the above-listed variances.

The NPDES permit regulations at 40 CFR Part 125, Subpart K, establish criteria and standards for Best Management Practices (BMPs), which are authorized under Section 304(e) of the CWA. BMPs may be included in effluent limitations guidelines and standards or established on a case-by-case basis by permit authorities in individual NPDES permits. BMPs are designed typically to control discharges of pollutants from activities that are ancillary to the manufacturing operations regulated by the numerical effluent limitations guidelines and standards (e.g., EPA is not proposing BMPs, but provides in this section examples of BMPs that permit writers can include in NPDES permits under appropriate circumstances.

15.2 National Pretreatment Standards

40 CFR Part 403 sets out national pretreatment standards that have three principal objectives:

- To prevent the introduction of pollutants that will interfere with POTW operations, including the use or disposal of municipal sludge;
- To prevent the introduction of pollutants that will pass through POTWs or otherwise be incompatible with POTWs; and
- To improve opportunities to recycle and reclaim municipal and industrial wastewater and sludge.

The national pretreatment standards prohibit certain discharges that interfere with POTW operations, and include federal categorical pretreatment standards designed to prevent pass-through of pollutants introduced into POTWs by industrial sources. Part 420 sets out the federal categorical pretreatment standards applicable to the iron and steel industry. Local control authorities are required to implement the national pretreatment program, which includes applying federal categorical pretreatment standards to industrial users that are subject to those standards and any local pretreatment standards that may be more restrictive than the federal categorical standards. The proposed regulation revises the federal categorical pretreatment standards applicable to iron and steel facilities regulated by Part 420. Facilities must meet effluent limitations based on the federal categorical pretreatment standards not later than three years after promulgation of the standards.

15.3 NPDES Permit and Pretreatment Production Rates

The effluent limitations guidelines and standards for BPT, BAT, NSPS, PSES, and PSNS in the proposed regulation are expressed as mass limitations in pounds/ton of product. Each mass limitation is calculated by multiplying an effluent concentration (determined from the analysis of treatment system performance) by a model flow rate appropriate for each subcategory, expressed in gallons/ton of product or gallons/day. The production-normalized flow rates used to develop many of the limitations in the proposed rule are considerably lower than those used to develop limitations in the 1982 rule. Consequently, many of the proposed limitations are more stringent than the 1982 limitations for the same operations, even though other components of the technology options remain the same. The proposed limitations do not require facilities to install any specific control technology or achieve any specific flow rate or effluent concentration; facilities can use various treatment alternatives or water conservation practices to meet the limitations or standards. Each model treatment system described in Section 8 illustrates at least one means available to achieve the proposed effluent limitations guidelines and standards.

The NPDES regulations at §122.45(f) require that NPDES permit effluent limitations be specified as mass effluent limitations (e.g., pounds/day or kilograms/day), except under certain circumstances that do not apply to the proposed rule. To convert the proposed effluent limitations (pounds/ton) to a monthly average or daily maximum permit limit, the permitting authority would use a production rate with units of tons/day. The 1982 iron and steel rule and Part 122.45(b)(2) of the NPDES permit regulations require that NPDES permit and pretreatment limits be based on a "...reasonable measure of actual production." NPDES permits for this industry have commonly used either the highest annual average production over the prior five years prorated to a daily basis or the highest monthly production over the prior five years prorated to a daily basis. Industry stakeholders have requested that: (1) EPA should specify the method used to determine appropriate production rates for calculating allowable mass loadings, so all permit writers use the same basis; and (2) EPA should use a high production basis, such as the maximum monthly production over the prior five years or the maximum design production, to ensure that facilities will not be out of compliance during periods of high production.

The NPDES permit regulations at 40 CFR 122.45(b)(2)(I) require that mass effluent limitations calculated for existing sources from production-based effluent limitations guidelines and standards must be based not on production capacity but on a "reasonable measure of actual production." The 1982 iron and steel regulation at 40 CFR 420.04 sets out the basis for calculating mass-based pretreatment requirements and also dictates that pretreatment requirements must be based on a reasonable measure of actual production. The 1982 regulation provides the following examples of what may constitute a reasonable measure of actual production: the monthly average for the highest of the previous five years or the high month of the previous year. Both values are converted to a daily basis (i.e., tons/day) to calculate monthly average and daily maximum mass permit effluent limitations. The national pretreatment regulations at 40 CFR 403.6(c)(3) have similar provisions for deriving mass-based pretreatment requirements.

The above regulations require that effluent limitations guidelines and pretreatment standards for new sources be based on projected production. EPA is proposing that approach in the proposed iron and steel regulation.

EPA believes that some NPDES and pretreatment permit production rates have not been calculated using a "reasonable measure of actual production." In some cases, maximum production rates for similar process units discharging to one treatment system have been determined from different years or months. In EPA's view, this approach may provide an unrealistically high measure of actual production if the different process units could not reasonably produce at these high rates simultaneously.

Ideally, permit writers would apply production-based effluent limitations guidelines and standards using relatively constant production from day to day or month to month. In this situation, the production rate used to calculate the permit limitations would then be the average rate. However, production rates in the iron and steel industry vary significantly over time (especially over a 5-year permit period), based on factors such as fluctuations in market demand for domestic products, maintenance, product changes, equipment failures, and facility modifications.

To determine a production estimate for a mill, permit writers should develop a reasonable measure of production for the facility during the next term of the permit. The permit writer uses this production estimate along with the production-based limitations to establish a maximum mass of pollutant that the facility may discharge each day and month. However, if the permit production rate is based on the maximum month, the permit could allow excessive pollutant discharges during the permit period. As a result, facilities may not have an incentive to implement optimal waste management, water conservation, and wastewater treatment practices during lower production periods. On the other hand, if the permit production rate is based on an average of the highest year of production over the prior five years, facilities may have trouble ensuring that their waste management, water conservation, and wastewater treatment practices can accommodate shorter periods of higher production. This situation might require facilities to meet, during these periods of high production, a more stringent treatment level than that on which

the limits were based. To do this, facilities would likely have to develop more efficient treatment systems, greater hydraulic surge capacity, and better water conservation and waste management practices.

15.3.1 Alternatives for Establishing Permit Effluent Limitations

EPA has solicited comment on several alternative approaches to establishing permit limits; these approaches may result in more stringent mass-based permit limits for some facilities (with better protection of the environment over the life of a permit) and may result in higher costs. Each approach excludes production from unit operations that do not generate or discharge process wastewater.

Alternative A

The approach under Alternative A is the basis for the proposed iron and steel effluent limitations. This approach retains the essential requirements of the 1982 rule as described above (see §420.3). However, the proposed rule provides additional instructions for avoiding approaches that result in unrealistically high estimates of actual production by considering only the production from all production units that could operate simultaneously (see §420.3(c)). Alternative A may result in higher costs for those facilities whose permits are based on production levels that are higher than those that could occur simultaneously at multiple process units. However, EPA included these costs in the economic analysis for the 1982 regulation as well as the proposed rule.

Alternative B

Under Alternative B, the Agency is considering requiring the permit writer to establish multitiered permit limits. Permit writers and control authorities currently use BPJ to establish multitiered permit limits. The Agency has issued guidance for use in considering multitiered permits (see Chapter 5 of the U.S. EPA NPDES Permit Writer's Manual and Chapter 7 of the Industrial User Permitting Guidance Manual (References 15-1 and 15-2)).

In situations where a single set of effluent limitations is not appropriate for the entire period of a permit, permit writers may establish a tiered permit. One set of limits would apply for periods of average production, and other sets of limits would apply when the average production rate significantly changes. EPA believes that a 10 to 15 percent deviation above or below the long-term average production rate falls within the range of normal variability. For facilities that have predictable changes in long-term production that fall outside of this range, permit writers should consider establishing a tiered or multitiered permit. The iron and steel industry has a variable historical production rate, and the permit modification process is not fast enough to respond to the need for higher or lower equivalent limits. For example, many iron and steel mills have a characteristic historical average monthly production rate that varies between 60 and 95 percent of plant capacity (note that for a mill operating at 60 percent of capacity, a production increase to 95 percent of capacity would represent a nearly 60 percent increase in

production). In this example, permit writers may establish alternate effluent limitations for average production rates at 75 and 95 percent of capacity.

Alternative C

Under Alternative C, EPA is considering revising the definition of production to provide a basis for deriving NPDES and pretreatment permit production rates that are "reasonable measures of actual production" and that can be applied consistently for iron and steel facilities subject to Part 420. The modified definition of the NPDES and pretreatment permit production basis would be the average daily operating rate for the year with the highest annual production over the prior five years, taking into account the annual hours of operation of the production unit and the typical operating schedule of the production unit, as illustrated by the following example.

Highest annual production from prior five years	3,570,000	tons
Operating hours	8,400	hours
Hourly operating rate	425	tons/hour
Average daily operating rate (24 hour day)	10,200	tons/day

The above example is for a process unit that is typically operated 24 hours per day with short-term outages for maintenance on a weekly or monthly basis. For steel processing facilities that operate typically less than 24 hours per day, the average daily operating rate must be based on the typical operating schedule (e.g., 8 hours per day for a facility operating one 8-hour turn (or shift) per day; 16 hours per day for a facility operating two 8-hour turns per day), as shown below.

Highest annual production from prior five years	980,000	tons
Operating hours	4,160	hours
Hourly operating rate	235.6	tons/hour
Average daily operating rate (16-hour day)	3,769	tons/day

EPA recognizes that the approach in the above example could cause problems for a facility that operated 16 hours/day at the time the permit was issued and then changed to a 24-hour/day schedule based on unforseen changes in market conditions. To address these potential problems, facilities could combine this approach with the tiered permit approach under Alternative B.

For multiple similar process units discharging to the same wastewater treatment system with one NPDES or pretreatment permit compliance point (e.g., two blast furnaces operated with one treatment and recycle system for process wastewater), the permit writer would base the year with the highest annual production over the prior five years on the sum of annual

production for both furnaces. Then, as above, the permit writer would calculate the average daily operating rate for each furnace independently using the annual production for that year and the annual operating hours for each furnace. The average daily operating rate for the combination of the two furnaces would be the sum of the daily production values. For example, consider the following production data.

Year	Furnace A	Furnace B	Total (tons)
1995	1,850,000	1,305,000	3,155,000
1996	1,675,000	1,425,000	3,100,000
1997	1,760,000	1,406,000	3,166,000
1998	1,580,000	1,328,000	2,908,000
1999	1,825,000	1,380,000	3,205,000

Annual maximum production rates for each furnace and the total for both furnaces are underlined. In this example, 1999 was the maximum production year for the combination of the furnaces, and the data from each furnace for that year would be used to calculate the average daily operating rates. Combining the 1995 data from Furnace A and the 1996 data from Furnace B (3,275,000 tons), might have produced an unrealistic measure of actual production if the two furnaces could not produce at these high levels concurrently (e.g., if the downstream intermediate production capacity effectively limits the combined production of the two furnaces). On the other hand, if the two furnaces could expect to produce at these high levels concurrently over the next five-year permit period if strong market conditions prevailed, then the production based on the combined 1995 Furnace A data and the 1996 Furnace B data might not be unrealistic.

In contrast to the previous example, for multiple process units that are not similar but have process wastewater discharges that are co-treated in one centralized wastewater treatment system with one NPDES or pretreatment permit compliance point, the year with the highest production over the prior five years would be determined separately for each production unit or combination of similar production units with the highest annual production. The following table lists production data for a facility that discharges process wastewater streams for basic oxygen furnace (BOF) steelmaking, vacuum degassing, and continuous casting operations through one NPDES or pretreatment permit compliance point.

Year	BOF (tons)	Vacuum Degasser (tons)	Continuous Caster (tons)
1995	2,675,000	1,305,000	2,658,000
1996	2,900,000	1,600,000	2,885,000
1997	3,150,000	1,690,000	3,140,000
1998	3,280,000	1,668,000	3,270,000
1999	3,225,000	1,380,000	3,215,000

In this example, the permit writer would use 1998 production data for the BOF, 1997 data for the vacuum degasser, and 1998 data for the continuous caster to develop the permit limitations. An analogous situation would occur in a steel finishing plant with acid pickling, cold rolling, and electroplating operations with wastewater discharges that are co-treated in one centralized wastewater treatment system with one permit compliance point.

If EPA adopted the approach under Alternative C, the Agency would also add to the proposed regulation (§420.7) a requirement that facilities provide documentation of NPDES permit production rates with their NPDES permit renewal applications.

Alternative D

Under Alternative D, the Agency is considering establishing production-based maximum monthly average effluent limitations and standards in combination with daily maximum concentration-based effluent limitations and standards. Under this approach, permit writers would determine the maximum monthly average NPDES and pretreatment permit mass basis requirements using the Part 420 production-based standards in combination with a reasonable measure of actual production, such as that discussed under Alternative C. However, the daily maximum requirements included in Part 420 would be effluent concentrations in lieu of the daily maximum production-based mass effluent limitations guidelines and standards. These daily maximum concentrations would be those concentrations used to develop the proposed production-based mass effluent limitations guidelines and standards.

The Agency believes that, under most circumstances, the approach under Alternative D would effectively address potential issues regarding short-term peaks in production (see Section 15.3). This approach would place no additional burden on the industry and permit writers applying for and writing NPDES or pretreatment permits. Permit authorities may need to revise their automated compliance tracking systems to account for both mass-based and concentration-based limitations at the same outfall; however, setting both mass-based and concentration-based limits at the same outfall is common in many NPDES and pretreatment permits issued prior to the proposed Iron and Steel rule.

This approach would also provide some flexibility for the industry when, due to historical conditions, relatively high volumes of storm water from intense rainfall events are collected and treated with process wastewater. In some cases, the volume of storm water collected and treated may cause short-term peak discharge flow rates that exceed the normal process wastewater discharge flow and violate the daily-maximum limitations. However, the Agency believes that treatment of such storm water volume is beneficial. The combination of maximum monthly average mass-based limits and daily-maximum concentration-based limits would provide the flexibility to account for this situation.

EPA has solicited comments on these alternative approaches to determining the proposed production bases for NPDES permit effluent limitations and pretreatment requirements. The Agency has also sought comments on related costs and any technical difficulties associated with meeting limits during short periods of high production. In addition, EPA has solicited other options for consideration.

15.4 Applications of Best Professional Judgement

Section 402(a)(1) of the CWA and the NPDES permit regulations at §122.44(a) and §125.3 authorize permit authorities to use BPJ in the absence of categorical effluent limitations to establish NPDES permit effluent limitations. When developing the proposed Iron and Steel regulation, the Agency attempted to minimize the need for BPJ determinations by taking into account all process wastestreams commonly generated at each manufacturing process and, where evident, miscellaneous process-related wastestreams (e.g., those generated in roll shops and from building basement sumps). The Agency recognizes, however, that some sites may generate nonprocess wastestreams and wastestreams that meet the definition of process wastewater (see §122.2) that were not accounted for in the development of the proposed effluent limitations guidelines and pretreatment standards for existing sources. To assist permit writers in addressing such wastestreams and to minimize the number of requests for fundamentally different factors variances, EPA has proposed at §420.3(f) a provision that would authorize permit writers to provide for increased loadings for wastewater sources not included in the development of the proposed regulation if these sources generate an increased discharge flow.

Such wastewater sources may include ground water remediation flows that can effectively be co-treated with process wastewater in the process wastewater treatment systems (i.e., ground water remediation water at a coke plant). In these cases, the permit writer would first calculate the mass effluent limitations for the regulated process, then calculate mass loadings for the wastestream using a reasonable measure of the wastewater flow rates and concentrations used by the Agency to develop the effluent limitations guidelines and standards for that process. The NPDES permit or pretreatment limitations would be the sum of those mass loadings (see Example 4 in Section 15.5.2). The provision at §420.3(f) is not meant to address co-treatment of wastewater from multiple subcategories within Part 420 or co-treatment of wastewater from other categories (see Section 15.5).

15.5 Calculating NPDES and Pretreatment Effluent Limitations

To ensure a revised Part 420 is applied consistently and appropriately, the Agency is considering alternative approaches to defining the "reasonable measure of actual production" used to calculate NPDES and pretreatment permit limits (see Section 15.3). In any of these approaches, EPA proposes the revised Part 420 to be applied in a building-block manner. Permit writers would multiply the effluent limitations guidelines and standards for each process operation by the respective reasonable measure of actual production. Permit writers would sum the resulting mass effluent limitations for each process to determine the NPDES or pretreatment limits applicable to the wastewater treatment system discharge for those processes.

This subsection provides examples for calculating NPDES and pretreatment permit limits where process wastewater discharges from the same operation and same category are co-treated, where wastewater discharges from operations in different subcategories are co-treated, and where there are miscellaneous process wastewater discharges. This subsection also provides an example of how to derive alternative effluent limitations guidelines and standards under the proposed "water bubble" provision.

When promulgating the 1982 regulation, EPA recognized that the iron and steel industry extensively co-treated compatible wastestreams as a cost-effective means of wastewater treatment. EPA structured the proposed regulation to facilitate co-treatment of compatible wastestreams in centralized treatment systems and discourage co-treatment of wastestreams that the Agency deems incompatible. For example, the Agency determined that co-treatment of wastestreams from by-product cokemaking operations and BOF steelmaking operations could increase discharges of toxic pollutants from cokemaking operations. The following table presents groups of subcategories for which the proposed regulation is structured to facilitate co-treatment. In some cases, pretreating selected wastestreams would effectively minimize the overall pollutant discharge.

Group 1	Cokemaking		
Group 2	Ironmaking	Sintering	
		Blast furnaces	
Group 3	Carbon Steel	Steelmaking	BOF steelmaking
			Vacuum degassing
			Continuous casting
		Hot forming	
		Steel finishing	
Group 4	Stainless Steel	Steelmaking	BOF steelmaking
			Vacuum degassing
			Continuous casting
		Hot forming	
		Steel finishing	

The Agency selected pollutants for regulation in each of these groups to allow facilities to co-treat their wastestreams where feasible. EPA is requesting comments on this approach.

15.5.1 Direct Dischargers

Example 1: Two iron and steel processes within the same category; no nonregulated process wastewater.

In this example, a facility has two blast furnaces and treats their process wastewater in a dedicated blast furnace gas cleaning water treatment and recycle system. The reasonable measure of actual production (NPDES permit production rate) is 4,500 tons/day for one furnace and 3,900 tons/day for the other. The facility also has a sinter plant with wet air pollution controls equipped with a dedicated treatment and recycle system. The facility discharges blowdown from that recycle system into the blast furnace treatment and recycle system; the only discharge from these operations is the blowdown from the blast furnace treatment and recycle system. The NPDES production rate for the sinter plant is 4,100 tons/day. Table 15-1 presents the calculations illustrating how the effluent limitations guidelines are applied in this case. For this example, the TSS and O&G limitations are derived from the proposed regulation and reflect the BPT limitations from the 1982 regulation. Note that the 2,3,7,8-TCDF limitation applicable to sinter plant wastewater is applied to the combined wastewater discharge

from the sinter plant and blast furnaces as a daily maximum concentration limit less than the defined *minimum level* of 10 parts per quadrillion (ppq).[1]

Example 2: Multiple processes within the same category; presence of nonregulated process wastewater.

In this example, the NPDES production rates for a stainless steel finishing mill with wastestreams treated in a centralized wastewater treatment system are as follows.

Descaling and acid pickling	900	tons/day
Cold rolling--recirculation-multiple stands	870	tons/day
Alkaline cleaning	870	tons/day

The pickling line is equipped with two fume scrubbers. The mill has a steel coating operation that is not regulated by Part 420 or any other categorical effluent limitation guideline. The reasonable measure of discharge flow for the nonregulated stream is 50 gallons per minute (gpm). Table 15-2 presents the calculations illustrating how the limitations are applied in this case. As in Example 1, the TSS and O&G limitations are derived from the proposed regulation and reflect the BPT effluent limitations guidelines from the 1982 regulation.

Effluent limitations for the 50 gpm of nonregulated process wastewater are calculated in accordance with the proposed §420.3(d), which provides the permit writer with the authority to consider such flows when developing pretreatment limits or technology-based effluent limitations in NPDES permits. In this example, the mass-based effluent limits were derived from the reasonable measure of actual flow (i.e., 50 gpm) and the concentrations used to derive the effluent limitations guidelines and standards for stainless steel finishing operations (see Table 12-3). The resulting mass-based limits were added to the mass limits for the regulated processes to determine the NPDES permit limits applicable to the discharge from the wastewater treatment facility.

Example 3: Multiple processes from different subcategories; no nonregulated process wastewater.

This example is an integrated steel mill with separate treatment and recycle systems for BOF steelmaking with wet-open combustion air emission controls, a vacuum degassing plant, a continuous slab caster, and a hot strip mill. The blowdown streams from the vacuum degassing plant and the continuous caster cascade into the BOF treatment and recycle system. The facility combines the blowdown streams from the hot strip mill and BOF recycle systems for treatment of

[1]Direct and indirect dischargers must demonstrate compliance with the effluent limitations and standards for 2,3,7,8-TCDF at the point after treatment of sinter plant wastewater separately or in combination with blast furnace wastewater, but prior to mixing with any other process or nonprocess wastewaters or noncontact cooling waters.

toxic metals in a blowdown treatment system. The NPDES production rates for these operations are listed below.

BOF - wet-open combustion	8,500	tons/day
Vacuum degassing	6,800	tons/day
Continuous casting	8,450	tons/day
Hot strip mill	8,375	tons/day

Table 15-3 presents the calculations illustrating how the effluent limitations guidelines are applied in this example.

15.5.2 Indirect Dischargers

40 CFR Part 403 classifies wastewater that can be discharged from industrial facilities to POTWs as follows:

- *Regulated* - Wastewater regulated by categorical pretreatment standards, such as those contained in the proposed rule;
- *Unregulated* - Wastewater that is not regulated by categorical pretreatment standards and is not *dilute* wastewater; and
- *Dilute* - Sanitary wastewater, noncontact cooling water, boiler blowdown, and other wastestreams listed in Appendix D to Part 403.

For indirect iron and steel dischargers whose wastestreams are not co-treated with wastewater from other industrial categories, the control authority would derive mass-based pretreatment limits from the proposed pretreatment standards similarly to how NPDES permit limits are derived for direct dischargers. In this case, all of the wastewater is *regulated*, and the pretreatment authority would apply the pretreatment limits either at the point of discharge from the facility's wastewater treatment facility or at the point of discharge to the POTW, whichever point the control authority determines is appropriate based on site circumstances.

Where the above circumstances apply and there are other wastestreams present that would be regulated under the proposed rule (§420.3(d)), the pretreatment authority would calculate the applicable categorical pretreatment limits as described below in Example 4. In this case, the pretreatment authority would add incremental mass limits for the wastestreams regulated under §420.3(d) to the limits derived for the regulated wastewater to determine the appropriate categorical pretreatment limits.

Where facilities combine regulated wastestreams under the proposed rule and dilute wastewater, the pretreatment authority can either: (1) apply the categorical pretreatment

limits at an internal monitoring point where dilution is not a factor, under authority of §403.6(e)(2) and (4); or (2) apply the categorical pretreatment limits in terms of mass at a location after the regulated and dilute wastestreams are combined, provided the dilution is not so great as to interfere with compliance determinations.

Where facilities co-treat their iron and steel wastestreams with wastestreams from other industrial categories that are regulated under other categorical pretreatment standards, the pretreatment authority can either derive pretreatment standards for the combined wastestreams by using a building-block approach or use the "combined wastestream formula" set out at §403.6(e) and shown in the formula below:

$$C_T = \frac{\sum C_i F_I}{\sum F_I} \times \frac{F_T - F_D}{F_T} \qquad (15\text{-}1)$$

where:

C_T = The alternate concentration limit for the combined wastestream, mg/L

C_I = The categorical pretreatment standard concentration limit for a pollutant in the regulated stream I, mg/L

F_I = The average daily flow of stream I, L/day

F_D = The average daily flow from dilute wastestreams as defined in Part 403, L/day

F_T = The total daily flow, L/day.

See Reference 15-3 for more information on the combined wastestream formula.

As with direct dischargers, in circumstances where the pretreatment standards applicable to one category regulate a different set of pollutants than the standards applicable to another category, the control authority must ensure that the guidelines are properly applied. If a pollutant is regulated in one wastestream but not another, the control authority must ensure that the nonregulated pollutant stream does not dilute the regulated pollutant stream to the point where pollutants are not analytically detectable. If this level of dilution occurs, the control authority most likely would establish internal monitoring points, as authorized under 40 CFR Part 403.6(e)(2) and (4).

Example 4: Indirectly discharging coke plant; co-treatment of ground water from remediation project.

In this example, an indirectly discharging by-product coke plant has an active ground water remediation project that generates a continuous flow of 35 gpm; this wastestream

contains benzene, phenol, ammonia as nitrogen, and other pollutants characteristic of coke plant wastewater. Because the untreated ground water is compatible for treatment with untreated coke plant process wastewater, the Agency determined that it is appropriate to co-treat these two waste streams. In this example, benzene in the ground water would be removed in the ammonia still and returned to the coke oven gas, ammonia would be removed in the ammonia still and downstream treatment, and phenol would be removed either at the coke plant (depending upon the type of treatment provided) or at the POTW. The Agency has determined that phenol is compatible with biological treatment at POTWs and does not pass through.

The approach used in this example has the same effect as applying the combined wastestream formula from the pretreatment regulations reviewed above; however, the proposed rule allows both direct and indirect dischargers to treat combinations of regulated and unregulated wastestreams. Table 15-4 presents the derivation of pretreatment limits for both PSES options being considered by the Agency.

15.6 Water Bubble

The "water bubble" is a regulatory mechanism set out in the 1982 regulation (40 CFR 420.03) to allow an iron and steel facility to trade pollutants between multiple NPDES permit compliance points within the facility. Some facilities have used the water bubble to save costs and others to improve prospects for compliance. The provision is structured to also benefit the environment.

The water bubble provisions of the 1982 rule and the proposed rule allow alternative effluent limitations where a facility, in effect, trades pollutant discharges from one outfall or NPDES permit compliance monitoring point to another. Unlike variances, facilities may use the water bubble wherever they can meet the conditions governing the use of the water bubble.

The water bubble provision in the 1982 rule has the following restrictions:

- Trades can be made only for like pollutants (e.g., lead for lead, not lead for zinc);
- Alternative effluent limitations resulting from the application of the water bubble must comply with applicable water quality standards;
- Each outfall must have specific fixed limitations for the term of the permit;
- Trades involving cokemaking and cold rolling operations are prohibited;
- Each trade must result in a minimum net reduction in pollutant loading (15 percent for TSS and O&G, and 10 percent for all other traded pollutants); and

- Only existing sources may apply the water bubble.

Currently, NPDES permits for only nine iron and steel facilities have alternative effluent limitations derived from the water bubble; however, the Agency anticipates that there may be increased interest in the water bubble with the promulgation of a revised rule. Therefore, EPA proposes to make the following changes to the water bubble provision:

- Allow trades for by-product cokemaking operations, but only where the alternative limitations for cokemaking would be more stringent than the generally applicable limitations. This change would provide additional flexibility for certain facilities yet ensure that there would be no increased discharge of toxic organic and other pollutants associated with cokemaking operations.

- Restrict trades in the same manner for sinter plants as for by-product cokemaking operations due to the potential for discharges of dioxins and furans.

- Prohibit trades of O&G because of differences in the types of oil and grease used among iron and steel operations (finishing operations tend to use and discharge synthetic and animal fats and oils used to lubricate metals, the hot-end operations tend to discharge petroleum-based oil and grease used to lubricate machinery, and cokemaking operations tend to discharge oil and grease containing polynuclear aromatics generated by the combustion of coal).

- Allow trades for cold rolling operations.

- Allow trades for new as well as existing sources. Because the existing source environmental gain is 10 percent for all parameters except for TSS, which is 15 percent, EPA is considering whether a higher net gain (e.g., 20 percent) is appropriate for new sources given their flexibility in design.

EPA is proposing to change the 1982 regulation to prohibit trading of O&G between outfalls. As noted above, EPA is concerned that different types of oil and grease may be discharged by different process units, and that trading might increase the amount of a more environmentally harmful type of oil and grease (e.g., petroleum based), while reducing the amount of a less harmful type (e.g., animal fats). EPA recognizes that facilities will generally identify trades that save money. The Agency has no data to suggest that the most economically beneficial trading opportunities (i.e., those facilities will likely use) would systematically either decrease or increase discharges of the most harmful types of oil and grease. Given that facilities must decrease O&G discharge across all outfalls by 15 percent to trade under the existing rule, even if an individual trade might increase discharges of petroleum-based oil and grease, the net effect would still benefit the environment and save the facility costs.

When estimating the incremental investment and operating and maintenance costs associated with the proposed regulation, the Agency assumed that no facilities would use the water bubble. Consequently, any use of the water bubble would represent cost savings.

Table 15-5 presents an example of the water bubble used for a trade of zinc for the facilities identified above in Examples 1 and 3 (see Tables 15-1 and 15-3). Note that in this example trade, EPA assigned the sinter plant/blast furnace operations more stringent limitations; this outcome would be allowed with the proposed restriction on trades for sinter plant operations.

15.7 Monitoring Requirements

The NPDES permit regulations at §122.41(j)(4) and the pretreatment regulations at §403.12(b)(5)(vi) require that facilities conduct sampling and analyses for compliance monitoring purposes according to the techniques set out at 40 CFR Part 136, as amended. Table 15-6 presents the sampling and analytical methods for those pollutants regulated under the proposed rule (see Part 136 and the analytical methods for sample handling, sample holding time, and approved sample containers). Note that there is no method specified in Part 136 for thiocyanate. The Agency recommends that permit authorities specify analytical method 4500 CN M from the most current edition of Standard Methods for the Examination of Water and Wastewater (Reference 15-4).

The Agency has not proposed specific monitoring requirements or monitoring frequencies in the Iron and Steel regulation; therefore, permit authorities may establish monitoring requirements and monitoring frequencies at their discretion. Sections 15.7.1 through 15.7.3 provide guidance on establishing these requirements.

15.7.1 Sample Types

EPA recommends flow-proportioned, 24-hour composite samples for the following pollutants:

- TSS;
- Ammonia as nitrogen;
- Total cyanide;
- Phenol;
- Thiocyanate;
- 2,3,7,8-TCDF;
- Benzo-*a*-pyrene;
- Naphthalene;
- Hexavalent chromium;
- Total chromium;
- Total lead;
- Total nickel;
- Total mercury;

- Total selenium; and
- Total zinc.

Part 136 requires facilities to collect grab samples for O&G. Several iron and steel permits are written to require collection of three grab samples for O&G in a 24-hour monitoring day, with the results averaged to represent a daily sample. The sample types for pH can range from a one-time grab sample during a monitoring day for operations where pH is usually not a control parameter (e.g., continuous casting, hot forming) to continuous sampling where pH is a critical aspect of the wastewater to be treated or a critical control parameter for operation of wastewater treatment facilities (e.g., steel finishing and other subcategories where metals precipitation is a control technology).

15.7.2 Monitoring Frequency

The monitoring frequencies specified in iron and steel NPDES permits vary depending upon the size of the facility, potential impacts on receiving waters, compliance history, and other factors, including monitoring policies or regulations required by permit authorities. A few iron and steel permits for large mills have required monitoring for all limited pollutants as frequently as five times per week. Other permits for less complex facilities require twice monthly monitoring. When developing the proposed rule, EPA considered a monitoring frequency of once per week for limited pollutants, except for 2,3,7,8-TCDD, for which the Agency considered a monthly monitoring frequency. Most NPDES permits for iron and steel facilities require facilities to continuously monitor and record their discharge flow rates and report daily 24-hour total flow.

Facilities may monitor effluent more frequently than specified in their permits; however, the results must be reported in accordance with §122.41(l)(4)(ii).

15.7.3 Compliance Monitoring Locations

The NPDES permit regulations at §122.41(j)(1) require that samples and measurements taken for the purpose of monitoring be representative of the monitored activity and §125.3(e) requires that technology-based effluent limits be applied prior to or at the point of discharge. The pretreatment regulations at §403(d) prohibit facilities from diluting their wastewater to meet categorical pretreatment standards. The discharge from a wastewater treatment facility is usually a point where measurements will be most representative of the treated effluent. Under circumstances where dilution with relatively low volumes of noncontact cooling water or storm water will not interfere with compliance determinations, permit writers may apply the technology-based effluent limits at the point of discharge to a receiving water or to a POTW.

In the proposed regulation at §420.6(b) EPA has given permit writers the flexibility to apply pH effluent limitations at the point of discharge from a wastewater treatment facility or at the point of discharge to a receiving water. This mechanism is designed to prevent the need for facilities to reneutralize their treated wastewater to a pH of 6.0 to 9.0 if they can

achieve the same end by mixing treated wastewater with nonregulated wastewater, such as large volumes of noncontact cooling water.

15.8 Best Management Practices

BMPs are measures to prevent or mitigate water pollution from sources ancillary to the industrial manufacturing or treatment process. The NPDES regulations at §122.2 define the term "best management practices" and provide the following measures as examples:

- Schedules of activities;
- Prohibition of practices;
- Maintenance procedures;
- Treatment requirements; and
- Operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage areas.

The NPDES regulations at §122.44(k) allows BMPs to be included as permit conditions (when applicable) where they are authorized under Section 304(e) of the CWA when numeric effluent limitations are not feasible or when BMPs are necessary to meet the limitations or carry out the purpose and intent of the CWA. Examples of when numeric effluent limitations are not feasible include the following:

- When chemical analyses are inappropriate or impossible;
- When a history of leaks and spills exists or when housekeeping is sloppy;
- When a complex facility lacks toxic pollutant data; and
- When other discharge control options are prohibitively expensive.

Permit writers may include BMPs in permits in two ways: they may require the development of a general BMP plan and/or require site-, process-, or pollutant-specific BMPs. Because individual permits instead of general permits are issued to iron and steel facilities, permit writers usually require site-specific or pollutant-specific BMPs where appropriate.

The Guidance Manual for Developing Best Management Practices (BMPs) (Reference 15-5) presents additional information about BMPs and describes industrial activities and materials that are best addressed by BMP plans. EPA has identified several recommended components for effective BMP plans for the iron and steel industry. The minimum suggested components of a general BMP plan are presented below (Reference 15-5 discusses each of these components in more detail).

- General requirements:
  - Name and location of facility;
  - Statement of BMP policy and objective; and
  - Review by plant manager.

- Specific requirements:
  - BMP committee;
  - Risk identification and assessment;
  - Reporting of BMP incidents;
  - Materials compatibility;
  - Good housekeeping;
  - Preventive maintenance;
  - Inspections and records;
  - Security; and
  - Employee training.

The Preliminary Study of the Iron and Steel Category (Reference 15-6) identifies the activities listed below as possible BMPs for iron and steel facilities. EPA advises permit writers to apply or require BMPs in instances where site-specific circumstances warrant the application of BMPs such as the following:

- Control of spillage and losses from raw material handling operations (i.e., ore docks, coal handling);

- Control of runoff from raw material storage piles, including piles of coal, coke, iron ore, limestone, and scrap steel;

- Control of fugitive discharges of process wastewater and process materials to coke plant, blast furnace, and sinter plant noncontact cooling water;

- Control of coke oven and blast furnace gas condensates;

- Control of runoff/leachate and ground-water contamination from blast furnace slag pits located at blast furnaces;

- Control of runoff from blast furnace and steelmaking slag processing operations located at the furnaces and in remote areas;

- Control of runoff from electronic arc furnace (EAF) dust collection areas;

- Control of spillage and runoff from loading stations for rolling solutions and pickling acids; and

- Surveillance and corrective action programs for oil discharges from noncontact cooling water discharges.

In addition, BMPs could also be applied in the form of periodic (e.g., once during the term of a five-year permit) engineering reviews of the design and operation of wastewater treatment systems to ensure facilities schedule increases in capacity, major maintenance items, and replacement of treatment units as needed. Many existing steel industry wastewater treatment systems were first designed and installed during the 1960s and 1970s. The Agency believes that, for the most part, these systems have been properly operated and well maintained. For these facilities, BMPs would help identify those systems that require major maintenance or replacement in the near term.

15.9 Bypasses and Upsets

The CWA, the NPDES permit regulations at §122.41(m) and (n), and the pretreatment regulations at §403.16 and §403.17 allow effluent discharges in excess of permit limits under certain exceptional and limited circumstances. A *bypass* is an intentional diversion of a wastestream from any portion of a treatment facility to prevent unavoidable loss of life, personal injury, or severe property damage. Economic loss caused by delays in production does not constitute severe property damage for the purposes of this regulation. The key requirements for the bypass provisions of a permit are (1) the bypass must be intentional; (2) prior notice (10 days, if possible) must be provided; and (3) there must be no feasible alternatives to the bypass. A facility cannot meet these requirements if it lacks adequate back-up equipment that it should have installed to prevent a bypass during periods of normal operation or maintenance using reasonable engineering judgement. Intentional bypasses are allowed only if required for essential maintenance to ensure efficient operation, as long as these bypasses do not cause the facility to exceed its effluent limitations.

An *upset* is an exceptional incident in which a facility unintentionally and temporarily cannot comply with its technology-based permit effluent limitations due to factors beyond its reasonable control. An upset does not include noncompliance due to operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation. An upset can be an affirmative defense for effluent limitation exceedances provided that the permit holder demonstrates the following: the cause of the upset can be identified, the permitted facility was being properly operated at the time of the upset, and the permit holder made the required 24-hour notification. In any enforcement proceeding, the burden of proof is on the permit holder to demonstrate an upset has occurred through properly signed operating logs or other relevant evidence.

Because Section 510 of the CWA authorizes permit authorities to include more stringent controls than in permits than one contained in the federal regulations, any bypass and upset provisions must be included in permits issued by permit authorities to become available to permit holders. Permit authorities should anticipate that permit holders with properly designed

and operated wastewater treatment systems would have very few, if any, bypasses or upsets that meet the above criteria in the course of a five-year NPDES permit.

15.10 NPDES Permit and Pretreatment Variances

The CWA and the NPDES permit regulations allow certain variances from technology-based effluent limitations guidelines and standards for exceptional cases. The water bubble provisions of the 1982 rule and the proposed regulation at §420.4 allow alternative effluent limitations where a facility can trade pollutant discharges from one outfall or NPDES permit compliance monitoring point to another. Unlike variances, facilities may use the water bubble wherever they can meet the conditions governing use of the water bubble. As opposed to the bypass and upset provisions that are applicable within the term of a permit, the permit writer develops the variance and alternative limitations at the time of draft permit renewal so that the variance and alternative limitations are subject to public review and comment at the same time the entire permit is put on public notice. The variance and alternative limitations remain in effect for the term of a permit, unless the permit writer modifies it prior to expiration.

A permit applicant must meet specific data requirements before a variance is granted. As the term implies, a variance is an unusual situation, and the permit writer should not expect to routinely receive variance requests. The permit writer should consult 40 CFR §124.62 for procedures on making decisions on the different types of variances.

15.10.1 Economic Variances

Section 301(c) of the CWA allows a variance for nonconventional pollutants from technology-based BAT effluent limitations due to economic factors, at the request of the facility and on a case-by-case basis. There are no implementing regulations for §301(c); rather, variance requests must be made and reviewed based on the statutory language in CWA §301(c). The economic variance may also apply to non-guideline limits in accordance with 40 CFR §122.21(m)(2)(ii). The applicant normally files the request for a variance from effluent limitations developed from BAT guidelines during the public notice period for the draft permit. Other filing time periods may apply, as specified in 40 CFR §122.21(m)(2). The variance application must show that the modified requirements:

1) Represent the maximum use of technology within the economic capability of the owner or operator; and

2) Result in further progress toward the goal of discharging no process wastewater.

Facilities in industrial categories other than utilities must conduct three financial tests to determine if they are eligible for a 301(c) variance. Guidance for conducting the financial tests is available from EPA's Office of Wastewater Management. Generally, EPA will grant a variance only if all three tests indicate that the required pollution control is not economically

achievable, and the applicant makes the requisite demonstration regarding "reasonable further progress."

With respect to the second requirement for a 301(c) modification, the applicant must, at a minimum, demonstrate compliance with all applicable BPT limitations and pertinent water-quality standards. In addition, the proposed alternative requirements must reasonably improve the applicant's discharge.

15.10.2 Variances Based on Localized Environmental Factors

Section 301(g) of the CWA allows a variance for certain nonconventional pollutants (ammonia, chlorine, color, iron, and total phenols) from BAT effluent limitations guidelines due to local environmental factors. The discharger must file a variance application that shows the following:

- The modified requirements result in compliance with BPT and water-quality standards of the receiving stream;
- Other point or nonpoint source discharges will not need additional treatment as a result of the variance approval; and
- The modified requirements will not interfere with protection of public water supplies or with protection and propagation of a balanced population of shellfish, fish, and wildfowl, and will allow recreational activities in and on the water. Also, the modified requirements will not result in quantities of pollutants that may reasonably be anticipated to pose an unacceptable risk to human health or the environment, cause acute or chronic toxicity, or promote synergistic properties.

Section 301(g) also allows petitioners to add other nonconventional pollutants to the variance list upon petition to the Administrator. The petitioner must demonstrate that the pollutants do not exhibit the characteristics of toxic pollutants. Certain time restrictions and other conditions also apply (see Section 301(g)(4)(C)).

Permit writers must review the request to ensure that it complies with each of the requirements for this type of variance. The 301(g) variance request involves significant water-quality assessment, including aquatic toxicity, mixing zone, and dilution model analyses, and the possible development of site-specific criteria. In addition, many complex human health effects must be assessed, including carcinogenicity, teratogenicity, mutagenicity, bioaccumulation, and synergistic propensities. Permit writers should use EPA's Draft 301(g) Technical Guidance Manual (Reference 15-7) in assessing variance requests.

Several Section 301(g) variances have been granted for iron and steel facilities. Most of these have been for ammonia as nitrogen and total phenols discharged from blast furnace

operations. The proposed regulation contains effluent limitations guidelines and standards for phenol rather than total phenols. Consequently, the ability of some permit holders to obtain Section 301(g) variances may be limited because phenol is a designated priority pollutant for which 301(g) variances are not available.

15.10.3 Fundamentally Different Factors Variances

Section 301(n) of the CWA allows variances based upon fundamentally different factors (FDF) for BAT and BCT pollutants, while 40 CFR Part 125, Subpart D provides the regulatory authority for BPT variances. A direct discharger can receive an FDF variance from effluent limitations guidelines for priority, conventional, and nonconventional pollutants if the facility is found to be fundamentally different from the factors considered in establishing the effluent guidelines. There is no FDF variance allowed from NSPS. The facility must file the FDF variance for BPT by the close of the public comment period for the permit under 40 CFR §124.10, and request the FDF variance for BAT or BCT within 180 days of the guideline promulgation. Where an FDF variance request is approved, calculated alternative limits cannot be any less stringent than justified by the fundamental difference and cannot cause violations of water-quality standards. FDF variances may result in more or less stringent effluent limitations than those derived from the generally applicable effluent limitations guidelines.

Factors required to justify a BPT FDF variance related to a discharger's facilities, equipment, processes, and compliance costs must be different from those considered in the development of the guidelines. Factors for BAT and BCT variance requests are similar except that cost cannot be considered. Additional factors that cannot be considered for any FDF variance request include the feasibility of installing the necessary treatment within the given time frame, a claim that the limits cannot be achieved with the given technology (unless supported with data), the discharger's ability to pay, or the impact on local receiving water quality. Permit writers review FDF variances on a case-by-case basis. The burden of proof lies with the facility requesting the variance.

15.10.4 Thermal Discharge Variances

Section 316(a) of the CWA allows variances from effluent limitations for the thermal component of a discharge. Regulations for submitting and reviewing thermal discharge variance requests are promulgated at 40 CFR Part 125, Subpart H. Permits may include less stringent alternative thermal effluent limits if the discharger demonstrates that such limits are more stringent than necessary to ensure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made, taking into account the cumulative impact of its thermal discharge together with all other significant impacts on the species affected.

15.10.5 Net Credits

In some cases, solely as a result of the level of pollutants in the intake water, facilities find it difficult or impossible to meet technology-based limits with BAT/BCT technology. Under certain circumstances, the NPDES regulations allow credit for pollutants in intake water. 40 CFR §122.45(g) establishes the following requirements for net limitations:

- Credit for generic pollutants, such as BOD_5 or TSS, are authorized only where the constituents resulting in the effluent biological oxygen demand and TSS are similar between the intake water and the discharge;
- Credit is authorized only up to the extent necessary to meet the applicable limitation or standard, with a maximum value equal to the influent concentration;
- Intake water must be taken from the same body of water into which the discharge is made; and
- Net credits do not apply to the discharge of raw water clarifier sludge generated during the treatment of intake water.

Permit writers are authorized to grant net credits for the quantity of pollutants in the intake water where the applicable effluent limitations guidelines and standards specify that the guidelines are to be applied on a net basis or where the pollution control technology would, if properly installed and operated, meet applicable effluent guidelines limitations and standards in the absence of the pollutants in the intake waters. EPA has specified in the proposed rule that effluent limitations guidelines and standards are to be applied on a gross basis.

15.11 References

15-1 U.S. Environmental Protection Agency. NPDES Permit Writer's Manual. EPA 833/B-96-003. Washington, D.C., December 1996.

15-2 U.S. Environmental Protection Agency. Industrial User Permitting Guidance Manual. EPA 833/R-89-001. Washington, D.C., September 29, 1989.

15-3 U.S. Environmental Protection Agency. Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream Formula. EPA 833/B-85-201. Washington, D.C., September 1985.

15-4 American Public Health Association, American Water Works Association, and Water Pollution Control Federation. Standard Methods for the Examination of Water and Wastewater, 20th edition. Washington, D.C., 1998.

15-5 U.S. Environmental Protection Agency. Guidance Manual for Developing Best Management Practices (BMPs). EPA 833/B-93-004. Washington, D.C., 1993.

15-6 U.S. Environmental Protection Agency. Preliminary Study of the Iron and Steel Category: 40 CFR Part 420 Effluent Limitations Guidelines and Standards. EPA 821-R-95-037. Washington, D.C., September 1995.

15-7 U.S. Environmental Protection Agency. Draft 301(g) Technical Guidance Manual. Washington, D.C., 1984.

Table 15-1

Example 1: Application of the Proposed 40 CFR Part 420 Direct Discharge Blast Furnaces and Sinter Plant

BPT/BAT											
Operation	Production (tons/day)	Total Suspended Solids		Oil and Grease		Ammonia-N		Total Cyanide		Phenol	
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Max	Average
Blast Furnace A	4,500	0.1564 703.8	0.052 234	-	-	0.000217 0.9765	0.0000977 0.43965	0.00164 7.38	0.000623 2.8035	0.0000154 0.0693	0.00000523 0.023535
Blast Furnace B	3,900	0.1564 609.96	0.052 202.8	-	-	0.000217 0.8463	0.0000977 0.38103	0.00164 6.396	0.000623 2.4297	0.0000154 0.06006	0.00000523 0.020397
Sintering	4,100	0.1502 615.82	0.05 205	0.03 123	0.01002 41.082	0.000652 2.6732	0.000293 1.2013	0.00493 20.213	0.00187 7.667	0.0000463 0.18983	0.0000157 0.06437
NPDES Permit Limits											
Total Mass Limitations (lbs/day)		1,930	642	123	41.1	4.50	2.02	34.0	12.9	0.32	0.11
Total Mass Limitations (kg/day)		875	291	56	18.6	2.04	0.92	15.42	5.85	0.14	0.05

Operation	Production (tons/day)	Total Lead		Total Zinc		Total Residual Chlorine		2,3,7,8-TCDF			
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average		
Blast Furnace A	4,500	0.0000304 0.1368	0.0000159 0.07155	0.0000387 0.17415	0.0000152 0.0684	0.0000261 0.11745	-	-	-		
Blast Furnace B	3,900	0.0000304 0.11856	0.0000159 0.06201	0.0000387 0.15093	0.0000152 0.05928	0.00104 4.056	-	-	-		
Sintering	4,100	0.0000913 0.37433	0.0000476 0.19516	0.000116 0.4756	0.0000457 0.18737	0.000313 1.2833	-	< ML	-		
NPDES Permit Limits											
Total Mass Limitations (lbs/day)		0.63	0.33	0.80	0.32	5.46	-	-	-		
Total Mass Limitations (kg/day)		0.29	0.15	0.36	0.14	2.48	-	-	-		
Other Limitations								ND (10 ppq)			

Table 15-2

Example 2: Application of Proposed 40 CFR Part 420 Direct Discharge Stainless Steel Finishing Mill

BPT/BAT

Operation	Production (tons/day)	Total Suspended Solids		Oil and Grease		Ammonia-N		Total Chromium		Hexavalent Chromium	
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Max	Average
Descaling and Pickling -Strip, Sheet	900	0.876 788.4	0.376 338.4	0.376 338.4	0.1252 112.68	0.133 119.7	0.0873 78.57	0.00152 1.368	0.000854 0.7686	0.000969 0.8721	0.000595 0.5355
Fume Scrubbers	2	12.6 25.2	5.4 10.8	5.4 10.8	1.8 3.6	4.1 8.2	2.69 5.4	0.313 0.6	0.176 0.4	0.199 0.4	0.122 0.2
Cold Rolling Mult. Stand Recirc.	870	0.01252 10.89	0.00626 5.45	0.00522 4.54	0.00208 1.81	0.00304 2.64	0.00199 1.73	0.0000348 0.03	0.0000195 0.02	0.0000221 0.02	0.0000136 0.01
Alkaline Cleaning Strip, Sheet	870	0.204 177.48	0.0876 76.21	0.0876 76.21	0.0292 25.40	0.475 413.25	0.312 271.44	0.00543 4.72	0.00305 2.65	0.00346 3.01	0.00213 1.85
Unregulated Process Water	50 gpm	70 42.06	30 18.03	30 18.03	10 6.01	22.75 13.67	14.94 8.98	0.26025 0.16	0.14611 0.09	0.17 0.10	0.1 0.06
NPDES Permit Limits											
Total Mass Limitations (lbs/day)		**1,044**	**449**	**448**	**150**	**557**	**366**	**6.90**	**3.88**	**4.40**	**2.70**
Total Mass Limitations (kg/day)		**474**	**204**	**203**	**68**	**253**	**166**	**3.13**	**1.76**	**2.00**	**1.23**

Operation	Production (tons/day)	Total Nickel		Fluoride							
		Maximum	Average	Maximum	Average						
Descaling and Pickling -Strip, Sheet	900	0.000449 0.4041	0.000315 0.2835	0.136 122.4	0.108 97.2						
Fume Scrubbers	2	0.0923 0.2	0.0649 0.1	27.9 55.8	22.3 44.6						
Cold Rolling Mult. Stand Recirc.	870	0.0000103 0.01	0.00000721 0.01	0.00311 2.71	0.00248 2.16						
Alkaline Cleaning Strip, Sheet	870	0.0016 1.39	0.00113 0.98	0.485 421.95	0.387 336.69						
Unregulated Process Water	50 gpm	0.0768 0.05	0.054 0.03	23.25 13.97	18.54 11.14						
NPDES Permit Limits											
Total Mass Limitations (lbs/day)		**2.04**	**1.44**	**617**	**492**						
Total Mass Limitations (kg/day)		**0.92**	**0.65**	**280**	**223**						

Table 15-3

Example 3: Application of Proposed 40 CFR Part 420 Direct Discharge Integrated Steelmaking and Hot Forming

BPT/BAT									
Operation	Production (tons/day)	Total Suspended Solids		Oil and Grease		Total Lead		Total Zinc	
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
BOF Wet Open Comb.	8,500	0.1374 1167.90	0.0458 389.30	-	-	0.0000243 0.21	0.0000127 0.11	0.0000279 0.24	0.0000159 0.14
Vacuum Degassing	6,800	0.0312 212.16	0.01042 70.86	-	-	0.0000209 0.14	0.0000119 0.08	0.0000209 0.14	0.0000119 0.08
Continuous Casting	8,450	0.16 1318.20	0.05 439.40	0.05 395.46	0.02 131.82	0.00 0.21	0.00 0.11	0.00 0.24	0.00 0.13
Hot Strip Mill	8,375	0.854 7152.25	0.32 2680.00	0.107 896.13	-	0.000122 1.02	0.0000634 0.53	0.000131 1.10	0.0000907 0.76
NPDES Permit Limits									
Total Mass Limitations (lbs/day)		**9,851**	**3,580**	**1292**	**132**	**1.58**	**0.83**	**1.71**	**1.11**
Total Mass Limitations (kg/day)		**4,468**	**1,624**	**586**	**60**	**0.71**	**0.38**	**0.78**	**0.50**

Table 15-4

Example 4: Application of Proposed 40 CFR Part 420 Indirect Discharge Coke Plant

PSES Option 1 - Physical/Chemical Treatment

Operation	Production (tons/day)	Ammonia as Nitrogen		Total Cyanide		Thiocyanate		Selenium		Naphthalene	
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Max	Average
Cokemaking	4,430	0.0845 374.34	0.0559 247.64	0.0244 108.09	0.0128 56.70	0.402 1780.86	0.317 1404.31	0.00125 5.54	0.00104 4.61	0.00268 11.87	0.000869 3.85
Ground Water Remediation	35 gpm	64.06 26.94	42.4 17.83	18.47 7.77	9.67 4.07	304.91 128.24	240.38 101.10	0.94835 0.40	0.78984 0.33	2.02878 0.85	0.65929 0.28
Pre-Treatment Limitations											
Total Mass Limitations (lbs/day)		**401**	**265**	**116**	**61**	**1,909**	**1,505**	**5.94**	**4.94**	**12.7**	**4.13**
Total Mass Limitations (kg/day)		**182**	**120**	**53**	**28**	**866**	**683**	**2.69**	**2.24**	**5.77**	**1.87**

PSES Option 2 - Physical/Chemical and Biological Treatment

Operation	Production (tons/day)	Ammonia as Nitrogen		Total Cyanide		Thiocyanate		Selenium		Naphthalene	
		Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum	Average
Cokemaking	4,430	0.00539 23.88	0.00357 15.82	0.00616 27.29	0.00422 18.69	0.00164 7.27	0.00115 5.09	0.000185 0.82	0.000159 0.70	0.000103 0.46	0.0000345 0.15
Ground Water Remediation	35 gpm	1.04 0.44	0.047 0.02	7.87 3.31	2.99 1.26	1.24 0.52	0.87 0.37	0.13994 0.06	0.12056 0.05	0.07829 0.03	0.02613 0.01
Pre-Treatment Limitations											
Total Mass Limitations (lbs/day)		**24**	**16**	**31**	**20**	**7.79**	**5.46**	**0.88**	**0.76**	**0.49**	**0.16**
Total Mass Limitations (kg/day)		**11**	**7**	**14**	**9**	**3.53**	**2.48**	**0.40**	**0.34**	**0.22**	**0.07**

Table 15-5

Example 5: Application of Proposed 40 CFR Part 420.4 Example "Water Bubble" Trade for Zinc

Blast Furnaces and Sinter Plant (Outfall 001)			
BPT/BAT			
		Total Zinc	
Operation	**Production (tons/day)**	**Maximum**	**Average**
Blast Furnace A	4,500	0.0000387 0.17415	0.0000152 0.0684
Blast Furnace B	3,900	0.0000387 0.15093	0.0000152 0.05928
Sintering	4,100	0.000116 0.4756	0.0000457 0.18737
Generally Applicable NPDES Permit Limitations (lbs/day)		0.80	0.32
Minimum Net Reduction 10%		0.08	0.03
Amount tradable to Outfall 002 Proposed 50% of allowable limitations for trade to Outfall 002		0.72 0.36	0.28 0.14
NPDES Permit Limits			
Alternative mass limitations (lbs/day)		**0.44**	**0.17**

Integrated Steel Making and Hot Forming (Outfall 002)			
BPT/BAT			
		Total Zinc	
Operation	**Production (tons/day)**	**Maximum**	**Average**
BOF Wet Open Comb.	8,500	0.0000279 0.24	0.0000159 0.14
Vacuum Degassing	6,800	0.0000209 0.14	0.0000119 0.08
Continuous Casting	8,450	0.00 0.24	0.00 0.13
Hot Strip Mill	8,375	0.000131 1.10	0.0000907 0.76
Generally Applicable NPDES Permit Limitations (lbs/day)		1.71	1.11
Amount traded from Outfall 001		0.36	0.14
NPDES Permit Limits			
Alternative mass limitations (lbs/day)		**2.07**	**1.25**

Table 15-6

List of Approved Test Procedures for Pollutants Regulated Under the Proposed Rule for the Iron and Steel Point Source Category

Parameter and Units	Method				
	EPA	STD Method	ASTM	USGS	Other
Conventional Pollutants					
Total suspended solids, mg/L (CAS C009), gravimetric, 103°-105°, post washing of residue	160.2	2540 D		I-3750-85	
Oil and grease, hexane extractable material (HEM), mg/L (CAS C036)	1664				
pH	150.1, 150.2	4500 H^+ B	D1293-95		
Nonconventional Pollutants					
2,3,7,8 TCDF (CAS 51207319)	1613 B				
Ammonia as nitrogen, mg/L (CAS 7664417)					
Manual distillation (at pH 9.5)[6]	350.2	4500-NH_3 B	D1426-93(A)	I-3520-85	973.49[3]
followed by nesslerization	350.2	4500-NH_3 C			973.49[3]
Titration	350.2	4500-NH_3 E	D1426-93(B)		
Electrode	350.3	4500-NH_3 F or G		I-4523-85	
Automated phenate or automated electrode	350.1	4500-NH_3 H			Note 7
Chlorine, total residual, mg/L (CAS 7782505)					
Amperometric direct	330.1	4500-Cl D	D1253-86(92)		
Iodometric direct	330.3	4500-Cl B			
Back titration ether end-point[15] or	330.2	4500-Cl C			
DPD-FAS	330.4	4500-Cl F			
Spectrophotometric, DPD or	330.5	4500-Cl G			
Electrode					Note 16
Fluoride, total, mg/L (CAS 16984488)					
Manual distillation followed by:		4500-F B			
Electrode, manual or	340.2	4500-F C	D1179-93(B)		
Automated				I-4327-85	
Colorimetric (SPADNS)	340.1	4500-F D	D1179-93(A)		
automated complexone	340.3	4500-F E			
Thiocyanate (CAS 302045)		4500-CN^- M			

Table 15-6 (Continued)

Parameter and Units	Method				
	EPA	STD Method	ASTM	USGS	Other
Priority Pollutants					
Chromium, total[4], mg/L (CAS 7440473) Digestion[4] followed by: AA direct aspiration[36] AA chelation-extraction AA furnace ICP/AES[36] DCP, [36] or Colorimetric (Diphenylcarbazide)	 218.1 218.3 218.2 200.7	 3111 B 3111 C 3113 B 3120 B 3500-Cr D	 D 1687-92(B) D1687-92(C) D4190-82(88)	 I-3236-85	 974.27[3] Note 34
Chromium VI dissolved, mg/L (CAS 18540299) 0.45 micron filtration followed by: AA chelation-extraction or Colorimetric (Diphenylcarbazide)	 218.4	 3111 C 3500-Cr D	 D1687-92(A)	 I-1232-85 I-1230-85	
Lead, total[4], mg/L (CAS 7439921) Digestion[4] followed by: AA direct aspiration AA furnace ICP/AES[36] DCP[36] Voltametry[11]or Colorimetric (Dithizone)	 239.1 239.2 [5]200.7	 3111 B or C 3113 B 3120 B 3500-Pb D	 D3559-90(A or B) D3559-90(D) D4190-82(88) D3559-90(C)	 I-3399-85	 974.27[3] Note 34
Mercury, total[4], mg/L (CAS 7439976) Cold vapor, manual or automated	 245.1 245.2	 3112 B	 D3223-91	 I-3462-85	 977.22[3]
Nickel, total[4], mg/L (CAS 7440020) Digestion[4] followed by: AA direct aspiration[36] AA furnace ICP/AES[36] DCP[36], or Colorimetric (heptoxime)	 249.1 249.2 [5]200.7	 3111 B or C 3113 B 3120 B 3500-Ni D	 D1886-90(A or B) D1886-90(C) D4190-82(88)	 I-3499-85	 Note 34
Selenium, total[4], mg/L (CAS 7782492) Digestion[4] followed by: AA furnace ICP/AES[36], or AA gaseous hydride	 270.2 [5]200.7	 3113 B 3120 B 3114 B	 D3859-93(B) D3859-93(A)	 I-3667-85	

Table 15-6 (Continued)

Parameter and Units	Method				
	EPA	STD Method	ASTM	USGS	Other
Priority Pollutants (continued)					
Zinc, total[4], mg/L (CAS 7440666) Digestion[4] followed by: AA direct aspiration[36] AA furnace ICP/AES[36] DCP,[36] or Colorimetric (Dithizone) or (Zincon)	 289.1 289.2 5200.7	 3111 B or C 3120 B 3500-Zn E 3500-Zn F	 D1691-90 (A or B) D4190-82(88)	 I-3900-85	 974.27[3], p.37[9] Note 34 Note 33
Cyanide, total, mg/L (CAS 57125) Manual distillation with $MgCl_2$ followed by Titrimetric or Spectrophotometric, manual or automated[20]	 [31]335.2 [31]335.3	 4500-CN C 4500-CN D 4500-CN E	 D2036-91(A) D2036-91(A)	 I-3300-85	 p.22[9]
Benzo-a-pyrene (CAS 50328) GC GC/MS HPLC	 610 625, 1625 610	6410 B, 6440 B	D4657-92		
Phenol (CAS 108952) GC GC/MS	 604 625, 1625	6420B, 6410B			
Naphthalene (CAS 91203) GC GC/MS HPLC	 610 625, 1625 610	6410 B, 6440 B			

See 40 CFR Part 136 for footnotes and note references.
CAS: Chemical Abstracts Service.

SECTION 16

GLOSSARY

Acid Cleaning. Treatment of steel surfaces with relatively mild acid solutions for purposes of removing surface dirt and light oxide coatings. Scale and/or heavy oxide removal is considered acid pickling (see below). Acid cleaning operations are typically conducted for surface preparation prior to application of hot dip or electrolytic metal coating and after cold forming and annealing operations.

Acid Pickling. Scale and/or oxide removal from steel surfaces using relatively strong acid solutions. Acid pickling operations are typically conducted after hot forming operations and prior to subsequent steel finishing operations (e.g., cold forming, annealing, alkaline cleaning, metal coatings).

Acid Regeneration. Treatment of spent acid solutions by thermal and/or chemical means to produce usable acid solutions and iron-rich by-products.

Act. The Clean Water Act.

Administrator. The Administrator of the U.S. Environmental Protection Agency.

Agency. U.S. Environmental Protection Agency (also referred to as "EPA").

Agglomeration. The process of binding materials. See definitions for briquetting, nodulizing, pelletizing, and sintering.

Alkaline Cleaning. Application of solutions containing caustic soda, soda ash, alkaline silicates, or alkaline phosphates to a metal surface primarily for removing mineral deposits, animal fats, and oils.

Alloy. A substance that has metallic properties and is composed of two or more chemical elements of which at least one is a metal.

Alloy Steel. Steel is classified as alloy when the maximum of the range given for the content of alloying elements exceeds one or more of the following: manganese, 1.65%; silicon, 0.60%; copper, 0.60%; or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: aluminum, boron, chromium (less than 10%), cobalt, lead, molybdenum, nickel, niobium (columbium), titanium, tungsten, vanadium, zirconium, or any other alloying element added to obtain a desired alloying effect.

Alloying Materials. Additives to steelmaking processes for improving the properties of the finished products. Chief alloying elements in medium alloy steels are: nickel, chromium, manganese, molybdenum, vanadium, silicon, and copper.

Alternate Effluent Limitations to Those Representing the Degree of Effluent Reduction Attainable by the Application of Best Practicable Control Technology Currently Available, Best Available Technology, and Best Conventional Technology, 40 CFR 420.03. Section 420.03 (commonly known as the "water bubble" rule) provides a regulatory flexibility mechanism whereby a discharger with multiple outfalls or NPDES permit compliance points may discharge greater quantities of pollutants from outfalls where treatment costs may be high in exchange for a larger decrease in discharges from outfalls at the same plant where treatment costs may be less. The regulation stipulates that only intraplant trades and no interplant trades are allowed; that only like pollutants can be traded (e.g., zinc for zinc, not zinc for lead or ammonia-N); that minimum net reductions of 10% for toxic and non-conventional pollutants and 15% for conventional pollutants must be achieved; and, that trades within certain subcategories (i.e., cokemaking and cold forming) are restricted.

Ammonia Liquor (or Flushing Liquor). An aqueous solution used to condense moisture and tars from coke oven gas derived from coals charged to a by-product recovery coke oven battery. Excess ammonia liquor, or waste ammonia liquor, is flushing liquor rejected from the flushing liquor recirculating loop through the coke oven gas collecting mains and the coal tar decanter, and generally comprises the free and bound moisture contained in the coal charge to the by-product coke ovens. Weak ammonia liquor is ammonia liquor that has been processed in a free or fixed ammonia distillation column (ammonia still) for ammonia recovery to the coke oven gas stream prior to recovery of ammonium sulfate, anhydrous ammonia, or other by-product ammonium compounds.

Ammonia Still. A steam-stripping column in which ammonia and acid gases (hydrogen cyanide, hydrogen sulfide) are removed from waste ammonia liquor and other ammonia-containing wastewaters. A "free" still operates with steam only, with no alkali addition, to remove ammonia and acid gases. A "fixed" still is similar to a "free" still except lime, or more commonly sodium hydroxide, is added to the liquor to liberate ammonia from its compounds so it can be steam stripped.

Angle. A very common structural or bar shape with two legs of equal or unequal length intersecting at 90°.

Annealing. A heat treatment process in which steel is exposed to an elevated temperature in a controlled atmosphere for an extended period of time and then cooled. Annealing is performed to relieve stresses; increase softness, ductility, and toughness; and/or to produce a specific microstructure in the steel.

Argon Bubbling. Injection of argon into molten metal for rapid and uniform mixing of alloys, temperature homogenization, adjustment of chemical composition, and partial removal of non-metallic inclusions. Argon bubbling methods include argon stirring, trimming, and rinsing.

Argon/Oxygen Decarburization (AOD). A process by which an electric arc furnace heat is decarburized by blowing argon and oxygen into the steel at varying ratios.

AWQC. Ambient Water Quality Criteria.

Baghouse. A dry air pollution control device comprising an enclosure containing multiple fabric filter elements (bags) for removal of particulate matter from gas streams.

Bar. Produced from ingots, blooms, or billets covering the following range: Rounds, 3/8 to 8-1/4 inches inclusive; Squares, 3/8 to 5-1/2 inches; Round-cornered squares, 3/8 to 8 inches inclusive; Hexagons, 1/4 to 4-1/16 inches inclusive; Flats, 13/64 inches and over in specified thicknesses and not over 6 inches specified width.

Basic Oxygen Furnace (BOF). Pear-shaped, refractory-lined vessel used for conversion of a charge of molten iron and steel scrap into molten steel by the injection of high pressure oxygen into the furnace bath.

Basic Oxygen Furnace (BOF) Shop. A building or structure containing one or more basic oxygen furnaces and ancillary processes and equipment (e.g., hot metal desulfurization; hot metal charging; scrap charging; oxygen and flux additions; furnace tapping; ladle preparation; deslagging and slag handling; and primary and secondary air emission control equipment).

Basic Oxygen Steelmaking. The basic oxygen process is carried out in a basic lined furnace which is shaped like a pear. High pressure oxygen is blown vertically downward on the surface of the molten iron through a water cooled lance.

BAT. Best available technology economically achievable, as defined by section 304(b)(2)(B) of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

Battery. See By-Product Coke Battery.

BCT. Best conventional pollutant control technology, as defined by section 304(b)(4) of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

Beam. A member of the structural steel family. Beams come in three varieties: the standard H, I, and the wide flange used for weight supporting purposes.

Billet. A semi-finished piece of steel formed by casting or from hot rolling an ingot or a bloom. It may be square, but is never more than twice as wide as thick. Its cross-sectional area is usually not more than 36 square inches.

Blast Cleaning. Abrasive grit blasting of steel to remove scale; used in place of or in combination with acid pickling.

Blast Furnace. A large conical-shaped furnace used to reduce and melt iron-bearing materials to molten iron as the primary product. By-products include combustible blast furnace gas and blast furnace slag.

Blast Furnace Charge. The raw materials added to the blast furnace which react when heated to produce molten iron. The principal raw materials charged to blast furnaces include coke, limestone, beneficiated iron ores, and sinter.

Blast Furnace Gas Seals. Water-flooded seals located on a blast furnace gas main for collection and removal of blast furnace gas condensate from the blast furnace gas main. Blast furnace gas seal water is contaminated with pollutants associated with blast furnace operations (e.g., ammonia-N, cyanide, phenolic compounds).

Bloom. A semi-finished piece of steel formed by casting or from hot rolling or forging of an ingot. A bloom is square or not more than twice as wide as thick. Its cross-sectional area is usually not less than 36 square inches.

Blowdown. The partial discharge of water from a recirculating process or cooling water system for purposes of correcting hydraulic imbalances in the recirculating system or to control concentrations of substances in the recirculating water.

BMP. Best management practices, as defined by section 304(e) of the Clean Water Act or as authorized by section 402 of the Clean Water Act.

BOD_5. Five-day biochemical oxygen demand. A measure of biochemical decomposition of organic matter in a water sample. It is determined by measuring the dissolved oxygen consumed by microorganisms to oxidize the organic contaminants in a water sample under standard laboratory conditions of five days and 20°C. BOD_5 is not related to the oxygen requirements in chemical combustion.

BPT. Best practicable control technology currently available, as defined by section 304(b)(1) of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

Briquetting. A process for agglomerating or forming materials into discrete shapes of sufficient size, strength, and weight for charging to a subsequent process (e.g., briquetting wastewater sludges for charging to a blast furnace).

Building Evacuation. Control of process and fugitive air emissions from an entire building (e.g., total building evacuation for an electric furnace shop).

Butt-Welded Pipe/Tube. A continuous strip of hot-rolled skelp which is heated, formed into a circular shape, and then welded to form the pipe or tube.

BV. Baseline value as defined in Section 4.

By-Product Coke Battery. A coke-producing unit comprised of numerous adjoining, refractory-lined, slot-type ovens; coal charging and coke pushing facilities; coke quench stations; and coke oven gas collecting mains.

By-Product Cokemaking. Process in which coal is distilled at high temperatures in the absence of air to produce coke and recover the volatile compounds as by-products (e.g., crude coal tar, crude light oil).

CAA. Clean Air Act (42 U.S.C. 7401 *et seq.*, as amended *inter alia* by the Clean Air Act Amendments of 1990 (Pub. L. 101-549, 104 stat. 2394)).

Carbon Steel. Steel which owes its properties chiefly to various percentages of carbon without substantial amounts of other alloying elements. Steel is classified as carbon steel when no minimum content of elements other than carbon is specified or required to obtain a desired alloying effect and when the maximum content for any of the following do not exceed the percentage noted: manganese, 1.65%; silicon, 0.60%; copper, 0.60 percent.

Cast Iron. The metallic product obtained by reducing iron ore with carbon at a temperature sufficiently high to render the metal fluid and casting it in a mold.

Casting. (1) A term applied to the act of pouring molten metal into a mold. (2) The metal object produced by such pouring.

Categorical Pretreatment Standards. Standards for discharges of pollutants to POTWs promulgated by EPA, in accordance with Section 307 of the Clean Water Act, that apply to specific process wastewater discharges from particular industrial categories (40 CFR 403.6 and 40 CFR 405 - 471).

CBI. Confidential Business Information.

CFR. Code of Federal Regulations, published by the U.S. Government Printing Office. A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

Channels. A common steel shape consisting of two parallel flanges at right angles to the web. It is produced both in bar sizes (less than 3 in.) and in structural sizes (3 in. and over).

Clarifier. A wastewater treatment unit, usually in the form of a circular, cone-bottom steel or concrete tank with a center stilling well and mechanical equipment at the bottom for settling and subsequent removal of suspended solids from the wastewater stream. Clarifiers may also be equipped with surface skimming devices for removal of floating materials and oil.

Classifier. Mechanical device used for removal of heavy or coarse particulate matter from a wastewater stream.

Coating. The process of covering steel with another material, primarily for corrosion resistance.

COD. Chemical oxygen demand. A nonconventional, bulk parameter that measures the oxygen-consuming capacity of refractory organic and inorganic matter present in water or wastewater. COD is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test (see Method 410.1).

Coil. Steel sheet that is wound, usually rolled in a hot-strip mill. Coils are typically more than one-quarter mile long; coils are the most efficient way to store and transport sheet steel.

Coke. The carbon product resulting from the high temperature distillation of metallurgical coals in by-product or non-recovery coke ovens.

Coke Breeze. Undersized coke particles (also referred to as coke fines) recovered from coke screening operations and coke quenching stations. Coke breeze may be used as fuel in sintering operations or may be sold as a by-product.

Coke Oven Gas. Hot gas released in the coke ovens, containing water vapor, hydrogen, methane, nitrogen, carbon monoxide, carbon dioxide, hydrocarbons. Also contains contaminants that may be recovered as by-products: tar vapors, light oil vapors (aromatics), consisting mainly of benzene, toluene and xylene, naphthalene vapor, ammonia gas, hydrogen sulfide gas, and hydrogen cyanide gas.

Coke Pushing. The transfer of hot coke from coke ovens into quench cars, using pusher-side equipment such as a door remover and pusher.

Coke Quenching. Rapid cooling of hot coke using water.

Cold Forming. Also known as cold working; a forming operation in which the shape of the metal piece is changed by plastic deformation at a temperature below that at which recrystallization occurs. The plastic deformation can be effected by forging, rolling, extrusion, or drawing.

Cold Rolled Products. Flat-rolled products which have been finished by rolling the piece without heating (at approximately ambient temperature).

Continuous Casting. The process of casting liquid steel directly into semi-finished shapes such as slabs, billets, and rounds, thus eliminating ingot casting and associated ingot stripping, reheating, and primary rolling operations.

Contract Haul. Collection of wastewater or sludge by a private disposal service, scavenger, or purveyor in containers for subsequent transportation, treatment, and disposal off site.

Control Authority. The term "control authority" as used in section 403.12 refers to: (1) The POTW if the POTW's submission for its pretreatment program (§403.3(t)(1)) has been approved in accordance with the requirements of §403.11; or (2) the approval authority if the submission has not been approved.

Control Water. Dilution water added to control toxicity prior to biological treatment systems.

Conventional Pollutants. The pollutants identified in section 304(a)(4) of the Clean Water Act and the regulations thereunder (i.e., biochemical oxygen demand (BOD_5), total suspended solids (TSS), oil and grease, fecal coliform, and pH).

CWA. Clean Water Act. The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 *et seq.*), as amended, *inter alia*, by the Clean Water Act of 1977 (Public Law 95-217) and the Water Quality Act of 1987 (Public Law 100-4).

Cyanide. Total cyanide.

DCN. Document control number for a specific document located in the rulemaking record

Deep-Well Injection. Long-term or permanent disposal of untreated, partially treated, or treated wastewaters by pumping the wastewater into underground formations of suitable character through a bored, drilled, or driven well.

Dephenolizer. A coke plant by-product recovery unit in which phenol is removed from ammonia liquor and is recovered as sodium phenolate by liquid extraction and vapor recirculation.

Descaling. The process of removing scale from the surface of steel. The most common method of descaling is to crack the scale by use of roughened rolls and a forceful water spray (see also electrolytic and salt bath descaling).

Desulfurization. Processes for removal of sulfur compounds from coke oven gases and molten iron. Coke oven gas desulfurization usually involves scrubbing the sulfur-rich gas stream with an absorbent solution, with subsequent recovery of elemental sulfur from the solution. Hot metal

(molten iron) desulfurization involves treatment of the molten metal with lime, with subsequent collection of sulfur-rich particulate matter in fabric filter emission control devices (baghouses).

Dioxin/furans. Chlorinated dibenzo-*p*-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) are closely related families of highly toxic and persistent organic chemicals formed as unwanted by-products in some commercially significant chemical reactions, during high temperature decomposition and combustion of certain chlorinated organic chemicals, during combustion of natural materials, and through other reactions involving chlorine and organic materials. There are 210 CDD/CDF compounds (or congeners) with four to eight chlorine substitutions. Seventeen (CDD/CDF) congeners chlorinated at the 2,3,7,&8 lateral positions are among the most biologically active and toxic CDDs/CDFs. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD) is the most toxic of the CDDs/CDFs. The relative toxicity of mixtures of CDDs/CDFs is described through use of International Toxicity Equivalence Factors (I-TEFs/89).

Direct Application (Once-through). In cold rolling, use of water, detergent, rolling oil, or other substance for the removal of loose organic compounds and fines, in which the substance is not recirculated.

Direct Discharger. An industrial discharger that introduces wastewater to a water of the United States with or without treatment by the discharger.

Direct-Reduced Iron (DRI). Relatively pure iron produced by the reduction of iron ore below the melting point of the iron produced. DRI is used as a substitute for scrap steel in electric arc furnace steelmaking to minimize contaminant levels in the melted steel and to allow economic steel production when market prices for scrap are high.

DL. Sample-specific detection limit.

Drawing. A forming operation whereby deformation of the metal is accomplished by pulling the material through a die by means of a tensile force applied on the exit side.

Dry Air Pollution Control Equipment. Control equipment in which gases are cleaned without the use of water.

DSCFM. Dry standard cubic feet per minute. A standard unit for measuring gas flow.

EAD. EPA's Engineering and Analysis Division.

Effluent Limitations Guidelines and Standards. Regulations promulgated by U.S. EPA under authority of Sections 301, 304, 306 and 307 of the Clean Water Act that set out minimum, national technology-based standards of performance for point source wastewater discharges from specific industrial categories (e.g., iron and steel manufacturing plants). Effluent limitations

guidelines and standards regulations are implemented through the NPDES permit and national pretreatment programs and include the following:

- Best Practicable Control Technology Currently Available (BPT)
- Best Available Technology Economically Achievable (BAT)
- Best Conventional Pollutant Control Technology (BCT)
- New Source Performance Standards (NSPS)
- Pretreatment Standards for Existing Sources (PSES)
- Pretreatment Standards for New Sources (PSNS)

The pretreatment standards (PSES, PSNS) are applicable to industrial facilities with process wastewater discharges to publicly owned treatment works (POTWs). The effluent limitations guidelines and new source performance standards (BPT, BAT, BCT and NSPS) are applicable to industrial facilities with direct discharges of process wastewaters to waters of the United States.

Electric Arc Furnace (EAF). A furnace in which steel scrap and other ferrous and nonferrous materials are melted through application of electrical and chemical energy and converted into liquid steel.

Electric-Resistance-Welded Pipe/Tube. Pipe or tube formed from a plate or continuous strip of steel which is formed into a circular shape and welded together by the application of pressure and electrical energy. Heat is generated by the resistance to current flow (either transformed or induced) across the seam during welding.

Electrolytic Descaling. The aggressive physical and chemical removal of heavy scale from semi-finished specialty and high-alloy steels with molten using electrolytic sodium sulfate solutions.

Electroplating. Operations including application metal coating onto precleaned steel through use of an electric current. Common metal coating types include: chromium and tin. Electroplating improves resistance to corrosion, and for some products, improves appearance and paintability.

Electroslag Remelting (ESR). A specialty steel refining process used to produce ingots with stringent composition requirements. In the process, one or more steel electrodes of about the desired chemical composition are drip-melted through molten slag into a water-cooled copper mold at atmospheric pressure.

Electrostatic Precipitator (ESP). An air pollution control device that imparts an electrical charge on solid particles in the gas stream which are then attracted to an oppositely charged collector plate. The collector plates are intermittently rapped to discharge the collected dust to a hopper below.

End-of-Pipe Treatment (EOP). Refers to those processes that treat a facility waste stream for pollutant removal prior to discharge.

EPA. The U.S. Environmental Protection Agency (also referred to as "the Agency").

Extrusion. A forming operation whereby a material is forced, by compression, through a die orifice.

Filtration. The passage of fluid through a porous medium to remove matter held in suspension.

Final Gas Cooler. A packed tower used for cooling coke oven gas by direct contact with water. The gas is generally cooled to approximately 30°C (86°F) for recovery of light oil.

Finishing. Term used to generically describe steel processing operations conducted after hot forming (e.g., acid pickling, scale removal, cold forming, annealing, alkaline cleaning, hot coating, and electroplating).

Flat Products. Hot-rolled steel products including plate, strip, and sheet, that may or may not be further finished (e.g. cold-rolled or acid pickled).

Flume Flushing. Process by which mill scale collected under hot forming mills and runout tables of continuous casters is transported with water to scale pits for subsequent recovery.

Flushing Liquor. (See ammonia liquor)

Flux. Material added to a blast furnace or steelmaking furnace for the purpose of removing impurities from the molten metal.

Forging. A forming operation in which a metal piece is shaped by hammering.

Forming. Operations in which the shape of a metal piece is changed by plastic deformation. Examples include forging, rolling, extrusion, and drawing.

Foundry Coke. Coke produced for foundry operations.

Four-High Mill. A stand which has four rolls, one above the other. This kind of mill has two working rolls, each of which is stiffened by a larger back-roll. Four high rolls are used only on mills which roll flat products.

FR. Federal Register, published by the U.S. Government Printing Office. A publication making available to the public regulations and legal notices issued by federal agencies.

Free Leg. That section of an ammonia still from which ammonia, hydrogen sulfide, carbon dioxide, and hydrogen cyanide are steam distilled and returned to the gas stream without the addition of an alkaline substance to release free ammonia.

FTE. Full time equivalents (related to the number of employees).

Fugitive Emissions. Emissions that are expelled to the atmosphere in an uncontrolled manner.

Fume Scrubbers. See Wet Scrubbers

Fundamentally Different Factors Variance, CWA Section 301(n). The Administrator, with the concurrence of the State, may establish an alternative requirement under Section 301(b)(2) or Section 307(b) of the Clean Water Act for a facility that modifies the requirements of national effluent limitation guidelines or categorical pretreatment standards that would otherwise be applicable to such facility, if the owner or operator of such facility demonstrates to the satisfaction of the Administrator that the facility is fundamentally different with respect to the factors (other than cost) specified in Section 304(b) or 304(g) and considered by the Administrator in establishing such national effluent limitation guidelines or categorical pretreatment standards.

Furnace Burden. The solid materials charged to a blast furnace comprising coke, iron ore and pellets, sinter, and limestone.

Furnace Coke. Coke produced for blast furnace operations

Galvanizing. Application of zinc to the surface of steel primarily for the purpose of corrosion protection. Zinc may be applied by passing precleaned steel through a molten zinc bath (hot dip galvanizing) or electrochemically (electrogalvanizing).

Ground Water. Water in a saturated zone or stratum beneath the surface of land or water.

Hardness. Defined in terms of the method of measurement. (1) Usually, the resistance to dentation. (2) Stiffness or temper of wrought products. (3) Machinability characteristics.

Hazardous Waste. Any material that meets the Resource Conservation and Recovery Act definition of "hazardous waste" contained in 40 CFR Part 261.

Hearth. In a reverberatory furnace, the portion that holds the molten metal or bath.

Heat. Quantity of steel manufactured per batch in a BOF or an EAF.

Hexane Extractable Material (HEM). A method-defined parameter (EPA Method 1664) that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related material that are extractable in the solvent n-hexane. This parameter does not include materials that volatilize at temperatures below 85°C. EPA uses the term "HEM" synonymously with the conventional pollutant oil and grease (O&G).

Hot Blast. Preheated air blown into the blast furnace through a bustle pipe and numerous tuyeres located around the circumference of the furnace. Temperatures are in the range of 550°C to 1,000°C, and pressures are in the range of 2 to 45 atmospheres.

Hot Coating (Hot Dip Coating). Operations including immersion of precleaned steel into baths of molten metal. Common metal types include: tin, zinc (galvanizing), combinations of lead and tin (terne coating), and combinations of aluminum and zinc (galvalume® coating). Hot coating is typically used to improve resistance to corrosion, and for some products, to improve appearance and paintability.

Hot Forming. Also known as hot working; a forming operation in which the shape of the metal piece is changed by plastic deformation at a temperature above that at which recrystallization occurs. The plastic deformation can be effected by forging, rolling, extrusion, or drawing.

ICR. Information Collection Request.

Incineration. A controlled combustion process most commonly used for destruction of solid, liquid, or gaseous wastes.

Indirect Discharge. An industrial discharger that introduces wastewater into a POTW.

Ingot. A large block-shaped steel casting. Ingots are intermediates from which other steel products are made. When continuous casters are not used, an ingot is usually the first solid form the steel takes after it is made in a furnace.

Ingot Mold. Cast iron molds into which molten steel is teemed. After cooling, the mold is stripped from the solidified steel which is then re-heated in soaking pits (gas or oil-fired furnaces) prior to primary rolling into slabs or billets. Molds may be circular, square, or rectangular in shape, with walls of various thickness. Some molds are of larger cross section at the bottom, other are larger at the top.

Integrated Steel Mill. Mills that make steel by processing iron ore and other raw materials in blast furnaces and basic oxygen furnaces, rather than electric arc furnaces as at non-integrated mills, or mini-mills.

Iron. Primarily the name of a metallic element. In the steel industry, iron is the name of the product of a blast furnace containing 92 to 94% iron, the product made by the reduction of iron ore. Iron in the steel mill sense is impure and contains up to 4% dissolved carbon along with other impurities.

Iron and Steel Coke Plant. By-product cokemaking operations which provide more than fifty percent of the coke produced to ironmaking blast furnaces associated with steel production.

Iron Ore. The raw material from which iron is made. It is primarily iron oxide with impurities such as silica.

Ironmaking. The production of iron made by the reduction of iron ore. In the U.S. iron is made in blast furnaces.

Ladle. A large vessel into which molten metal or molten slag is received and handled.

Ladle Metallurgy. A secondary step in the steelmaking process usually performed in a ladle after the initial refining process in a steelmaking furnace (i.e., BOF, EAF) is complete. Ladle metallurgy is conducted for one or more of the following purposes: to control gases in the steel; to remove, add, or adjust concentrations of metallic or non-metallic compounds (alloying); and to adjust physical properties (e.g., temperature).

Landfill Leachate. Water or ground water collected from that portion of a solid or hazardous waste landfill containing disposed solid or hazardous wastes.

Larry Car. A movable device located on top of a coke battery for receiving and charging screened coal to coke ovens through charging holes located at the top of the ovens.

Light Oil. An unrefined, clear, yellow-brown oil with an approximate specific gravity of 0.889 produced as a by-product of by-product cokemaking operations. It contains varying amounts of coal-gas products with boiling points ranging from about 40°C to 200°C and from which benzene, toluene, xylene, and solvent naphthas are recovered.

Lime. Calcium oxide (CaO), produced by burning limestone (principally comprised of calcium carbonate ($CaCO_3$)) in a lime kiln. Lime is used as a flux (slagging agent) in BOF and EAF steelmaking; limestone is used as a flux in blast furnaces for production of molten iron.

LTA. Long-term average. For purposes of the pretreatment standards, average pollutant levels achieved over a period of time by a facility, subcategory, or technology option.

Merchant Coke Plant. By-product cokemaking operations other than those at iron and steel coke plants.

µg/L. Micrograms/liter.

mg/L. Milligrams/liter.

Microcleanliness. An end result of secondary steelmaking processes which is characterized by a removal of undesirable non-metallics, primary oxides, and sulfides from the molten steel.

Mill Scale. The iron oxide scale which breaks off of heated steel as it passes through a rolling mill. The outside of the piece of steel is generally completely coated with scale as a result of being heated in an oxidizing atmosphere.

Mini-Mill. See Non-Integrated Steel Mill.

Minimum Level (ML). The lowest concentration that can be reliably measured by an analytical method.

Modifications for Certain Non-conventional Pollutants, CWA Section 301(g). The Administrator, with the concurrence of the State, may modify the requirements of Section 301(b)(2)(A) of the Clean Water Act with respect to the discharge from any point source of ammonia, chlorine, color, iron, and total phenols (4AAP) (when determined by the Administrator to be a pollutant covered by Section 301(b)(2)(F)) and any other pollutant which the Administrator lists under 301(g)(4). In the iron and steel industry, variances under Section 301(g) have been granted for discharges of ammonia-N and phenols (4AAP) from cokemaking and ironmaking operations. The variances granted under Section 301(g) must meet certain conditions (e.g., the alternative discharges from BAT must meet local water quality standards, cannot be less stringent than BPT, must not result in more stringent controls on other dischargers, and must satisfy other environmental and human health concerns).

Mold. A form or cavity into which molten metal is poured to produce a desired shape. See ingot molds.

Multiple Stand (Multi Stand). A type of cold rolling stand which has greater than one roll, one above the other, used on flat products.

NC. Non-censored.

NESHAP Control for Benzene. The National Emission Standards for Hazardous Air Pollutants (NESHAPs) regulations set out at 40 CFR 61, Subpart J (6/6/89), Subpart L (9/14/89), Subpart BB (3/7/90), and Subpart FF (3/7/90).

Noncontact Cooling Water. Water used for cooling in process and nonprocess applications which does not come into contact with any raw material, intermediate product, by-product, waste product (including air emissions), or finished product.

Nonconventional Pollutants. Pollutants other than those defined specifically as conventional pollutants (identified in section 304(a) of the Clean Water Act) or priority pollutants (identified in 40 CFR Part 423, Appendix A).

Nondetect Value (ND). Samples below the level that can be reliable measured by an analytical method. This is also known, in statistical terms, as left-censored (i.e., value having an upper bound at the sample-specific detection limit and a lower bound at zero).

Non-Integrated Steel Mill (Mini-Mill). Steel mills that melt scrap metal in an electric arc furnace to produce commodity products.

Nonrecovery Cokemaking. Production of coke from coal in which volatile components derived from the coal are consumed in the process and by-products are not recovered.

NPDES Program. The National Pollutant Discharge Elimination System (NPDES) program authorized by Sections 307, 318, 402, and 405 of the Clean Water Act which applies to facilities that discharge wastewater directly to United States surface waters.

NRDC. Natural Resources Defense Council.

NSPS. New source performance standards, under section 306 of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

Oil and Grease (O&G). A method-defined parameter (EPA Method 413.1) that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, (EPA nitrous 413.1) waxes, soaps, greases, and related materials that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane). This parameter does not include materials that volatilize at temperatures below 75°C. Oil and grease is a conventional pollutant as defined in section 304(a)(4) of the Clean Water Act and in 40 CFR Part 401.16. Oil and grease is also measured by the hexane extractable material (HEM) method (see Method 1664, promulgated at 64 FR 26315; May 14, 1999). The analytical method for TPH and oil and grease has been revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 (Hexane Extractable Material) replaces the current oil and grease Method 413.1 found in 40 CFR 136.

Oil Skimmer. A device which skims the top surface of wastewater for the purpose of removing floating oil.

Open Hearth Furnace. A furnace for melting metal, in which the bath is heated by the convection of hot gases over the surface of the metal and by radiation from the roof.

OSW. EPA's Office of Solid Waste.

Oxidization. A chemical treatment which increases the positive valences of a substance. In a limited sense, adding oxygen to a substance, as in oxidizing C to CO, CO to CO_2, Si to SiO_2, Mn to MnO.

Pig Iron. Iron cast into the form of small blocks that weigh about 30 kilograms (kg) each. The blocks are called pigs.

Pipe. A hollow, cylindrical product distinguished from tube by heavier wall thickness. Pipe is usually measured by its inside diameter. Tube is generally measured by outside diameter.

Plant Service Water. City, well, or surface water which has not been used elsewhere on site (i.e., water prior to its use in a process or operation).

Plate. A flat-rolled finished steel product within the following size and/or weight limitations:

Width	Thickness
over 48 inches wide	0.180 inches or thicker
between 8 and 48 inches inclusive	0.230 inches or thicker
over 48 inches wide	7.53 lb/sq ft or heavier
between 8 and 48 inches inclusive	9.62 lb/sq ft or heavier

POC. Polluant of concern.

Pollution Prevention. The use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes. It includes practices that reduce the use of hazardous and nonhazardous materials, energy, water, or other resources, as well as those practices that protect natural resources through conservation or more efficient use. Pollution prevention consists of source reduction, in-process recycle and reuse, and water conservation practices.

Polychlorinated Biphenyl (PCB) Compounds. Any of a family of halogenated aromatic hydrocarbons that were produced and marketed in the United States as a series of complex mixtures under the trade name Aroclor; any specific chemical included within the following Chemical Abstracts Service Registry Numbers: 1336-36-3 (total PCBs), 12674-11-2 (Aroclor 1016), 11104-28-2 (Aroclor 1221), 11141-16-5 (Aroclor 1232), 53469-21-9 (Aroclor 1242), 12672-29-6 (Aroclor 1254), or 11096-82-5 (Aroclor 1260), see 40 CFR 302; or, any of 209 synthetic congeners of biphenyl with 1 to 10 chlorine substitutions.

Potable Water. Water which can be consumed; drinking water.

Press Forging. The forging process in which metal stock is formed between dies, usually by hydraulic pressure. Press forging is an operation that employs a single, slow stroke. Compare with hammer forging.

Priority Pollutants. The 126 toxic pollutants listed in 40 CFR Part 423, Appendix A.

Privately Owned Treatment Works (PrOTW). Any device or system owned and operated by a private entity and used for storage, treatment, recycling, or reclamation of liquid industrial wastes.

Process Wastewater. Any water which, during manufacturing or processing, comes into direct contact with or results from the storage, production, or use of any raw material, intermediate product, finished product, by-product, or waste product. Wastewater from slag quenching, equipment cleaning, direct-contact air pollution control devices, rinse water, storm water associated with industrial activity, and contaminated cooling water are considered process wastewater. Process wastewater may also include wastewater that is contract hauled for off-site disposal. Sanitary wastewater, uncontaminated noncontact cooling water, and storm water not associated with industrial activity are not considered process wastewater.

PSES. Pretreatment standards for existing sources of indirect discharges, under section 307(b) of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

PSNS. Pretreatment standards for new sources of indirect discharges, under sections 307(b) and (c) of the Clean Water Act. See also Effluent Limitations Guidelines and Standards.

Publicly Owned Treatment Works (POTW). Any device or system owned and operated by a public entity and used in the storage, treatment, recycling, or reclamation of liquid municipal sewage and/or liquid industrial wastes. The sewerage system that conveys wastewaters to treatment works is considered part of the POTW.

QA/QC. Quality Assurance/Quality Control.

QC. Quality Control.

Quality. Refers to the suitability of the steel for the purpose or purposes for which it is intended.

Quenching. A process of rapid cooling from an elevated temperature by contact with liquids, gases, or solids.

Recirculation. In cold rolling, use and recirculation of water, detergent, rolling oil, or other substance for the removal of loose organic compounds and fines.

Reduction. A chemical treatment which decreases the positive valences of a substance. In a limited sense, removing oxygen from a substance, as in reducing CO to C, CO_2 to CO, SiO_2 to Si, MnO to Mn.

Refining. Oxidation cycle for transforming hot metal (iron) and other metallics into steel by removing elements present, such as silicon, phosphorus, manganese, and carbon.

Reheat Furnace. A gas-fired, refractory-lined furnace used for heating steel shapes for subsequent hot forming operations.

Rod. A hot-rolled steel section, usually round in cross-section, produced as a final product or as an intermediate product for subsequent production of wire and wire products.

Rolling. A forming operation that reduces the thickness of a metal piece by passing it between two or more rolls.

Roughing Stand. The rolls used for breaking down the ingot, billet, or slab in the preliminary rolling of metal products.

Runout Table. Area of a hot strip mill located after the finishing stands and before the coilers where laminar-flow cooling is applied to the strip. Generally, for any hot forming mill, this area of the mill is downstream of the last stand of work rolls. For continuous casters, this area of the process is after the torch cut-off.

Salt Bath Descaling. The aggressive physical and chemical removal of heavy scale from semi-finished specialty and high-alloy steels with molten salt baths or solutions containing neutral or acidic salts.

Scale. Iron oxides which form on the surface of hot steel when the steel is exposed to an oxidizing atmosphere.

Scale Pit. An in-ground rectangular (and in some instances, circular) basin constructed of concrete for recovery of scale from process wastewaters used in hot forming and continuous casting operations. Collected scale is mechanically removed and recovered for recycle through a sinter plant or for sale as a by-product.

Scarfing. Removal of imperfections on the surface of semi-finished steel shapes by the use of oxygen/acetylene torches.

Scrap. Iron or steel discard, cuttings, or junk metal, which can be reprocessed.

Seamless Pipe/Tube. Tubular product produced by piercing (a hot forming process), which is followed by further processing to achieve correct wall and size dimensions, or by extrusion for small diameter products.

Secondary Steelmaking. The practice of redistributing steel that does not meet the original customer's specifications because of a defect in its chemistry, gauge or surface quality. Some steel users may accept lower quality, off-spec steel, usually at a lower price.

Semi-Finished Shapes. Steel in the form of ingots, blooms, billets, or slabs for forging or rolling into a finished product.

Semi-Wet Air Pollution Control Equipment. A gas cleaning system in which furnace off-gases are conditioned with moisture prior to processing in electrostatic precipitators or baghouses.

Sendzimir Mill. Type of cold rolling mill used to finish hot-rolled strip to a specific width, thickness, and hardness.

Shear. In a steel mill, a machine for cutting steel products. Steel shears may be classified: as to kind of drive - hydraulic and electric; as to the work done - cropping, squaring, slab, bloom, billet, bar shears; as to type of mechanism - rotary, rocking, gate, guillotine, alligator shears; as to movement of work while shearing - flying shears.

Sheet. Steel produced in coils or in cut lengths within the following size limitations:

Width	Thickness
between 12 and 48 inches inclusive	0.1800 to 0.2299 inch
over 12 inches	0.0449 to 0.1799 inch

SIC. Standard Industrial Classification, a numerical categorization scheme used by the U.S. Department of Commerce to denote segments of industry.

Silica Gel Treated Hexane Extractable Material (SGT-HEM). The freon-free oil and grease method (EPA Method 1664) used to measure the portion of oil and grease that is similar to total petroleum hydrocarbons. (Also referred to as nonpolar material (NPM)).

Single Stand. A type of cold rolling stand which has only one roll, used on flat products.

Sinter. In blast furnace usage, lumpy material which has been prepared from flue dust, other iron-bearing materials, lime, and coke breeze. The dust is agglomerated by heating it to a high temperature. Sinter contains valuable amounts of combined iron.

Sintering. The process of burning a fuel (e.g., coke fines, coke breeze) with limestone fines and a variety of fine iron-bearing materials including iron ore screenings, blast furnace gas cleaning wastewater sludges, and mill scale to form an agglomerated product suitable for charging to a blast furnace. The product is a clinker-like aggregate referred to as sinter or clinker.

Site. A site is generally one contiguous physical location at which manufacturing operations related to the iron and steel industry occur. This includes, but is not limited to, cokemaking, ironmaking, steelmaking, rolling, and finishing. In some instances, a site may include properties located within separate fence lines, but located close to each other.

Skelp. Flat, hot-rolled steel strip or sheet used to manufacture welded pipe or tube products.

Slab. A semifinished block of steel formed from a rolled ingot or manufactured on a continuous slab casting machine, with its width at least twice its thickness.

Slag. Vitrified mineral by-product produced in the reduction of metals from their ores. The principal components of blast furnace slag are oxides of silica and alumina originating chiefly with the iron-bearing materials and lime and magnesia originating with the flux. The major components of steelmaking slags are calcium silicates, lime-iron compounds, and lesser amounts of free lime and magnesia. Usually, slags consist of combinations of acid oxides with basic oxides; neutral oxides are added to aid fusibility.

Sludge Dewatering. The mechanical or natural processes for removal of free water from wastewater sludges. Mechanical equipment used for sludge dewatering may include rotary or leaf vacuum filters, filter presses, or belt filters. Wastewater sludges may be dewatered naturally in sludge drying beds.

Specialty Steel. Steel products containing alloying elements which are added to enhance the properties of the steel product when individual alloying elements (e.g., aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium) exceed 3% or the total of all alloying elements exceeds 5 percent.

Stainless Steel. A trade name given to alloy steel that is corrosion and heat resistant. The chief alloying elements are chromium, nickel, and silicon in various combinations with possible small percentages of titanium, vanadium, and other elements. By American Iron and Steel Institute (AISI) definition, a steel is called "stainless" when it contains 10% or more chromium.

Steel. A hard, tough metal composed of iron alloyed with carbon and other elements to enhance hardness and resistance to rusting.

Strand. A continuous casting mold and its associated mechanical equipment. Also, a term applied to the traveling grate of the sintering machine.

Stream Degassing. A category of vacuum degassing processes including ladle-to-mold degassing, ladle-to-ladle degassing, and tap degassing.

Strip. Steel produced in coils or in cut lengths within the following size limitations:

Width	Thickness
up to 3-1/2 inches inclusive	0.0255 to 0.2030 inch inclusive
between 3-1/2 and 6 inches inclusive	0.0344 to 0.2030 inch inclusive
between 6 and 12 inches inclusive	0.0449 to 0.2299 inch inclusive

Surface Water. Waters of the United States as defined at 40 CFR 122.2.

Tandem Mill. A mill with a number of stands in succession, generally a cold rolling mill.

Tapping. Process of opening a taphole in a blast furnace to remove hot metal and slag; process of pouring molten steel from a steelmaking furnace into a receiving ladle for transfer to a ladle metallurgy station or continuous caster, or into a teeming ladle for pouring into ingot molds.

Tar. Black, viscous organic matter removed from coke oven gas in recirculating flushing liquor systems in the gas collector mains located on top of the by-product recovery coke battery. Tar is subsequently recovered in a tar or flushing liquor decanter where most of the tar is separated from recirculating flushing liquor by gravity separation.

2,3,7,8-TCDF. 2,3,7,8-Tetrachlorodibenzo-furan.

Technical Development Document (TDD). Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Point Source Category.

Teeming. Pouring or casting of molten steel from a ladle into cast iron ingot molds of various dimensions for cooling and solidification of the steel.

Temper Mill. Relatively light cold rolling process (< 1% thickness reduction) performed to improve flatness, alter the mechanical properties of the steel, and minimize surface disturbances. Temper mills are usually single-stand mills.

Three-High Mill. A stand which has three rolls, one above the other. The steel which is being rolled passes one way between the bottom and middle rolls, and the other way between the middle and top rolls.

Total Organic Carbon (TOC). A nonconventional bulk parameter that measures the total organic content of wastewater (EPA Method 415.1). Unlike five-day biochemical oxygen demand (BOD_5) or chemical oxygen demand (COD), TOC is independent of the oxidation state of the organic matter and does not measure other organically bound elements, such as nitrogen and hydrogen, and inorganics that can contribute to the oxygen demand measured by BOD_5 and COD. TOC methods utilize heat and oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants to convert organic carbon to carbon dioxide (CO_2). The CO_2 is then measured by various methods.

Total Petroleum Hydrocarbons (TPH). - A method-defined parameter that measures the presence of mineral oils that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane) and not absorbed by silica gel. The analytical method for TPH and oil and grease has been revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC).

Method 1664 (Hexane Extractable Material) replaces the current oil and grease Method 413.1 found in 40 CFR 136. (Also referred to as nonpolar material (NPM)).

Traveling Grate. Part of a sinter machine or other agglomeration process consisting of zones for drying, preheating, combustion, and cooling.

TRC. Total Residual Chlorine.

TSS. Total Suspended Solids.

Tube. A hollow, cylindrical product distinguished from pipe by thinner wall thickness. Tube is usually measured by its outside diameter. Pipe is generally measured by inside diameter.

Tundish. A refractory-lined vessel located between the ladle and the continuous caster. Molten steel is tapped from the ladle to the tundish for the purpose of providing a stable flow of metal into the caster.

Tuyeres. Water cooled openings located around the circumference of a blast furnace at the top of the hearth through which the hot blast enters the furnace.

Two-High Mill. A stand having only two rolls. Some two-high mills are reversing with screw-downs to adjust the rolls; others are one way only and may or may not have screw-downs for roll adjustment and may or may not be a part of a continuous mill.

Utility Operations. The ancillary operations at a steel mill necessary for mill operations, but not part of a production process (e.g., steam production in a boiler house; power generation; boiler water treatment; intake water treatment).

Vacuum Degassing. A process for removing dissolved gases from liquid steel by subjecting it to a vacuum.

Vacuum Ladle Degassing. A variation of vacuum degassing which includes induction stirring and vacuum-oxygen decarburization.

Variability Factor (VF). A variability factor is used in calculating a limitation to allow for reasonable, normal variation in pollutant concentrations when processed through well designed and operated treatment systems. Variability factors account for normal fluctuations in treatment. By accounting for these reasonable excursions about the long-term average, EPA's use of variability factors results in limitations that are generally well above the actual long-term average.

Venturi Scrubber. A wet air pollution control device that operates by causing intermixing of particulates in a gas stream and water applied to the scrubber. The intermixing is accomplished by

rapid contraction and expansion of the gas stream and a high degree of turbulence in the throat of the scrubber.

Vertical Shaft Furnace. A type of furnace used for pelletizing. Unbaked or green balls are charged through the top of the furnace, descend through the furnace countercurrent to the hot gases, and are discharged as pellets. The shaft furnace is well suited for pelletizing magnetite, but not hematite or limonitic materials.

Volatile Organic Compound (VOC). A measure of volatile organic constituents performed by isotope dilution gas chromatography/mass spectrometry (GC/MS), EPA Method 1624. The isotope dilution technique uses stable, isotopically labeled analogs of the compounds of interest as internal standards in the analysis.

Wastewater. See Process Wastewater.

Wastewater Treatment. The processing of wastewater by physical, chemical, biological, or other means to remove specific pollutants from the wastewater stream or to alter the physical or chemical state of specific pollutants in the wastewater stream. Treatment is performed for discharge of treated wastewater, recycle of treated wastewater to the same process which generated the wastewater, or for reuse of the treated wastewater in another process.

Water Bubble. See Alternate Effluent Limitations to Those Representing the Degree of Effluent Reduction Attainable by the Application of Best Practicable Control Technology Currently Available, Best Available Technology, and Best Conventional Technology, 40 CFR 420.03.

Wet Air Pollution Control Equipment. Venturi, orifice plate, or other units used to bring water into intimate contact with contaminated gas for the purpose of contaminant removal from the gas stream.

Wet Precipitator. An air pollution control device that uses a spray water wash to cleanse the fume residue which is collected dry on precipitator plates. Two types of wet precipitators can be used: intermittent (on a timed cycle) or continuous.

Wet Scrubbers. Venturi or orifice plate units used to bring water into contact with dirty gas to remove it from the gas stream.

Wet-Open Combustion Gas Cleaning System. A BOF gas cleaning system in which excess air is admitted to the off-gas collection system, allowing carbon monoxide to combust prior to high-energy wet scrubbing for air pollution control.

Wet-Suppressed Combustion Gas Cleaning System. A BOF gas cleaning system in which the admission of excess air to the off-gas collection system prior to high-energy wet scrubbing for air

pollution control is limited, thus minimizing combustion of carbon monoxide and the volume of gas requiring subsequent treatment.

Windbox. Sintering machine device for drawing air through the sinter strand to enhance the combustion of fuel in the sinter mix.

Wire. Small diameter steel section produced by cold drawing rod through one or more dies.

Zero Discharge or Alternative Disposal Methods. Disposal of process and/or nonprocess wastewaters other than by direct discharge to a surface water or by indirect discharge to a POTW or PrOTW. Examples include incineration, deep well injection, evaporation on slag or coke, and contract hauling.

Appendix A

SURVEY DESIGN AND CALCULATION OF NATIONAL ESTIMATES

APPENDIX A

SURVEY DESIGN AND CALCULATION OF NATIONAL ESTIMATES

In 1998, EPA distributed two industry surveys that were similar in content and purpose. The first survey, entitled U.S. EPA Collection of 1997 Iron and Steel Industry Data (detailed survey), was mailed to 176 iron and steel industry sites. The second survey, entitled U.S. EPA Collection of 1997 Iron and Steel Industry Data (Short Form) (short survey), was mailed to 223 iron and steel industry sites. Both surveys collected detailed technical and financial information from iron and steel industry sites. The short form is an abbreviated version of the detailed survey and was designed for those iron and steel sites that do not have manufacturing processes found only at integrated and non-integrated mills. Section 3 of this document describes these surveys in greater detail.

Section 1 of this appendix describes the sampling plan (identification of facilities in the industry, sample design, selection of the sample, and out-of-scope and nonresponding facilities). Section 2 of this appendix describes the calculation of sample weights. Section 3 of this appendix describes the methodology for estimating national totals and their variance estimates.

1.0 SAMPLING PLAN

This section describes the development of the sampling plan, which includes identification of the iron and steel industry, selection of the facilities to receive the detailed and short surveys, and the treatment of out-of scope and nonresponding facilities.

1.1 Sampling Frame

To produce a mailing list of facilities for the detailed and short surveys, EPA developed a sampling frame of the iron and steel industry. A sampling frame is a list of all members (sampling units) of a population, from which a random sample of members will be drawn for the survey. Therefore, a sample frame is the basis for the development of a sampling plan to select a random sample. Using the sources identified in Table A-1, EPA developed a sample frame of iron and steel facilities and divided it into 12 strata (categories) based on the types of operations conducted at the facility. A sample frame size (N) is the total number of members in the frame. Since the sample frame sufficiently covered the iron and steel population, the frame size gave a good estimate of the population size (total number of elements in the population.)

EPA cross-referenced the sources in Table A-1 with one another to obtain facility level information and to ensure the accuracy and applicability of each facility's information. After removing the duplicate entries, EPA estimated 822 engaged in iron and steel manufacturing. These facilities include some facilities that EPA now proposes to include in the Metal Products and Machinery (MP&M) Category and will be regulated under 40 CFR Part 438.

1.2 Sample Design

To minimize the burden on the respondents to the industry surveys and improve the precision of estimates from the survey, EPA grouped the facilities into 12 strata (categories), with operations in each stratum expected to be similar. In general, the strata were determined by EPA's understanding of the manufacturing processes at each facility. This grouping of similar facilities is known as stratification. Table A-2 describes the stratification of the iron and steel industry. The Agency also developed two "certainty strata," one for the detailed survey and one for the short form (strata 5 and 8, respectively).

EPA selected a stratified random sample using the sampling frame. A stratified random sample separates the eligible population into nonoverlapping strata, that are as homogeneous as possible. Together these strata make up the whole eligible population. A simple random sample is then selected from each stratum.

For the iron and steel industry surveys, there were 12 strata: seven for the detailed survey and five for the short survey. Table A-2 includes the strata descriptions.

1.3 Sample Selection of Facilities

EPA selected 402 facilities out of the 822 facilities identified in the sample frame. Table A-2 provides the frame size and sample size for each of the 12 strata. Depending on the amount/type of information EPA determined it needed for this rulemaking and the number of facilities in a stratum, the Agency either solicited information from all facilities within a stratum (i.e., performed a census) or selected a random sample of facilities within each stratum. EPA sent a survey to all the facilities in strata 5 and 8, determining that it was necessary to capture the size, complexity, or uniqueness of the steel operations present at these sites. EPA also sent surveys to all the facilities in strata 1 though 4 (all cokemaking sites, integrated steel sites, and all sintering and direct reduced iron sites) because the number of sites is relatively low and because of the size, complexity, and uniqueness of raw material preparation and steel manufacturing operations present. EPA statistically sampled the remaining sites in strata 6, 7, and 9 through 12. The sample sizes were determined to detect a relative difference of 30 percent on a proportion of 0.25 with 90 percent confidence for a binary variable (e.g., a yes/no question).[1] EPA used the following formula to calculate the sample size for each stratum:

$$n_h = \frac{Z^2 q/(d^2 p)}{1 + \frac{[Z^2 q/(d^2 p)]}{N_h}} \qquad \text{(A-1)}$$

[1] While many questions are not binary, this is a common assumption used in survey methodology.

where:

n_h	=	Number of samples to be selected from stratum h, and h=1,2,...,12
p	=	True proportion being estimated (assuming to be 0.25)
q	=	1-p
Z	=	Value obtained from the standard normal (Z) distribution. (For 90 percent confidence, this value is 1.645, which is 95th percentile of standard normal distribution.)
d	=	Relative difference (assuming to be 0.3 or 30 percent)
N_h	=	Total number of facilities in stratum h.

1.4 Out-of-Scope Sites and Response Rates

EPA mailed industry surveys to all of the facilities in the sample. After receiving the industry survey, EPA determined that some facilities were "out-of-scope" or "ineligible" because the regulation would not apply to them. After reviewing the survey responses, EPA identified additional ineligible facilities. In all, EPA identified 203 of the 402 sample facilities as ineligible. Over 75 percent of these facilities were ineligible because EPA is proposing that their operations be regulated under the MP&M Category (see Section 1 of this document).

Of the remaining 199 facilities, 188 were eligible respondents, and 11 were nonrespondents (i.e., did not return a survey). The overall unweighted response rate was 94 percent (188/199). Section 2 of this appendix provides detailed facility level response rates by stratum. EPA made a nonrespondent adjustment to the weights, as described in Section 2 of this appendix.

2.0 Calculation of Sample Weights

This section describes the methodology used to calculate the base weights, non-response adjustments, and the final weights. The base weights and nonresponse adjustments reflect the probability of selection for each facility and adjustments for facility level non-responses, respectively. Weighting the data allows inferences to be made about all eligible facilities, not just those included in the sample, but also those not included in the sample or those that did not respond to the survey. Also, the weighted estimates have a smaller variance than unweighted estimates (see Section 3 of this appendix for variance estimation.) In its analysis, EPA applied sample weights to survey data.

2.1 Base Weights

The base weight assigned to each facility is the reciprocal of the probability that the facility was sampled for the particular stratum. EPA took a census for strata 1 through 5 and stratum 8; thus, the probability of selection for facilities in these strata is one. EPA selected a simple random sample from strata 6 and 7 and strata 9 through 12. The probability of selection for facility *i* from stratum *h* can be written as:

$$PROBSEL_{hi} = \frac{n_h}{N_h} \quad \text{(A-2)}$$

where:

i	=	Facility i
h	=	Any of the *h*=1,2,..., 12 strata
n_h	=	Total sample size for stratum *h*
N_h	=	Total frame size for stratum *h*.

The base weight is the inverse of this probability, and for facility *i* in stratum *h* can be written as:

$$BASE\ WEIGHT_h = \frac{1}{PROBSEL_h} = \frac{N_h}{n_h} \quad \text{(A-3)}$$

Table A-2 provides the sample size and frame size by stratum. Using stratum 6 from Table 3-1 as an example, the probability of selection for all sampled facilities in stratum 6 would be 40/69=.57971. Thus, the base weight for all facilities in stratum 6 would be 1/.57971=1.725.

2.2 Facility Level Nonresponse Adjustment

EPA made a facility-level nonresponse adjustment to account for those facilities that did not complete the industry surveys. Since the eligibility status of the nonrespondents was unknown, EPA assumed that the eligibility status of the nonrespondents was proportional to the known proportion of eligible respondents and ineligibles.

The facility-level nonresponse adjustment for stratum *h* was calculated as:

$$NRA_h = \frac{n_h}{r_h} \quad \text{(A-4)}$$

where:

r_h	=	Number of sample facilities (eligible and ineligible facilities) in stratum h responding to the detailed survey and short survey.

For example, the nonresponse adjustment for stratum 6 can be calculated as follows:

$$NRA_6 = \frac{40}{30 + 9} = \frac{40}{39} = 1.02564 \quad \text{(A-5)}$$

Table A-3 provides the response status of the sampled cases and the base weight and facility-level nonresponse adjustment by stratum. There were no eligible respondents in stratum 12; therefore, EPA also assumed the nonrespondents to be ineligible.

2.3 Final Weights

The final facility weight is the product of the base weight and the facility-level nonresponse adjustment. This can be written as:

$$FINALWT_h = BASEWT_h \times NRA_h \quad \text{(A-6)}$$

Again, using the example from stratum 6, the final facility weight would be:

$$1.725 \times 1.02564 = 1.76923$$

Ineligible facilities also have a base weight and nonresponse adjustments, and thus an associated final weight. However, they represent only other ineligible facilities in this sample frame. Therefore, their contribution to the national estimates are not of interest, and thus their final weights are zeros.

Table A-4 provides the base weight, facility-level nonresponse adjustment factor, and final weight for each facility by stratum.

3.0 Estimation Methodology

This section presents the general methodology and equations for calculating estimates from the detailed survey and short form sampling efforts.

3.1 National Estimates

For each characteristic of interest (e.g., number of a particular operation using dry air pollution control or annual discharge flow from a particular operation), EPA estimated totals for the entire U.S. iron and steel industry ('national estimates'). Each national estimate, $\hat{Y}_{st}$, was calculated as:

$$\hat{Y}_{st} = \sum_{h=1}^{12} [FINALWT_h \cdot \sum_{i=1}^{n_h} y_{hi}] \quad \text{(A-7)}$$

where:

h	=	Stratum and h=1,2,...12 since there are 12 strata
$FINALWT_h$	=	Final weight for the stratum h
y_{ih}	=	ith value from the sample in stratum h.

3.2 Variance Estimation

The estimate of the variance for a national estimate can be calculated as follows:

$$\text{Var}(\hat{Y}_{st}) = \sum_{h=1}^{L} \text{FINALWT}_h^2 \cdot \text{FPC}_h \cdot n_h \cdot s_h^2 \qquad \text{(A-8)}$$

where:

$\hat{Y}_{st}$ = National estimate of number of facilities with the characteristic of interest

L = Number of strata (L= 12)

$\text{FPC}_h = 1 - \frac{n_h}{N_h}$ (finite population correction for stratum h)

$s_h^2 = \frac{1}{n_h - 1}[\sum_{i=1}^{n_h} (y_{ih} - \bar{y}_h)^2]$

(the estimate of the variance within stratum h where

$\bar{y}_h = \frac{\sum_{i=1}^{n_h} y_{ih}}{n_h}$ is the sample mean of stratum h).

The variance estimates can be used to calculate confidence intervals for the survey estimates. The confidence interval comprises a lower confidence limit and an upper confidence limit. The greater the variance, the wider the interval, and the lower the precision associated with the estimate. A 95-percent confidence interval should be interpreted as follows: If many samples were taken from the population of interest and a confidence interval were calculated from each sample, 95 percent of the confidence intervals would contain the true value of what is being estimated and 5 percent of the confidence intervals would not contain the true value. Thus, a 95-percent confidence interval is interpreted as saying that the true value of the population can be found by the random interval 95 percent of the time. The lower and upper 95-percent confidence limits can be written as:

$$\text{Lower 95-percent confidence limit} = \hat{Y}_{st} - \left(Z \cdot \sqrt{\text{var}(\hat{Y}_{st})}\right) \qquad \text{(A-9)}$$

$$\text{Upper 95-percent confidence limit} = \hat{Y}_{st} + \left(Z \cdot \sqrt{\text{var}(\hat{Y}_{st})}\right) \qquad \text{(A-10)}$$

where:

Z = Value obtained from the standard normal (Z) distribution. (For 95-percent confidence interval, this value is 1.96, which is 97.5th percentile of standard normal distribution.)[2]

When comparing estimates, if the confidence intervals overlap, there is no statistically significant difference between the two estimates.

4.0 REFERENCES

A-1 Cochran, William G. Sampling Techniques, 3rd Ed. New York: John Wiley and Sons, Inc., 1977.

A-2 SAS®, The SAS System, SAS Institute Inc.

[2]When the national estimate is based on a sample size of less than 30, the appropriate value from the t distribution is used instead of $Z_{0.025}$ for calculating the upper and lower confidence limits.

Table A-1

Sources Used For Development of Sample Frame

1	Association of Iron and Steel Engineers' 1997 Directory: Iron and Steel Plants Volume 1, Plants and Facilities
2	Iron and Steel Works of the World (12th edition) directory
3	Iron and Steel Society's Steel Industry of Canada, Mexico, and the United States: Plant Locations Map
4	American Coke and Coal Chemicals Institute (Membership List)
5	American Galvanizers Association (Membership List)
6	American Iron and Steel Institute (Membership List)
7	American Wire Producers Association (Membership List)
8	Cold Finished Steel Bar Institute (Membership List)
9	Specialty Steel Industry of North America (Membership List)
10	Steel Manufacturers Association (Membership List)
11	Steel Tube Industry of North America (Membership List)
12	Wire Association International (Membership List)
13	Dun & Bradstreet Facility Index database
14	EPA Permit Compliance System (PCS) database
15	EPA Toxic Release Inventory (TRI) database
16	Iron and Steelmaker Journal, "Roundup" editions
17	33 Metalproducing Journal, "Census of the North American Steel Industry"
18	33 Metalproducing Journal, "Roundup" editions

Table A-2

Frame Sizes and Sample Sizes for the Iron and Steel Population Frame

Stratum h	Stratum Description	Frame Size (N_h)	Sample Size (n_h)
Detailed Survey Strata			
1	Integrated steel facilities with cokemaking	9	9
2	Integrated steel facilities without cokemaking	12	12
3	Stand-alone cokemaking facilities	16	16
4	Stand-alone direct reduced ironmaking or sintering facilities	5	5
5	Detailed survey certainty stratum	60	60
6	Non-integrated facilities (with and without finishing)	69	40
7	Stand-alone finishing and stand-alone hot forming facilities	54	35
Short Survey Strata			
8	Short survey certainty stratum	13	13
9	Stand-alone cold forming facilities	62	37
10	Stand-alone pipe and tube facilities	164	59
11	Stand-alone hot dip coating facilities	106	49
12	Stand-alone wire facilities	252	67
	TOTAL:	**822**	**402**

Table A-3

Response Status, Base Weight, and Facility-Level Nonresponse Adjustments by Stratum

Stratum (h)	Frame Size (N_h)	Sample Size (n_h)	Response Status			Base Weight	Facility Level Nonresponse Adjustment
			Number of Eligible	Number of Ineligible	Number of Nonrespondents		
1	9	9	9	0	0	1.00000	1.00000
2	12	12	12	0	0	1.00000	1.00000
3	16	16	15	1	0	1.00000	1.00000
4	5	5	3	2	0	1.00000	1.00000
5	60	60	54	4	2	1.00000	1.03448
6	69	40	30	9	1	1.72500	1.02564
7	54	35	28	7	0	1.54286	1.00000
8	13	13	11	2	0	1.00000	1.00000
9	62	37	19	18	0	1.67568	1.00000
10	164	59	6	50	3	2.77966	1.05357
11	106	49	1	48	0	2.16327	1.00000
12	252	67	0	62	5	3.76119	0.00000
Total	**822**	**402**	**188**	**203**	**11**		

Table A-4

Base Weights, Facility-Level Nonresponse Adjustment Factors, and Final Weights by Stratum

Stratum	Base Weight	Facility Level Nonresponse Adjustment	Final Weight
1	1.00000	1.00000	1.00000
2	1.00000	1.00000	1.00000
3	1.00000	1.00000	1.00000
4	1.00000	1.00000	1.00000
5	1.00000	1.03448	1.03448
6	1.72500	1.02564	1.76923
7	1.54286	1.00000	1.54286
8	1.00000	1.00000	1.00000
9	1.67568	1.00000	1.67568
10	2.77966	1.05357	2.92857
11	2.16327	1.00000	2.16327
12	3.76119	0.00000	0.00000

Appendix B

REVISED EDITING CRITERIA FOR POTW PASS-THROUGH ANALYSIS

Appendix B

REVISED EDITING CRITERIA FOR POTW PASS-THROUGH ANALYSIS

For the proposed Iron and Steel rule, EPA used its traditional methodology to determine POTW performance (percent removal) for priority and nonconventional pollutants. POTW performance is a component of the pass-through methodology used to identify the pollutants to be regulated for PSES and PSNS. It is also a component of the analysis to determine net pollutant reductions (for both total pounds and toxic pound-equivalents) for various indirect discharge technology options (see Section 10). However, as discussed in more detail below, EPA is considering revisions to its traditional methodology for determining POTW performance (percent removals) for priority and nonconventional pollutants. In the traditional methodology, the pertinent data selection editing criteria used to determine POTW percent removals were based on the editing criteria listed in Section 11 for each data source. However, since POTWs are designed to treat conventional pollutants, not toxic pollutants, the revised editing criteria would more accurately reflect the incidental removals of toxic pollutants in POTWs.

See Section 11 for general information on the POTW pass-through analysis methodology and for data-editing criteria used for the proposed Iron and Steel rule.

Review of the 50-POTW Study Analytical Laboratory Reporting Practices and Standardization of Minimum Level (ML) Values

At the time of the 50-POTW sampling program that spanned approximately 2.5 years (July 1978 to November 1980), EPA collected samples at selected POTWs across the United States. The samples were subsequently analyzed by either EPA or EPA contract laboratories using test procedures (analytical methods) specified by the Agency or in use at the laboratories. Laboratories typically reported the analytical method used along with the test results. However, for those cases in which the laboratory specified no analytical method, EPA was able to specify the method based on the nature of the results and knowledge of the methods available at the time.

To provide consistency for data analysis and establishment of removal efficiencies, EPA reviewed the 50-POTW Study and standardized the reported MLs for use in the Centralized Water Treatment (CWT) final rule and the proposed Iron and Steel rule. EPA standardized the MLs based on information about the analytical methods used, laboratory capabilities at the time the testing was conducted (1978 to 1980), MLs that had been achievable historically, and consultation with Agency experts in the field of analytical chemistry. The standardized MLs are used in this reassessment.

Reassessment of the Pass-Through Methodology and Revised Editing Criteria for the 50-POTW Study

The Agency reevaluated several aspects of the 50-POTW Study database editing process and is considering changes to the editing criteria. Appendix C, "Revised Data Conventions for the 50-POTW Study Analytical Data," describes the minor editing criteria changes that EPA is considering for use in the final Iron and Steel pretreatment standards, including those related to the presence of analytical interferences, missing data, reported greater-than values, and reported less-than values higher than the minimum levels.

The principal editing criterion of the pass-through analysis used for the proposed Iron and Steel rule was to use available performance data representing average influent concentrations 10 times the analytical minimum level. This is also the primary editing criteria for ensuring that promulgated effluent limitations guidelines and standards are based only on the performance of BAT wastewater treatment systems with meaningful influent concentrations of pollutants. This editing criterion ensures that BAT data would demonstrate at least 90 percent removal of priority pollutants. EPA selected this criterion for the POTW data for similar reasons. However, after reconsidering the design differences between industrial BAT treatment and POTW treatment systems, as well as the differences in toxic pollutant influent concentrations, EPA believes that the "10 × ML" editing criterion is too restrictive for the purpose of analyzing POTW data, especially where effluent values are above the minimum level.

The majority of discharging POTWs (67 percent) have installed secondary biological treatment systems[1] designed to treat conventional pollutants characteristic of domestic sewage (primarily BOD and TSS). Most POTWs with secondary treatment have installed a variation of the activated sludge biological process with typical wastewater hydraulic residence times ranging from 4 to 8 hours for the most prevalent process designs.[2] Very few secondary POTWs install unit operations specifically designed to remove priority and nonconventional pollutants.[3]

---

[1] The 1996 Clean Water Needs Survey (Reference B-1) found that of the 13,992 discharging POTWs, 1.3 percent reported less than secondary treatment, 67.1 percent reported secondary treatment, and the remaining 31.6 percent reported better than secondary treatment (**www.epa.gov/owm/uc.htm** at Reference B-1; Appendix C).

[2] Hydraulic residence times for the conventional and tapered aeration activated sludge processes range from 4 to 8 hours; for the step aeration and contact stabilization processes, from 3 to 6 hours; for the modified and high-rate aeration processes, from 0.5 to 3 hours; and for the extended aeration process, from 18 to 36 hours (1992 WEF Manual of Practice No. 8, page 627, Vol. I) (Reference B-2).

[3] Typical POTW unit operations include preliminary treatment (screening and grit removal), primary treatment (sedimentation, sludge collection, and odor control), and secondary treatment (biological treatment with secondary clarification). POTW unit operations associated with advanced or tertiary treatment include nutrient controls (phosphorus and nitrogen [including ammonia] removal processes), multimedia filtration, and activated carbon (1992 WEF Manual of Practice No. 8, pages 389, 447, 517, and 675, Vol. I and pages 895 and 1013, Vol. II) (Reference B-2).

In contrast, depending on raw waste characteristics, industrial treatment systems are often designed to remove toxic pollutants using a wide variety of in-plant wastewater treatment unit operations with or without end-of-pipe secondary biological treatment systems and sometimes followed by tertiary controls. For example, plants in the metal products and machinery, electroplating, iron and steel, OCPSF, inorganic chemicals, landfills, commercial hazardous waste combustor, CWT, and other industries may use in-process or end-of-pipe chemical precipitation for metals control, alkaline chlorination for cyanide control, steam or air stripping for volatile organic pollutant control, and activated carbon or biological treatment for control of a wide variety of organic pollutants. For plants in the OCPSF industry with end-of-pipe secondary biological treatment systems, the median and average wastewater hydraulic residence times are 48 and 118 hours, respectively.[4] Most of the pollutant-specific treatment unit operations listed above are not used to treat POTW wastewater because of the relatively low influent toxic pollutant concentrations. POTW toxic pollutant influent concentrations are often orders of magnitude lower than industrial raw waste concentrations.

Because of these design and toxic pollutant influent concentration differences, the POTW data-editing criteria should reflect typical incidental removals of toxic pollutants in secondary biological treatment systems designed and operated to control municipal sewerage. In general, due to dilution in municipal sewer collection systems, POTW influent concentrations of toxic pollutants are lower than the influent concentrations of industrial treatment systems. In those cases where both industrial and municipal treatment systems reduce the effluent pollutant concentration to the analytical minimum level, the relative performance (percent removal) is primarily a function of the influent concentrations. This was the principal reason for initially using the "10 × ML" influent editing criterion for retaining POTW average performance data – to avoid the bias of calculating artificially low median percent removals (median of POTW average performance). However, this editing criterion, when applied to the 50-POTW Study data, overestimates POTW incidental removals for many toxic pollutants. In the 50-POTW Study database, there are many cases where POTW average influent concentrations are less than the "10 × ML" edit and the average effluent data are above the ML. These cases should be included in the calculation of national POTW performance (median of POTW average percent removals) because they accurately reflect the incidental removals of the toxic pollutants in treatment systems primarily designed to control conventional pollutants. For example, for many POTWs in the study, average metal pollutant influent concentrations less than "10 times the ML" are paired with average effluent concentrations where each data point is measured above the analytical minimum level. Because of these pairings, EPA can accurately calculate the incidental removals of toxic pollutants characteristic of POTW designs and the characteristically low POTW toxic pollutant influent concentrations. EPA believes it is reasonable to include these percent removal calculations in its pass-through analysis.

[4] Based on 31 OCPSF biological treatment systems with residence times ranging from 4.5 to 1,008 hours (Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category. EPA 440/1-87/009, October 1987, Vol. II, page VIII-45 and Supplement to the Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category. EPA 821-R-93-007, May 1993, pages III-20 to III-23).

Furthermore, one of the observations and conclusions in the 50-POTW Study was that, for many pollutants, "as influent concentrations increased, effluent concentrations also increased. This implies that the removal rates for the priority pollutants are relatively constant and a fixed percentage of incremental loadings of these pollutants will be removed by secondary treatment." Therefore, except for highly biodegradable compounds, for typical POTW secondary biological treatment designs without specific unit operations for toxic pollutant control, one would not necessarily expect the percent removals of toxic pollutants to increase (above incidental removal levels) as influent concentrations increased.

Assessment of Editing Criteria for 50-POTW Study Performance by Treatment Technology

EPA is also considering incorporating POTW treatment system and BOD_5/TSS performance editing criteria into the methodology for determining POTW performance (percent removal) for priority and nonconventional pollutants.

A major goal of the 50-POTW study was to obtain priority pollutant data from representative types of secondary treatment facilities that would exist after completion of EPA's Construction Grants program. The 50 POTWs selected for sampling are representative of biological treatment processes – 35 activated sludge, 8 trickling filter, 4 activated sludge with parallel trickling filter, 1 rotating biological contactor, 1 aerated lagoon, and 1 lagoon system. Eight of these POTWs include post-secondary or tertiary treatment (four filtration and four lagoon systems).

The 50-POTW Study and subsequent assessments of POTW performance (including the assessment for the proposed Iron and Steel rule) used combined end-of-pipe data for all 50 POTWs. The analyses did not assess potential differences in toxic pollutant reductions among the various types of secondary systems, between secondary and tertiary systems, and among different levels of BOD_5 and TSS control (the principal design basis for POTW treatment systems).

After publication of the 50-POTW Study, EPA promulgated its Secondary Treatment Regulation (40 CFR Part 133) to provide information on the level of effluent quality attainable through the application of secondary or equivalent treatment. Secondary treatment generally refers to activated sludge biological processes, and treatment equivalent to secondary treatment refers to trickling filters or waste stabilization ponds. The secondary treatment performance criteria for both BOD_5 and TSS are 30-day and 7-day averages not exceeding 30 mg/L and 45 mg/L, respectively. The BOD_5 and TSS criteria for equivalent secondary treatment are 30-day and 7-day averages not exceeding 45 mg/L and 65 mg/L, respectively. These definitions and treatment levels provide the basis for the technology and BOD_5 /TSS performance edits being proposed for use in the proposed rule.

The revised analyses under consideration include separating the data collected for the four parallel activated sludge and trickling filter systems and, for two of the tertiary systems, including the secondary activated sludge sampling data. This expands the performance database

to 56 POTW treatment trains – 41 activated sludge, 12 trickling filter, 1 rotating biological contactor, 1 aerated lagoon, and 1 lagoon system. Again, eight of these treatment trains include post-secondary or tertiary treatment (four filtration and four lagoon systems). Based on the definitions in 40 CFR Part 133, the POTW treatment trains consist of 47 secondary or equivalent systems, 1 rotating biological contactor, and 8 post-secondary or tertiary systems. The Agency is considering a variety of POTW treatment train and BOD_5/TSS performance editing criteria to determine if these factors significantly affect the incidental removals of priority and nonconventional pollutants in POTWs. For example, among other alternatives, EPA is considering editing criteria that would retain only those secondary or equivalent treatment trains and the rotating biological contactor treatment train that meet the BOD_5 /TSS 7-day average performance criteria. EPA is considering this alternative because it accounts for the fact that only 6 days of data were collected at each POTW.

Revised Editing Criteria for Determining POTW Performance for the 50-POTW Study

Based on these concerns, EPA is considering revising the POTW priority and nonconventional pollutant performance (percent removal) editing criteria. Given the range of analytical minimum levels[5] and their influence on calculated percent removals, as well as the range of in-place POTW treatment technology, EPA is considering several editing alternatives including:

- **Alternative A** – For POTW treatment trains that meet the 7-day conventional pollutant performance criteria for BOD_5 (45 mg/L or lower) and TSS (45 mg/L or lower) using secondary activated sludge biological treatment or its equivalent:

  1) If all effluent values are equal to the ML and the ML is less than or equal to 20 µg/l, retain the pollutant performance (percent removal) if the pollutant influent average is at least 10 times the nominal minimum level (10 × ML).

  2) If all effluent values are equal to the ML and the ML is greater than 20 ppb, retain the pollutant performance (percent removal) if the pollutant influent average is at least 10 times one-half the nominal minimum level (10 × ½ ML or 5 × ML).

  3) If the effluent average is greater than the ML, retain the pollutant performance (percent removal) regardless of the pollutant influent average.

[5] For most organic pollutants, the ML is 10 µg/l (several have MLs of 20 and 50 µg/l). For mercury, silver, cadmium, zinc, copper, nickel, lead, and barium, the respective MLs are 0.2, 2, 5, 20, 25, 40, 50, and 200 µg/l.

4) The national POTW/pollutant percent removal is the median of the retained values from 1, 2, and 3 above.

- **Alternative B** -- The same as Alternative A for items 1, 2, and 4 with the following modification to item 3: If the effluent average is greater than the ML, retain the pollutant performance (percent removal) if the pollutant influent average is at least two times the nominal minimum level (2 × ML). Based on the analyses conducted to date, this is the Agency's preferred alternative.

- **Alternative C** -- Retain all priority pollutant data for POTW treatment trains that meet the 7-day conventional pollutant performance criteria for BOD_5 (45 mg/L or lower) and TSS (45 mg/L or lower) using secondary activated sludge biological treatment or its equivalent.

- **Alternative D** -- The same as Alternative B with the following modifications: (a) retain POTW treatment trains with secondary biological treatment (as designated by treatment flag "S"), only if both the effluent BOD_5 and TSS average concentrations are less than or equal to 45 mg/L, and (b) retain POTW treatment trains with equivalent to secondary biological treatment (as designated by treatment flag "E"), only if both the effluent BOD_5 and TSS average concentrations are less than or equal to 65 mg/L.

- **Alternative E** -- The same as Alternative D with the following modification: substitute ½ × ML for all data points set equal to the analytical ML.

Table B-1 lists the national POTW percent removals for several pollutants, determined by using the traditional methodology for the proposed rule, Alternative A, Alternative B, Alternative C, Alternative D, and Alternative E. For the proposed rule, EPA has used the traditional methodology to estimate POTW percent removals, and, therefore, whether these pollutants "pass through" for purposes of selecting pollutants for regulation by PSES and PSNS.

Assessment of the Use of Analytical Minimum Levels for the 50-POTW Study

Since some commenters on other effluent limitations guidelines and standards have complained that EPA's use of the ML for reported effluent data of <ML underestimates actual percent removal, EPA tried to determine the extent of this situation and possible effects on estimating POTW percent removals for the pass-through analysis. The assessment below indicates that the proportion of POTW not-detected effluent toxic pollutant data varies from pollutant to pollutant and from POTW to POTW.

To help characterize the effect of substituting the analytical ML for not-detected data, the Agency assigned each POTW/pollutant dataset to one of three groups based on the proportion of not-detected effluent values, as follows:

1) All ND - when all of the effluent data points were not detected or assigned the ML value for the pollutant;

2) All NC (noncensored) - when all of the effluent data points were measured concentrations above the ML for the pollutant; and

3) Mix (NC and ND) - when the effluent data points were a mixture of not-detect and measured values.

For those cases where all of the effluent data were noncensored, the calculated percent removal reflects POTW incidental removals with the most accuracy. For those cases where all the effluent data were not detected, the calculated percent removal reflects POTW incidental removals with the least accuracy. In those cases where the effluent data is a mixture of not detected and noncensored data, the calculated percent removals are probably more accurate than "All ND" but less accurate than "All NC". Table A-2 provides pollutant-by-pollutant tabulations for the number of POTWs retained by the Alternative D data conventions with counts of the POTWs' effluent datasets that fall into each category.

For the 21 metal pollutants retained by the Alternative D data conventions, about 97 percent of the 347 POTW/metal pollutant effluent datasets in the table comprise all NC (66 percent) and a mixture of NC and ND (31 percent) values. For ammonia and cyanide, 100 percent of the 65 data sets comprise all NC (99.5 percent) and a mixture of NC & ND (0.5 percent) values.

The 28 organic pollutants retained by the Alternative D data conventions were divided into low, medium, and high Henry's Law Constant groups. For the six organics with low Henry's Law Constants (10^{-3} to 10^{-8}), about 81 percent of the 38 POTW/organic pollutant effluent datasets in the table comprise all NC (18 percent) and a mixture of NC and ND (63 percent) values. For the nine organics with medium Henry's Law Constants (10^{-1} to 10^{-3}), about 83 percent of the 36 POTW/organic pollutant effluent datasets in the table comprise all NC (25 percent) and a mixture of NC and ND (58 percent) values. For the 13 organics with high Henry's Law Constants (2×10^{2} to 10^{-1}), about 83 percent of the 73 POTW/organic pollutant effluent datasets in the table comprise all NC (19 percent) and a mixture of NC and ND (64 percent) values.

The Agency concludes that POTW performance for metals, ammonia, cyanide, and organic pollutants is not significantly affected by the bias of effluent data being less than the minimum levels.

References

B-1 U.S. Environmental Protection Agency. 1996 Clean Water Needs Survey. 1996.

B-2 U.S. Environmental Protection Agency. 1992 WEF Manual of Practice No. 8 (Volume I and II). 1992.

Table B-1

Comparison of 50-POTW Study Removal Estimation Alternatives (Median Percent Removals)

Pollutant	Traditional Method (%)	Alternative A (%)	Alternative B (%)	Alternative C (%)	Alternative D (%)	Alternative E (%)	Analytical ML µg/l
Ammonia	39	40	40	40	39	39	10
Cyanide	70	65	66	60	65	65	20
Antimony	67	47	57	10	57	57	20
Cadmium	90	86	89	37	89	89	5
Chromium	80	76	77	76	76	77	10
Copper	84	80	80	80	79	80	25
Iron	82	82	82	82	80	82	100
Lead	77	48	57	55	57	69	50
Manganese	36	24	24	24	23	23	15
Mercury	90	63	63	60	61	73	0.2
Naphthalene	95	95	95	39	95	97	10
Nickel	51	28	29	32	29	29	40
Phenol	95	95	96	70	96	97	10
Silver	88	67	69	69	67	73	2
Tin	43	20	41	39	41	47	30
Zinc	79	77	77	77	76	76	20

Table B-2

Number of POTWs Retained by Alternative D Data Conventions

Analyte	CAS No.	Total Number of POTWs	Effluent All (NC)	Effluent Mix (NC and ND)	Effluent (ND)
Class=M, Tech Group=E or S					
Aluminum	7429905	31	11	16	4
Antimony	7440360	1	1	0	0
Boron	7440428	6	4	2	0
Cadmium	7440439	6	2	4	0
Calcium	7440702	36	35	1	0
Chromium	7440473	34	23	11	0
Cobalt	7440484	1	0	1	0
Copper	7440508	34	13	17	4
Iron	7439896	43	34	9	0
Lead	7439921	7	2	4	1
Magnesium	7439954	22	22	0	0
Manganese	7439965	40	38	2	0
Mercury	7439976	15	4	11	0
Molybdenum	7439987	2	1	1	0
Nickel	7440020	14	9	5	0
Silver	7440224	17	5	12	0
Sodium	7440235	21	21	0	0
Tin	7440315	3	1	2	0
Titanium	7440326	10	1	9	0
Vanadium	7440622	2	2	0	0
Yttrium	7440655	2	0	2	0
Total		**73**	**14**	**47**	**12**

Table B-2 (Continued)

Analyte	CAS No.	Total Number of POTWs	Effluent All (NC)	Effluent Mix (NC and ND)	Effluent (ND)
Class=N, Tech Group=E or S					
Ammonia as N	7664417	35	35	0	0
Total Cyanide	57125	30	27	3	0
Total		**65**	**62**	**3**	**0**
Class=O_LOW, Tech Group=E or S					
Bis(2-ethylhexyl)phthalate	117817	25	6	19	0
Butyl benzyl phthalate	85687	1	0	0	1
Di-n-butyl phthalate	84742	2	0	2	0
Di-n-octyl phthalate	117840	2	0	2	0
Fluoranthene	206440	1	0	1	0
Phenol	108952	7	1	0	6
Total		**38**	7	**24**	**7**
Class=O_MED, Tech Group=E or S					
Acenaphthene	83329	2	0	1	1
Anthracene	120127	2	0	1	1
Methylene chloride	75092	22	7	15	0
Naphthalene	91203	1	0	0	1
Phenanthrene	85018	2	0	1	1
1,2-Dichlorobenzene	95501	2	0	1	1
1,2-Dichloroethane	107062	2	2	0	0
1,2-Dichloropropane	78875	1	0	0	1
1,2,4-Trichlorobenzene	120821	2	0	2	0
Total		**36**	**9**	**21**	**6**

Table B-2 (Continued)

Analyte	CAS No.	Total Number of POTWs	Effluent All (NC)	Effluent Mix (NC and ND)	Effluent (ND)
Class=O_HIGH, Tech Group=E or S					
Benzene	71432	5	0	2	3
Chlorobenzene	108907	1	0	0	1
Chloroform	67663	5	2	3	0
Chloromethane	74873	2	0	2	0
Dichlorodifluoromethane	75718	1	1	0	0
Ethylbenzene	100414	5	0	5	0
Tetrachloroethene	127184	15	4	9	2
Tetrachloromethane	56235	1	1	0	0
Toluene	108883	11	0	9	2
Trans-1,2-Dichloroethene	156605	2	0	2	0
Trichlorethene	79016	10	4	4	2
Vinyl chloride	75014	1	0	1	0
1,1,1-Trichloroethane	71556	14	2	10	2
Total		**347**	**229**	**109**	**9**

Source: U.S. EPA, 50-POTW Study, 1982.

NC - Noncensored (when all effluent data points were measured concentrations above the ML for the pollutant).
ND - When all effluent data points were not detected or assigned the ML value for the pollutants.

Appendix C

REVISED DATA CONVENTIONS

Appendix C

REVISED DATA CONVENTIONS FOR THE 50-POTW STUDY ANALYTICAL DATA (UNDER CONSIDERATION FOR USE IN THE FINAL IRON AND STEEL RULE)

This appendix describes the minor editing criteria changes that EPA is considering for use in the final Iron and Steel pretreatment standards, including those related to the presence of analytical interferences, missing data, reported greater-than values, and reported less-than values higher than minimum levels. To compare the proposed changes to the traditional editing criteria used for the proposed Iron and Steel rule (outlined in Section 11), additions to the criteria are highlighted as "(New)" and revisions to existing criteria are highlighted as "(Revised)".

1. **(New)** Applied an alpha-numeric naming convention to identify parallel treatment trains within a POTW. The naming convention is composed of the POTW's number and a suffix. For example, POTW 10 has two parallel treatment trains, which the new naming convention designated as 10A and 10B. Records associated with treatment train "A" in POTW 10 all carry the designation 10A. If a POTW has only one treatment train, all records for the POTW are identified by the POTW number only. The one exception is POTW 56, in which case a sampling point is designated after primary clarification (56A) and after tertiary filtration (56B). EPA did not collect samples after the secondary activated sludge treatment unit. The traditional data conventions – used for the proposed Iron and Steel rule – averaged all of the respective influent and effluent values for parallel treatment systems.

2. **(New)** Added treatment technology codes and technology flags. Treatment technology codes include "AS" for activated sludge, "TF" for trickling filter, and "RBC" for rotating biological contactor, lagoon, and primary clarifier. Some POTWs use a combination of treatment technologies, such as AS + tertiary oxidation ponds. In these cases, EPA identifies the combination. Technology flags are "P" for primary treatment, "S" for secondary biological treatment, "E" for equivalent to secondary biological treatment, and "T" for secondary biological or equivalent treatment systems with tertiary treatment unit operations.

3. This placeholder ensures consistency between the computer output headings and these data conventions. (The numbered statements correspond to preliminary drafts of the revised data conventions. Some data conventions contained in earlier drafts were mistaken or misplaced in sequence and EPA removed these conventions from subsequent drafts. However, EPA retained the assigned number sequence because of reference to these numbers in the computer listings. Thus, this number is effectively blank.)

4. Converted the units of measure for each pollutant to a common metric.

5. **(Revised)** Deleted individual data points for a pollutant if supporting records indicated that one of the following conditions was met (corresponding to key codes 4, 5, 6, and 8 in Table C-1 in this appendix):

   a. Analytical interference prevented the determination of the presence or quantification of the pollutant (key code = 4),

   b. Analytical interference was present, but the pollutant concentration was not detected above the concentration reported (key code = 5),

   c. No chemical analysis was conducted or the result of the chemical analysis was not reported (key code = 6), and

   d. The pollutant was detected but not quantified or confirmed (key code = 8).

   e. **(Revised)** Deleted the record results from a "right censored" qualitative method. These records are identified as "greater-than (>) X" where "X" is a method-specific value. This indicator signifies that the recorded measure is the lower bound of the amount of the pollutant in the sample. The traditional data conventions – used for the Iron and Steel and Metal Products and Machinery (MP&M) proposed rules – reported ">values" as the value. (If calculations are based on influent ">values," then the percent removals would be lower than they should be. If calculations are based on effluent ">values," then the percent removals would be higher than they should be.)

   The revised data conventions delete pollutant concentration data points on an individual basis, not in pairs. For example, if the influent data point meets one of the previously identified conditions, it is deleted. Its paired effluent data point is not deleted unless it too meets one of the conditions. The traditional data conventions deleted data in daily pairs.

6. Incorporated the standardized analytical "minimum level" (ML) values for each record. EPA assigned these values based on the precision and accuracy of the 1978 to 1980 analytical methods used to measure the pollutant.

7. **(Revised)** Deleted records reported as "< values" that are greater than the ML. This may occur when samples are diluted to reduce analytical matrix interference. If a pollutant is not detected in the diluted sample, the

resulting ML is multiplied by the dilution factor. (For data reported as "< values," this rule initially set the value to the ML for calculation purposes without considering if the value is greater than the ML. The traditional editing rule decreases calculated performance for influent value substitutions, and increases it for effluent value substitutions.)

8. Set equal to the pollutant analytical ML any remaining pollutant values reported as not detected (key codes 1, 3, and 7):

   a. Less than the concentration listed (key code = 1),

   b. Detected, but not quantified at lower than the concentration listed (key code = 3), and

   c "Not detected" (key code = 7).

9. For detected or noncensored (NC) values reported as less than the ML, set the value equal to the ML and report the value as a nondetect.

10. **(New)** If the pollutant ML is GREATER THAN 20, substituted 0.5 × ML for influent and effluent samples if all effluent values are equal to the ML and the value was a nondetect. The following pollutants are excluded from this convention: BOD_5, COD, O&G, TDS, TOC, total solids, and TSS.

11. Retained pollutant data for a POTW if there are at least three (3) influent concentration values reported and at least one of these values is measured above the ML for the pollutant.

12. This placeholder ensures consistency between the computer output headings and these data conventions. (The numbered statements correspond to preliminary drafts of the revised data conventions. Some data conventions contained in earlier drafts were mistaken or misplaced in sequence and EPA removed these conventions from subsequent drafts. However, EPA retained the assigned number sequence because of reference to these numbers in the computer listings. Thus, this number is effectively blank.)

13. **(New)** Retained POTW treatment trains with secondary biological treatment or equivalent (as designated by treatment flags "S" or "E") only if both the effluent BOD_5 and TSS average concentrations are less than or equal to 45 mg/L.

14. **(Revised)** Retained non-negative percent removals that are greater than zero for a given pollutant where the percent removal = (100)(average influent - average effluent)/average influent. The traditional data

conventions retained zero percent removals. (The medians of these intermediate values are referred to as **Alternative C.**)

15. Identified three (overlapping) subsets of POTWs based on the average influent concentration:

    a. (i.) If all effluent values are equal to the ML and the ML is greater than 20 ppb, retain the pollutant performance (percent removal) if the pollutant influent average is at least 10 times one-half the nominal ML ($10 \times \frac{1}{2}$ ML = $5 \times$ ML).

    (ii) If all effluent values are equal to the ML and the ML is less than or equal to 20 ppb, retain the pollutant performance (percent removal) if the pollutant influent average is at least 10 times the nominal ML ($10 \times$ ML).

    b. If the effluent average is greater than the ML, retain the pollutant performance (percent removal) regardless of the pollutant influent average.

16. The national POTW/pollutant percent removal is the median of the retained values from 15a and 15b above. (This is referred to as **Alternative A.**)

17. Modify 15b: If the effluent average is greater than the ML, retain the pollutant performance (percent removal) if the pollutant influent average is at least two times the nominal minimum level ($2 \times$ ML).

18. Modify 16: The national POTW/pollutant percent removal is the median of the retained values from 15a and 17 above. (This is referred to as **Alternative B.**)

19. Modify 13: (a) Retain POTW treatment trains with secondary biological treatment (as designated by treatment flag "S"), only if both the effluent BOD_5 and TSS average concentrations are less than or equal to 45 mg/L. (b) Retain POTW treatment trains with equivalent to secondary biological treatment (as designated by treatment flag "E"), only if both the effluent BOD_5 and TSS average concentrations are less than or equal to 65 mg/L. (c) The national POTW/pollutant percent removal is the median of the retained values from 15a and 17 above. (This is referred to as **Alternative D.**)

20. Modify 19: Substitute $\frac{1}{2} \times$ ML for all data points set equal to the analytical ML. (This is referred to as **Alternative E.**)

Table C-1

Description of the Key Codes Used to Qualify Analytical Results in the 50-POTW Dataset[a]

Code	Concentration	Meaning of code
0	. . any	Detected at this concentration
1	. . any	Less than this concentration
2	. . any	Detected at greater than (>) this concentration
3	. . any	Detected, but not quantified at lower than this concentration
4	. . 0	Analytical interference prevented determination of the presence or quantification of the analyte
4	. . any value >0	Analytical interference was present, but concentration was estimated as this concentration
5	. . any	Analytical interference was present, but the analyte was not detected above this concentration
6	. . 0	No chemical analysis conducted or the result of the chemical analysis was not reported
7	. . 0 or blank	Reported as "not detected"
8	. . 0	Analyte was detected, but not quantified or confirmed
8	. . any value >0	A pesticide was detected by GC-ECD at this concentration, but GC-MS did not confirm the presence of the analyte

[a]U.S. EPA, 50-POTW Study, 1982, pp. 29 and 30.

Appendix D

AGGREGATED DATA LISTING

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=COKE_BYPROD -- Option=BAT1 ----------

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	3	3.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	4	1.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	5	2.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	6	1.010	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	7	1.650	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	8	1.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	9	1.900	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	10	1.640	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	11	1.790	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	12	1.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	13	1.290	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	14	1.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	15	1.330	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	16	1.730	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	17	1.680	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	18	1.790	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	19	1.150	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	20	1.540	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	21	1.570	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	22	1.240	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	23	1.240	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	24	0.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	25	0.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	26	0.100	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	27	0.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	28	0.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	29	1.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	30	1.050	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	31	1.220	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	32	1.260	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	33	1.230	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	34	1.290	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	35	0.870	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	36	1.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	37	1.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	38	0.560	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	39	1.280	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	40	1.150	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	41	1.090	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	42	1.230	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	43	1.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	44	1.650	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	45	1.000	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	46	1.470	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	47	1.160	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	48	1.010	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	49	1.000	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	50	1.200	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	51	1.430	MG/L	0.05	ND
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	52	1.050	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	53	1.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	54	0.950	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	55	1.570	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM50	350.2	SP-A	56	0.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	1	2.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	2	1.900	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	3	3.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	4	3.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	5	3.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	6	3.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	7	3.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM51	SM4500NH3-E	SP-A	8	2.900	MG/L	0.05	NC
BENZO(A)PYRENE	50328	ESE01	1625	SP-B +SP-C	1	10.000	UG/L	10.00	ND
BENZO(A)PYRENE	50328	ESE01	1625	SP-B +SP-C	2	10.000	UG/L	10.00	ND
BENZO(A)PYRENE	50328	ESE01	1625	SP-B +SP-C	3	10.000	UG/L	10.00	ND
BENZO(A)PYRENE	50328	ESE01	1625	SP-B +SP-C	4	10.000	UG/L	10.00	ND
BENZO(A)PYRENE	50328	ESE01	1625	SP-B +SP-C	5	10.400	UG/L	10.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE01	1664	SP-B +SP-C	1	5.896	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE01	1664	SP-B +SP-C	2	5.733	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE01	1664	SP-B +SP-C	3	5.716	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE01	1664	SP-B +SP-C	4	12.263	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE01	1664	SP-B +SP-C	5	5.945	MG/L	5.00	NC
MERCURY	7439976	ESE01	1620	SP-B +SP-C	1	0.200	UG/L	0.20	ND
MERCURY	7439976	ESE01	1620	SP-B +SP-C	2	0.200	UG/L	0.20	ND
MERCURY	7439976	ESE01	1620	SP-B +SP-C	3	0.200	UG/L	0.20	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD --- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
MERCURY	7439976	ESE01	1620	SP-B +SP-C	4	0.200	UG/L	0.2	ND
MERCURY	7439976	ESE01	1620	SP-B +SP-C	5	0.200	UG/L	0.2	ND
MERCURY	7439976	ESE02	1620	SP-A +SP-B	1	0.100	UG/L	0.2	NC
MERCURY	7439976	ESE02	1620	SP-A +SP-B	2	0.115	UG/L	0.2	NC
MERCURY	7439976	ESE02	1620	SP-A +SP-B	3	0.060	UG/L	0.2	NC
MERCURY	7439976	ESE02	1620	SP-A +SP-B	4	0.100	UG/L	0.2	NC
MERCURY	7439976	ESE02	1620	SP-A +SP-B	5	0.170	UG/L	0.2	NC
MERCURY	7439976	ISM51	245.1	SP-A	1	0.390	UG/L	0.2	ND
MERCURY	7439976	ISM51	245.1	SP-A	5	0.390	UG/L	0.2	ND
NAPHTHALENE	91203	ESE01	1625	SP-B +SP-C	1	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ESE01	1625	SP-B +SP-C	2	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ESE01	1625	SP-B +SP-C	3	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ESE01	1625	SP-B +SP-C	4	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ESE01	1625	SP-B +SP-C	5	10.400	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	1	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	2	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	3	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	4	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	5	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	6	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	7	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	8	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	9	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	10	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	11	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	12	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	13	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	14	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	15	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	16	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	17	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	18	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	19	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	20	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	21	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	22	10.000	UG/L	10.0	ND
NAPHTHALENE	91203	ISM50	625	SP-A	23	10.000	UG/L	10.0	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
NAPHTHALENE	91203	ISM50	625	SP-A	24	43.990	UG/L	10	NC
NAPHTHALENE	91203	ISM50	625	SP-A	25	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	26	100.000	UG/L	10	NC
NAPHTHALENE	91203	ISM50	625	SP-A	27	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	28	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	29	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	30	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	31	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	32	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	33	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	34	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	35	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	36	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	37	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	38	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	39	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	40	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	41	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	42	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	43	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	44	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	45	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	46	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	47	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	48	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	49	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	50	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	51	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	52	35.000	UG/L	10	NC
NAPHTHALENE	91203	ISM50	625	SP-A	53	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	54	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	55	10.000	UG/L	10	ND
NAPHTHALENE	91203	ISM50	625	SP-A	56	10.000	UG/L	10	ND
PHENOL	108952	ESE01	1625	SP-B +SP-C	1	10.000	UG/L	10	ND
PHENOL	108952	ESE01	1625	SP-B +SP-C	2	10.000	UG/L	10	ND
PHENOL	108952	ESE01	1625	SP-B +SP-C	3	10.000	UG/L	10	ND
PHENOL	108952	ESE01	1625	SP-B +SP-C	4	10.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
PHENOL	108952	ESE01	1625	SP-B +SP-C	5	10.400	UG/L	10.00	ND
SELENIUM	7782492	ESE01	1620	SP-B +SP-C	1	112.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-B +SP-C	2	99.500	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-B +SP-C	3	104.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-B +SP-C	4	109.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-B +SP-C	5	130.000	UG/L	5.00	NC
THIOCYANATE	302045	ESE01	SM4500-CN M.	SP-B +SP-C	1	0.595	MG/L	0.10	NC
THIOCYANATE	302045	ESE01	SM4500-CN M.	SP-B +SP-C	2	0.465	MG/L	0.10	NC
THIOCYANATE	302045	ESE01	SM4500-CN M.	SP-B +SP-C	3	0.305	MG/L	0.10	NC
THIOCYANATE	302045	ESE01	SM4500-CN M.	SP-B +SP-C	4	0.220	MG/L	0.10	NC
THIOCYANATE	302045	ESE01	SM4500-CN M.	SP-B +SP-C	5	0.370	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	1	1.000	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	2	1.000	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	3	1.200	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	4	1.100	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	5	1.000	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	6	1.000	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	7	1.100	MG/L	0.10	NC
THIOCYANATE	302045	ISM51	SM4500CN-M	SP-A	8	1.000	MG/L	0.10	NC
TOTAL CYANIDE	57125	ESE01	335.2	SP-B +SP-C	1	2.710	MG/L	0.02	NC
TOTAL CYANIDE	57125	ESE01	335.2	SP-B +SP-C	2	3.940	MG/L	0.02	NC
TOTAL CYANIDE	57125	ESE01	335.2	SP-B +SP-C	3	3.920	MG/L	0.02	NC
TOTAL CYANIDE	57125	ESE01	335.2	SP-B +SP-C	4	3.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ESE01	335.2	SP-B +SP-C	5	3.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	1	0.780	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	2	1.050	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	3	1.810	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	4	1.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	5	2.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	6	2.140	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	7	1.670	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	8	1.880	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	9	2.440	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	10	2.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	11	2.410	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	12	1.320	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	13	1.660	MG/L	0.02	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	14	1.440	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	15	1.120	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	16	1.490	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	17	1.660	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	18	2.240	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	19	1.650	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	20	1.130	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	21	1.290	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	22	1.480	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	23	1.690	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	24	4.100	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	25	1.700	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	26	3.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	27	2.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	28	2.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	29	1.870	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	30	1.980	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	31	1.060	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	32	1.250	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	33	0.840	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	34	1.730	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	35	1.500	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	36	1.420	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	37	1.260	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	38	1.070	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	39	1.110	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	40	1.400	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	41	0.830	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	42	1.720	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	43	1.490	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	44	1.940	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	45	1.510	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	46	1.560	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	47	2.190	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	48	5.640	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	49	2.270	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	50	1.250	MG/L	0.02	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	51	1.720	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	52	1.570	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	53	1.790	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	54	1.580	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	55	1.520	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM50	335.2	SP-A	56	1.380	MG/L	0.02	NC
TOTAL SUSPENDED SOLIDS	C009	ESE01	160.2	SP-B +SP-C	1	22.500	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ESE01	160.2	SP-B +SP-C	4	19.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ESE01	160.2	SP-B +SP-C	5	14.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	1	148.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	2	7.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	3	4.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	4	4.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	5	17.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	6	11.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	7	16.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	8	14.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	9	13.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	10	19.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	11	4.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	12	11.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	13	4.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	14	5.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	15	9.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	16	12.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	17	9.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	18	6.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	19	4.000	MG/L	4.00	ND
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	20	6.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	21	5.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	22	12.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	23	22.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	24	16.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	25	9.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	26	24.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	27	18.000	MG/L	4.00	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	28	4.000	MG/L	4.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	29	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	30	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	31	26.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	32	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	33	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	34	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	35	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	36	26.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	37	29.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	38	33.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	39	22.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	40	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	41	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	42	17.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	43	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	44	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	45	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	46	8.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	47	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	48	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	49	20.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	50	49.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	51	17.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	52	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	53	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	54	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	55	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM50	NA	SP-A	56	27.000	MG/L	4	NC

Subcategory=COKE_BYPROD -- Option=BAT3

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	1	0.114	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	8	0.124	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT3 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	15	0.164	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	22	0.536	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	29	0.294	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	36	0.221	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	44	0.178	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	50	0.170	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	57	0.272	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	64	0.249	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	71	0.806	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	78	0.485	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	85	0.203	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	93	0.461	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	99	0.232	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	106	0.159	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	120	0.136	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	127	0.543	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	134	0.250	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	141	0.115	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	148	0.483	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	155	0.261	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	162	0.402	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	170	0.175	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	176	0.356	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	182	0.088	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	189	0.082	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	196	0.252	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	203	0.310	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	210	0.145	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	217	0.101	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	243	0.079	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	249	0.171	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	257	0.116	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	263	0.118	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	270	0.487	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	277	0.792	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	284	0.115	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	291	0.116	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT3 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	305	0.116	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	312	0.546	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	319	0.410	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	326	0.556	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	333	0.095	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	340	0.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	347	0.103	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	354	0.476	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	361	0.436	MG/L	0.05	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	1	1.253	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	8	0.233	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	15	1.322	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	22	1.689	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	29	3.806	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	36	0.921	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	44	1.026	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	50	2.388	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	57	2.035	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	64	0.800	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	71	2.713	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	78	2.604	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	85	0.804	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	93	0.878	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	99	1.167	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	106	0.945	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	120	1.590	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	127	2.471	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	134	1.334	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	141	1.855	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	148	1.958	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	155	1.855	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	162	0.354	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	170	1.193	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	176	1.255	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	182	0.450	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	196	0.717	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	203	0.651	MG/L	0.02	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=BAT3 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	210	0.540	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	217	2.621	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	243	3.468	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	249	2.130	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	257	2.822	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	263	1.546	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	270	0.789	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	277	0.658	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	284	1.194	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	291	0.501	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	305	0.537	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	312	0.135	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	319	0.087	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	326	0.062	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	333	0.275	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	340	0.738	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	347	1.108	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	354	1.130	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	361	0.629	MG/L	0.02	NC

Subcategory=COKE_BYPROD -- Option=PSES1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	1	52.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	2	53.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	3	49.900	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	4	47.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	5	49.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	6	48.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	7	49.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	8	54.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	9	45.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	10	41.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	11	48.100	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=COKE_BYPROD -- Option=PSES1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	12	47.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	13	44.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM53	SM4500-NH3	SP-A	14	48.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	3	29.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	9	22.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	16	32.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	23	37.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	30	12.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	38	23.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	45	25.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	52	23.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	59	30.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	67	18.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	74	15.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	81	19.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	88	20.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	96	12.900	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	103	12.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	110	16.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	117	25.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	124	32.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	132	21.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	139	41.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	146	36.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	153	46.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	161	52.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	168	56.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	175	47.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	182	32.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	190	12.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	197	12.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	204	29.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	211	18.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	218	21.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	226	26.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	233	21.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	240	30.800	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=PSES1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	247	18.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	255	42.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	262	13.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	269	16.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	276	23.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	284	37.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	291	11.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	298	23.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	305	9.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	312	7.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	320	13.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	327	11.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	334	28.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	341	42.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	349	36.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	356	32.200	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	363	30.800	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	370	29.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM54	4500NH, BE	SP-A	377	23.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	1	49.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	2	38.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	3	44.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	4	50.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	5	39.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	6	32.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	7	27.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	8	26.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	9	21.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	10	32.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	11	28.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	12	29.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM55	417/350.2	SP-A	13	24.000	MG/L	0.05	NC
NAPHTHALENE	91203	ESE03	1625	SP-A	2	116.490	UG/L	10.00	NC
NAPHTHALENE	91203	ESE03	1625	SP-A	3	503.440	UG/L	10.00	NC
NAPHTHALENE	91203	ESE03	1625	SP-A	4	100.000	UG/L	10.00	ND
NAPHTHALENE	91203	ESE03	1625	SP-A	5	100.000	UG/L	10.00	ND
PHENOL	108952	ESE03	1625	SP-A	1	114770.000	UG/L	10.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
PHENOL	108952	ESE03	1625	SP-A	2	182284.800	UG/L	10.00	NC
PHENOL	108952	ESE03	1625	SP-A	3	16402.800	UG/L	10.00	NC
PHENOL	108952	ESE03	1625	SP-A	4	313800.000	UG/L	10.00	NC
PHENOL	108952	ESE03	1625	SP-A	5	176600.000	UG/L	10.00	NC
SELENIUM	7782492	ESE01	1620	SP-A	1	793.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-A	2	678.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-A	3	715.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-A	4	790.000	UG/L	5.00	NC
SELENIUM	7782492	ESE01	1620	SP-A	5	585.000	UG/L	5.00	NC
THIOCYANATE	302045	ESE03	4500-CN	SP-A	1	217.000	MG/L	0.10	NC
THIOCYANATE	302045	ESE03	4500-CN	SP-A	2	166.000	MG/L	0.10	NC
THIOCYANATE	302045	ESE03	4500-CN	SP-A	3	259.000	MG/L	0.10	NC
THIOCYANATE	302045	ESE03	4500-CN	SP-A	4	216.000	MG/L	0.10	NC
THIOCYANATE	302045	ESE03	4500-CN	SP-A	5	191.000	MG/L	0.10	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	2	6.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	3	6.700	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	7	6.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	8	6.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	10	9.100	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	11	10.800	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	12	8.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	13	8.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	14	7.600	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	15	10.400	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	16	8.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	17	7.700	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	18	8.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	19	8.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	20	7.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	21	8.670	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	22	6.580	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	23	6.500	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	24	7.890	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	25	5.500	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	26	7.300	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	27	8.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	28	5.030	MG/L	0.02	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=COKE_BYPROD -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	29	5.330	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	30	4.100	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	31	4.670	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	32	6.170	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	33	5.400	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	34	3.140	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	36	5.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	37	6.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	38	6.330	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	39	0.520	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	40	4.140	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	41	5.400	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	42	4.770	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	43	5.200	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	44	8.880	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	45	7.900	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	47	8.690	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	48	5.060	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	49	5.680	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	50	1.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	51	3.320	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	52	4.120	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	53	4.330	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	54	5.330	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	55	6.970	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	56	4.480	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	57	5.040	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	67	5.000	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM56	335.2	SP-A	68	6.470	MG/L	0.02	NC

Subcategory=FINISHING -- Option=CARBON_BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	1	9.990	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	2	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	3	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	4	19.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	5	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	6	10.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	7	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	8	27.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	9	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	10	16.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	11	13.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	12	43.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	13	86.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	14	56.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	15	16.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	16	43.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	17	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	18	28.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	19	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	20	26.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	21	45.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	22	14.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	23	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	24	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	25	28.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	26	74.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	27	32.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	28	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	29	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	30	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	32	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	33	63.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	34	68.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	35	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	36	52.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	37	54.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	38	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	39	19.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	40	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	41	43.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	42	224.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	43	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	44	41.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	45	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	46	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	47	41.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	48	52.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	49	116.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	50	39.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	51	48.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	52	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	53	97.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	54	35.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	55	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	56	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	57	39.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	58	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	59	165.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	60	78.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	61	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	62	28.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	63	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	64	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	65	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	66	68.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	67	26.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	68	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	69	48.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	70	29.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	71	32.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	72	35.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	73	10.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	74	37.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	75	87.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	76	41.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	77	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	78	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	79	17.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	80	26.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	81	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	82	28.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	83	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	84	43.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	85	39.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	86	326.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	87	34.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	88	52.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	89	101.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	90	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	91	72.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	92	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	93	46.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	94	34.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	95	34.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	96	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	97	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	98	45.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	99	26.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	100	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	101	48.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	102	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	103	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	104	56.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	105	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	106	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	107	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	108	52.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	109	74.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	110	61.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	111	52.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	112	46.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	113	128.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	114	29.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	115	34.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	116	56.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	117	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	118	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	119	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	120	35.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	121	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	122	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	123	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	124	10.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	125	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	126	35.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	127	16.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	128	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	129	10.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	130	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	131	14.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	132	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	133	37.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	134	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	135	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	136	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	137	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	138	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	139	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	140	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	141	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	142	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	143	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	144	32.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	145	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	146	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	147	10.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	148	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	149	13.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	150	17.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	151	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	152	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	153	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	154	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	155	13.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	156	16.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	157	14.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	158	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	159	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	160	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	161	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	162	25.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	163	30.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	164	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	165	39.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	166	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	167	17.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	168	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	169	14.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	170	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	171	25.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	172	17.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	173	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	174	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	175	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	176	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	177	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	178	30.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	179	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	180	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	181	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	182	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	183	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	184	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	185	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	186	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	187	9.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	188	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	189	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	190	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	191	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	192	17.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	193	74.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	194	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	195	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	196	41.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	197	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	198	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	199	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	200	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	201	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	202	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	203	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	204	13.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	205	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	206	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	207	16.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	208	32.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	209	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	210	12.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	211	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	212	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	213	27.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	214	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	215	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	216	17.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	217	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	218	26.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	219	14.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	220	28.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	221	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	222	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	223	32.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	224	37.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	225	9.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	226	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	227	23.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	228	18.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	229	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	230	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	231	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	232	20.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	233	14.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	234	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	235	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	236	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	237	13.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	238	46.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	239	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	240	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	241	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	242	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	243	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	244	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	245	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	246	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	247	50.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	248	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	249	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	250	57.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	251	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	252	17.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	253	27.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	254	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	255	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	256	30.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	257	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	258	24.000	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	259	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	260	21.990	UG/L	10	NC
CHROMIUM	7440473	ISM57	200.7	SP-A	261	9.990	UG/L	10	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM57	200.7	SP-A	262	9.990	UG/L	10	ND
CHROMIUM	7440473	ISM57	200.7	SP-A	263	9.990	UG/L	10	ND
CHROMIUM	7440473	ESE04	1620	SP-F +SP-G	1	4.050	UG/L	10	NC
CHROMIUM	7440473	ESE04	1620	SP-F +SP-G	2	5.850	UG/L	10	NC
CHROMIUM	7440473	ESE04	1620	SP-F +SP-G	3	9.500	UG/L	10	NC
CHROMIUM	7440473	ESE04	1620	SP-F +SP-G	4	11.250	UG/L	10	NC
CHROMIUM	7440473	ESE04	1620	SP-F +SP-G	5	15.400	UG/L	10	NC
CHROMIUM	7440473	ESE05	1620	SP-A +SP-B	1	10.200	UG/L	10	NC
CHROMIUM	7440473	ESE05	1620	SP-A +SP-B	2	9.000	UG/L	10	ND
CHROMIUM	7440473	ESE05	1620	SP-A +SP-B	3	9.000	UG/L	10	ND
CHROMIUM	7440473	ESE05	1620	SP-A +SP-B	4	18.550	UG/L	10	NC
CHROMIUM	7440473	ESE05	1620	SP-A +SP-B	5	9.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	1	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	2	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	3	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	4	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	5	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	6	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	7	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	8	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	9	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	10	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	11	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	12	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	13	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	14	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	15	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	16	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	17	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	18	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	19	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	20	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	21	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	22	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	23	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	24	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	25	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	26	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	27	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	28	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	29	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	30	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	31	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	32	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	33	50.000	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	34	119.990	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	35	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	36	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	37	50.000	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	38	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	39	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	40	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	41	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	42	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	43	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	44	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	45	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	46	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	47	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	48	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	49	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	50	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	51	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	52	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	53	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	54	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	55	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	56	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	57	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	58	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	59	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	60	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	61	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	62	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	63	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	64	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	65	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	66	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	67	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	68	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	69	50.000	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	70	50.000	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	71	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	72	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	73	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	74	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	75	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	76	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	77	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	78	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	79	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	80	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	81	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	82	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	83	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	84	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	85	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	86	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	87	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	88	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	89	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	90	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	91	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	92	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	93	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	94	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	95	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	96	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	97	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	98	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	99	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ----------
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	100	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	101	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	102	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	103	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	104	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	105	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	106	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	107	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	108	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	109	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	110	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	111	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	112	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	113	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	114	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	115	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	116	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	117	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	118	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	119	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	120	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	121	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	122	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	123	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	124	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	125	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	126	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	127	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	128	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	129	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	130	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	131	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	132	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	133	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	134	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	135	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	136	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	137	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	138	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	139	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	140	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	141	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	142	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	143	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	144	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	145	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	146	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	147	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	148	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	149	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	150	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	151	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	152	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	153	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	154	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	155	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	156	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	157	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	158	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	159	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	160	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	161	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	162	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	163	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	164	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	165	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	166	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	167	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	168	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	169	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	170	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	171	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	172	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	173	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	174	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	175	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	176	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	177	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	178	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	179	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	180	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	181	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	182	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	183	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	184	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	185	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	186	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	187	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	188	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	189	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	190	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	191	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	192	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	193	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	194	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	195	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	196	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	197	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	198	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	199	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	200	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	201	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	202	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	203	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	204	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	205	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	206	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	207	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	208	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	209	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	210	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	211	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	212	119.990	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	213	140.000	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	214	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	215	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	216	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	217	19.990	UG/L	10	NC
CHROMIUM	7440473	ISM58	SM3120B	SP-A	218	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	219	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	220	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	221	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	222	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	223	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	224	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	225	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	226	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	227	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	228	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	229	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	230	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	231	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	232	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	233	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	234	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	235	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	236	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	237	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	238	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	239	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	240	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	241	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	242	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	243	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	244	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	245	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	246	50.000	UG/L	10	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	247	50.000	UG/L	10	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM58	SM3120B	SP-A	248	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	249	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	250	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	251	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	252	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	253	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	254	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	255	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	256	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	257	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	258	50.000	UG/L	10.00	ND
CHROMIUM	7440473	ISM58	SM3120B	SP-A	259	50.000	UG/L	10.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-F +SP-G	1	6.550	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-F +SP-G	2	6.791	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-F +SP-G	3	7.366	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-F +SP-G	4	6.261	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-F +SP-G	5	5.848	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE05	1664	SP-A +SP-B	1	6.000	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE05	1664	SP-A +SP-B	2	6.000	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE05	1664	SP-A +SP-B	3	6.250	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE05	1664	SP-A +SP-B	4	5.750	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE05	1664	SP-A +SP-B	5	6.000	MG/L	5.00	ND
HEXAVALENT CHROMIUM	18540299	ESE04	218.4	SP-F +SP-G	1	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE04	218.4	SP-F +SP-G	2	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE04	218.4	SP-F +SP-G	3	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE04	218.4	SP-F +SP-G	4	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE04	218.4	SP-F +SP-G	5	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE05	218.4	SP-A +SP-B	1	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE05	218.4	SP-A +SP-B	2	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE05	218.4	SP-A +SP-B	3	0.010	MG/L	0.01	ND
HEXAVALENT CHROMIUM	18540299	ESE05	218.4	SP-A +SP-B	4	0.012	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ESE05	218.4	SP-A +SP-B	5	0.013	MG/L	0.01	NC
LEAD	7439921	ISM57	200.7	SP-A	1	4.990	UG/L	50.00	ND
LEAD	7439921	ISM57	200.7	SP-A	2	4.990	UG/L	50.00	ND
LEAD	7439921	ISM57	200.7	SP-A	3	4.990	UG/L	50.00	ND
LEAD	7439921	ISM57	200.7	SP-A	4	4.990	UG/L	50.00	ND
LEAD	7439921	ISM57	200.7	SP-A	5	4.990	UG/L	50.00	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	6	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	7	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	8	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	9	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	10	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	11	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	12	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	13	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	14	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	15	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	16	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	17	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	18	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	19	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	20	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	21	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	22	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	23	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	24	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	25	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	26	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	27	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	28	8.000	UG/L	50	NC
LEAD	7439921	ISM57	200.7	SP-A	29	12.000	UG/L	50	NC
LEAD	7439921	ISM57	200.7	SP-A	30	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	32	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	33	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	34	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	35	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	36	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	37	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	38	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	39	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	40	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	41	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	42	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	43	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	44	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	45	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	46	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	47	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	48	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	49	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	50	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	51	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	52	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	53	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	54	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	55	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	56	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	57	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	58	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	59	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	60	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	61	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	62	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	63	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	64	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	65	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	66	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	67	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	68	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	69	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	70	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	71	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	72	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	73	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	74	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	75	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	76	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	77	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	78	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	79	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	80	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	81	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	82	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	83	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	84	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	85	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	86	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	87	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	88	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	89	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	90	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	91	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	92	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	93	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	94	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	95	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	96	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	97	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	98	7.000	UG/L	50	NC
LEAD	7439921	ISM57	200.7	SP-A	99	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	100	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	101	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	102	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	103	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	104	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	105	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	106	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	107	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	108	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	109	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	110	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	111	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	112	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	113	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	114	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	115	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	116	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	117	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	118	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	119	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	120	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	121	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	122	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	123	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	124	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	125	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	126	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	127	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	128	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	129	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	130	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	131	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	132	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	133	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	134	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	135	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	136	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	137	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	138	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	139	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	140	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	141	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	142	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	143	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	144	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	145	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	146	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	147	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	148	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	149	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	150	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	151	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	152	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	153	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	154	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	155	10.990	UG/L	50	NC
LEAD	7439921	ISM57	200.7	SP-A	156	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	157	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	158	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	159	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	160	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	161	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	162	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	163	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	164	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	165	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	166	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	167	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	168	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	169	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	170	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	171	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	172	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	173	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	174	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	175	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	176	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	177	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	178	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	179	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	180	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	181	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	182	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	183	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	184	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	185	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	186	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	187	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	188	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	189	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	190	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	191	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	192	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	193	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	194	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	195	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	196	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	197	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	198	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	199	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	200	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	201	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	202	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	203	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	204	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	205	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	206	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	207	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	208	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	209	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	210	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	211	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	212	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	213	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	214	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	215	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	216	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	217	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	218	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	219	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	220	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	221	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	222	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	223	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	224	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	225	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	226	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	227	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	228	6.000	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM57	200.7	SP-A	229	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	230	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	231	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	232	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	233	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	234	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	235	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	236	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	237	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	238	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	239	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	240	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	241	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	242	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	243	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	244	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	245	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	246	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	247	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	248	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	249	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	250	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	251	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	252	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	253	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	254	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	255	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	256	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	257	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	258	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	259	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	260	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	261	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	262	4.990	UG/L	50	ND
LEAD	7439921	ISM57	200.7	SP-A	263	4.990	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-F +SP-G	1	2.000	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-F +SP-G	2	2.000	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ESE04	1620	SP-F +SP-G	3	2.000	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-F +SP-G	4	2.000	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-F +SP-G	5	2.000	UG/L	50	ND
LEAD	7439921	ESE05	1620	SP-A +SP-B	1	2.000	UG/L	50	ND
LEAD	7439921	ESE05	1620	SP-A +SP-B	2	2.000	UG/L	50	ND
LEAD	7439921	ESE05	1620	SP-A +SP-B	3	2.000	UG/L	50	ND
LEAD	7439921	ESE05	1620	SP-A +SP-B	4	2.000	UG/L	50	ND
LEAD	7439921	ESE05	1620	SP-A +SP-B	5	2.000	UG/L	50	ND
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	1	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	2	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	3	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	4	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	5	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	6	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	7	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	8	6.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	9	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	10	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	11	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	12	7.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	13	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	14	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	15	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	16	9.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	17	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	18	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	19	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	20	9.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	21	4.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	22	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	23	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	24	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	25	6.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	26	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	27	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	28	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	29	6.000	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	31	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	32	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	33	6.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	34	28.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	35	8.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	36	6.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	37	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	38	6.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	39	6.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	40	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	41	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	42	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	43	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	44	9.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	45	5.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	46	4.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	47	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	48	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	49	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	50	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	51	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	52	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	53	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	54	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	55	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	56	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	57	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	58	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	59	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	60	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	61	9.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	62	8.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	63	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	64	8.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	65	5.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	66	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	67	4.500	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	68	7.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	69	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	70	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	71	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	72	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	73	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	74	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	75	32.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	76	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	77	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	78	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	79	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	80	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	81	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	82	6.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	83	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	84	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	85	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	86	40.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	87	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	88	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	89	24.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	90	6.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	91	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	92	8.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	93	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	94	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	95	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	96	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	97	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	98	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	99	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	100	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	101	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	102	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	103	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	104	23.000	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	105	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	106	18.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	107	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	108	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	109	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	110	18.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	111	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	112	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	113	38.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	114	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	115	17.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	116	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	117	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	118	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	119	19.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	120	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	121	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	122	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	123	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	124	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	125	7.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	126	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	127	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	128	9.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	129	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	130	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	131	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	132	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	133	8.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	134	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	135	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	136	7.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	137	1.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	138	6.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	139	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	140	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	141	7.400	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	142	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	143	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	144	9.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	145	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	146	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	147	9.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	148	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	149	26.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	150	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	151	9.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	152	18.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	153	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	154	8.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	155	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	156	6.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	157	9.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	158	9.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	159	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	160	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	161	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	162	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	163	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	164	8.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	165	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	166	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	167	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	168	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	169	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	170	9.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	171	8.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	172	4.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	173	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	174	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	175	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	176	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	177	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	178	9.800	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	179	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	180	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	181	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	182	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	183	7.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	184	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	185	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	186	2.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	187	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	188	9.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	189	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	190	8.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	191	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	192	6.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	193	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	194	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	195	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	196	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	197	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	198	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	199	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	200	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	201	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	202	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	203	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	204	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	205	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	206	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	207	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	208	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	209	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	210	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	211	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	212	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	213	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	214	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	215	8.600	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	216	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	217	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	218	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	219	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	220	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	221	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	222	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	223	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	224	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	225	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	226	4.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	227	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	228	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	229	1.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	230	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	231	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	232	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	233	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	234	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	235	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	236	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	237	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	238	7.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	239	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	240	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	241	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	242	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	243	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	244	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	245	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	246	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	247	34.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	248	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	249	9.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	250	35.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	251	11.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	252	7.600	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	253	8.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	254	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	255	7.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	256	22.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	257	14.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	258	18.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	259	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	260	16.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	261	7.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	262	6.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM57	160.2	SP-A	263	6.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-F +SP-G	1	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-F +SP-G	2	6.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-F +SP-G	3	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-F +SP-G	4	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-F +SP-G	5	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE05	160.2	SP-A +SP-B	1	4.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE05	160.2	SP-A +SP-B	2	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE05	160.2	SP-A +SP-B	3	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE05	160.2	SP-A +SP-B	4	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE05	160.2	SP-A +SP-B	5	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	1	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	2	8.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	3	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	4	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	5	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	6	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	7	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	8	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	9	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	10	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	11	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	12	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	13	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	14	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	15	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	16	5.800	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	17	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	18	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	19	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	20	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	21	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	22	4.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	23	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	24	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	25	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	26	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	27	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	28	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	29	12.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	30	13.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	31	3.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	32	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	33	9.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	34	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	35	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	36	4.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	37	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	38	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	39	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	40	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	41	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	42	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	43	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	44	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	45	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	46	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	47	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	48	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	49	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	50	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	51	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	52	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	53	4.000	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	54	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	55	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	56	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	57	5.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	58	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	59	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	60	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	61	5.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	62	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	63	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	64	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	65	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	66	2.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	67	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	68	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	69	7.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	70	41.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	71	1.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	72	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	73	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	74	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	75	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	76	12.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	77	12.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	78	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	79	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	80	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	81	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	82	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	83	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	84	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	85	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	86	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	87	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	88	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	89	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	90	2.800	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	91	3.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	92	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	93	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	94	1.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	95	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	96	3.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	97	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	98	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	99	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	100	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	101	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	102	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	103	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	104	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	105	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	106	5.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	107	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	108	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	109	10.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	110	4.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	111	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	112	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	113	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	114	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	115	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	116	5.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	117	6.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	118	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	119	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	120	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	121	2.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	122	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	123	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	124	22.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	125	7.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	126	3.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	127	3.400	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	128	1.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	129	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	130	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	131	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	132	1.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	133	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	134	1.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	135	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	136	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	137	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	138	1.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	139	1.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	140	1.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	141	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	142	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	143	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	144	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	145	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	146	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	147	1.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	148	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	149	4.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	150	5.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	151	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	152	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	153	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	154	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	155	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	156	8.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	157	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	158	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	159	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	160	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	161	1.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	162	1.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	163	4.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	164	1.900	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=CARBON_BAT1 ---------- (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	165	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	166	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	167	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	168	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	169	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	170	1.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	171	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	172	11.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	173	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	174	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	175	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	176	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	177	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	178	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	179	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	180	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	181	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	182	7.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	183	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	184	3.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	185	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	186	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	187	8.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	188	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	189	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	190	102.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	191	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	192	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	193	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	194	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	195	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	196	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	197	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	198	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	199	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	200	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	201	3.400	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	202	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	203	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	204	2.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	205	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	206	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	207	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	208	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	209	4.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	210	4.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	211	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	212	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	213	15.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	214	5.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	215	36.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	216	4.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	217	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	218	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	219	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	220	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	221	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	222	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	223	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	224	4.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	225	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	226	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	227	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	228	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	229	2.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	230	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	231	7.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	232	4.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	233	2.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	234	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	235	6.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	236	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	237	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	238	3.400	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	239	5.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	240	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	241	6.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	242	2.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	243	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	244	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	245	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	246	2.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	247	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	248	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	249	2.900	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	250	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	251	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	252	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	253	9.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	254	5.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	255	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	256	1.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	257	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	258	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM58	SM209C	SP-A	259	11.100	MG/L	4	NC
ZINC	7440666	ISM57	200.7	SP-A	1	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	2	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	3	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	4	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	5	35.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	6	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	7	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	8	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	9	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	10	10.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	11	23.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	12	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	13	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	14	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	15	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	16	14.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	17	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	18	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	19	19.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	20	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	21	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	22	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	23	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	24	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	25	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	26	79.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	27	101.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	28	123.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	29	157.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	30	128.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	32	45.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	33	59.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	34	46.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	35	48.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	36	41.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	37	32.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	38	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	39	70.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	41	85.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	42	97.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	43	43.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	44	65.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	45	86.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	46	75.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	47	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	48	37.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	49	122.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	50	134.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	51	317.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	52	404.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	53	175.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	54	112.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	55	104.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	56	48.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	57	43.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	58	74.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	59	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	60	41.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	61	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	62	10.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	63	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	64	52.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	65	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	66	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	67	37.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	68	56.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	69	48.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	70	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	71	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	72	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	73	10.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	74	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	75	57.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	76	41.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	77	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	78	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	79	78.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	80	48.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	81	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	82	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	83	48.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	84	61.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	85	48.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	86	111.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	87	41.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	88	25.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	89	46.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	90	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	91	29.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	92	9.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	93	94.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	94	48.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	95	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	96	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	97	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	98	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	99	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	100	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	101	32.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	102	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	103	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	104	39.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	105	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	106	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	107	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	108	21.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	109	71.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	110	48.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	111	105.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	112	32.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	113	82.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	114	30.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	115	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	116	50.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	117	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	118	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	119	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	120	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	121	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	122	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	123	35.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	124	37.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	125	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	126	112.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	127	23.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	128	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	129	9.990	UG/L	20	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	130	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	131	35.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	132	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	133	32.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	134	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	135	25.000	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	136	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	137	35.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	138	35.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	139	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	140	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	141	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	142	78.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	143	29.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	144	29.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	145	30.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	146	35.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	147	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	148	34.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	149	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	150	17.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	151	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	152	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	153	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	154	79.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	155	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	156	65.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	157	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	158	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	159	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	160	94.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	161	10.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	162	23.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	163	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	164	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	165	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	166	24.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	167	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	168	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	169	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	170	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	171	28.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	172	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	173	37.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	174	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	175	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	176	93.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	177	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	178	25.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	179	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	180	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	181	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	182	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	183	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	184	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	185	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	186	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	187	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	188	13.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	189	9.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	190	17.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	191	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	192	23.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	193	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	194	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	195	43.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	196	32.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	197	50.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	198	10.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	199	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	200	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	201	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	202	50.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	203	10.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	204	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	205	56.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	206	54.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	207	28.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	208	14.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	209	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	210	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	211	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	212	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	213	59.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	214	35.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	215	28.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	216	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	217	32.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	218	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	219	26.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	220	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	221	21.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	222	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	223	29.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	224	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	225	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	226	19.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	227	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	228	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	229	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	230	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	231	17.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	232	30.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	233	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	234	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	235	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	236	9.990	UG/L	20	ND
ZINC	7440666	ISM57	200.7	SP-A	237	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	238	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	239	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	240	64.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM57	200.7	SP-A	241	14.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	242	24.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	243	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	244	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	245	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	246	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	247	46.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	248	39.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	249	20.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	250	46.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	251	16.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	252	18.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	253	12.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	254	48.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	255	29.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	256	43.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	257	70.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	258	101.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	259	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	260	46.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	261	65.990	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	262	27.000	UG/L	20	NC
ZINC	7440666	ISM57	200.7	SP-A	263	48.000	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-F +SP-G	1	35.950	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-F +SP-G	2	10.000	UG/L	20	ND
ZINC	7440666	ESE04	1620	SP-F +SP-G	3	12.200	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-F +SP-G	4	16.200	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-F +SP-G	5	131.000	UG/L	20	NC
ZINC	7440666	ESE05	1620	SP-A +SP-B	1	9.800	UG/L	20	NC
ZINC	7440666	ESE05	1620	SP-A +SP-B	2	8.000	UG/L	20	ND
ZINC	7440666	ESE05	1620	SP-A +SP-B	3	11.900	UG/L	20	NC
ZINC	7440666	ESE05	1620	SP-A +SP-B	4	18.400	UG/L	20	NC
ZINC	7440666	ESE05	1620	SP-A +SP-B	5	9.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=FINISHING -- Option=SPECIALTY_BAT1 ----------

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ESE06	350.2	SP-A +SP-B	1	2.310	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE06	350.2	SP-A +SP-B	2	0.955	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE06	350.2	SP-A +SP-B	3	1.905	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE06	350.2	SP-A +SP-B	4	1.890	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE06	350.2	SP-A +SP-B	5	1.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	1	27.300	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	3	21.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	5	22.600	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	7	19.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	9	32.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	11	25.400	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	13	12.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	15	19.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	17	16.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	19	26.700	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	21	19.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM59	NA	SP-A	23	16.000	MG/L	0.05	NC
CHROMIUM	7440473	ESE06	1620	SP-A +SP-B	1	69.500	UG/L	10.00	NC
CHROMIUM	7440473	ESE06	1620	SP-A +SP-B	2	298.000	UG/L	10.00	NC
CHROMIUM	7440473	ESE06	1620	SP-A +SP-B	3	130.500	UG/L	10.00	NC
CHROMIUM	7440473	ESE06	1620	SP-A +SP-B	4	82.900	UG/L	10.00	NC
CHROMIUM	7440473	ESE06	1620	SP-A +SP-B	5	80.300	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	1	72.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	2	78.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	3	67.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	4	72.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	5	74.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	6	59.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	7	74.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	8	74.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	9	83.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	10	89.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	11	76.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	12	74.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	13	34.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	14	61.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	15	67.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	16	86.990	UG/L	10.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ISM59	NA	SP-A	17	61.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	18	59.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	19	71.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	20	79.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	21	122.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	22	97.990	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	23	68.000	UG/L	10.00	NC
CHROMIUM	7440473	ISM59	NA	SP-A	24	75.000	UG/L	10.00	NC
FLUORIDE	16984488	ESE06	340.2	SP-A +SP-B	1	16.900	MG/L	0.10	NC
FLUORIDE	16984488	ESE06	340.2	SP-A +SP-B	2	20.600	MG/L	0.10	NC
FLUORIDE	16984488	ESE06	340.2	SP-A +SP-B	3	14.000	MG/L	0.10	NC
FLUORIDE	16984488	ESE06	340.2	SP-A +SP-B	4	15.800	MG/L	0.10	NC
FLUORIDE	16984488	ESE06	340.2	SP-A +SP-B	5	14.200	MG/L	0.10	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE06	1664	SP-A +SP-B	1	7.625	MG/L	5.00	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE06	1664	SP-A +SP-B	2	5.875	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE06	1664	SP-A +SP-B	3	6.000	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE06	1664	SP-A +SP-B	4	5.500	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE06	1664	SP-A +SP-B	5	6.000	MG/L	5.00	ND
HEXAVALENT CHROMIUM	18540299	ESE06	218.4	SP-A +SP-B	1	0.094	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ESE06	218.4	SP-A +SP-B	2	0.215	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ESE06	218.4	SP-A +SP-B	3	0.150	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ESE06	218.4	SP-A +SP-B	4	0.085	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ESE06	218.4	SP-A +SP-B	5	0.066	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	1	0.034	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	2	0.041	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	3	0.023	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	4	0.029	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	5	0.029	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	6	0.023	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	7	0.034	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	8	0.029	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	9	0.026	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	10	0.028	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	11	0.030	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	12	0.030	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	13	0.016	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	14	0.022	MG/L	0.01	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	15	0.028	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	16	0.037	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	17	0.028	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	18	0.027	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	19	0.030	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	20	0.032	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	21	0.044	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	22	0.037	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	23	0.025	MG/L	0.01	NC
HEXAVALENT CHROMIUM	18540299	ISM59	NA	SP-A	24	0.032	MG/L	0.01	NC
NICKEL	7440020	ESE06	1620	SP-A +SP-B	1	42.650	UG/L	40.00	NC
NICKEL	7440020	ESE06	1620	SP-A +SP-B	2	33.400	UG/L	40.00	NC
NICKEL	7440020	ESE06	1620	SP-A +SP-B	3	24.950	UG/L	40.00	NC
NICKEL	7440020	ESE06	1620	SP-A +SP-B	4	18.000	UG/L	40.00	ND
NICKEL	7440020	ESE06	1620	SP-A +SP-B	5	25.200	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	1	57.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	2	34.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	3	59.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	4	46.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	5	64.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	6	43.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	7	54.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	8	43.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	9	61.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	10	43.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	11	79.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	12	52.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	13	64.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	14	52.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	15	68.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	16	56.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	17	76.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	18	54.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	19	59.990	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	20	71.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	21	63.000	UG/L	40.00	NC
NICKEL	7440020	ISM59	NA	SP-A	22	90.000	UG/L	40.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
NICKEL	7440020	ISM59	NA	SP-A	23	52.000	UG/L	40	NC
NICKEL	7440020	ISM59	NA	SP-A	24	45.000	UG/L	40	NC
TOTAL SUSPENDED SOLIDS	C009	ESE06	160.2	SP-A +SP-B	1	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE06	160.2	SP-A +SP-B	2	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE06	160.2	SP-A +SP-B	3	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE06	160.2	SP-A +SP-B	4	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE06	160.2	SP-A +SP-B	5	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	1	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	2	1.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	3	3.300	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	4	1.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	5	3.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	6	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	7	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	8	1.700	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	9	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	10	1.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	11	3.400	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	12	5.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	13	3.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	14	1.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	15	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	16	1.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	17	3.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	18	4.200	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	19	5.800	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	20	1.100	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	21	2.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	22	3.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	23	1.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ISM59	NA	SP-A	24	3.700	MG/L	4	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_HOTFORM -- Option=CARBON_BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-E	1	6.340	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-E	2	7.705	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE04	1664	SP-E	3	5.410	MG/L	5	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE07	1664	SP-A	2	5.500	MG/L	5	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE07	1664	SP-A	3	6.000	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE07	1664	SP-A	4	8.000	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE07	1664	SP-A	5	7.030	MG/L	5	NC
LEAD	7439921	ESE04	1620	SP-E	1	28.000	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-E	2	15.000	UG/L	50	ND
LEAD	7439921	ESE04	1620	SP-E	3	15.000	UG/L	50	ND
LEAD	7439921	ESE07	1620	SP-A	2	12.100	UG/L	50	NC
LEAD	7439921	ESE07	1620	SP-A	3	2.000	UG/L	50	ND
LEAD	7439921	ESE07	1620	SP-A	4	2.100	UG/L	50	NC
LEAD	7439921	ESE07	1620	SP-A	5	2.100	UG/L	50	NC
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-E	1	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-E	2	15.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE04	160.2	SP-E	3	21.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE07	160.2	SP-A	2	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE07	160.2	SP-A	3	13.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE07	160.2	SP-A	4	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE07	160.2	SP-A	5	4.000	MG/L	4	ND
ZINC	7440666	ESE04	1620	SP-E	1	4.000	UG/L	20	ND
ZINC	7440666	ESE04	1620	SP-E	2	2.800	UG/L	20	ND
ZINC	7440666	ESE04	1620	SP-E	3	2.800	UG/L	20	ND
ZINC	7440666	ESE07	1620	SP-A	2	140.000	UG/L	20	NC
ZINC	7440666	ESE07	1620	SP-A	3	246.000	UG/L	20	NC
ZINC	7440666	ESE07	1620	SP-A	4	142.000	UG/L	20	NC
ZINC	7440666	ESE07	1620	SP-A	5	158.000	UG/L	20	NC

Subcategory=INT_STEEL -- Option=BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	1	10.182	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	2	10.501	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	3	12.510	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	4	14.389	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	5	12.137	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	6	11.206	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	7	13.896	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	8	12.727	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	9	10.341	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	10	30.930	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	11	16.137	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	12	11.052	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	1	14.542	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	14	13.895	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	15	14.391	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	16	15.858	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	17	14.499	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	18	13.374	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	19	16.423	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	20	13.641	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	21	15.663	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	22	14.405	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	23	19.056	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	24	12.162	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	25	12.540	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	26	12.284	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	27	11.833	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	28	19.682	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	29	14.618	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	30	14.465	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	4	16.311	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	32	17.330	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	6	13.287	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	7	14.234	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	8	12.992	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	9	14.722	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	37	21.691	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	38	22.348	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	11	14.684	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	40	18.127	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	41	16.640	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	42	16.927	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	15	14.737	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	44	15.434	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	45	12.874	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	46	13.682	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	47	15.065	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	48	11.106	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	49	12.148	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	50	12.446	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	51	16.814	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	52	22.391	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	20	13.708	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	21	13.299	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	22	14.532	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	56	11.912	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	57	12.186	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	58	11.247	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	59	15.352	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	60	19.436	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	61	12.277	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	62	15.179	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	63	23.707	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	29	12.010	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	30	18.472	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	31	12.179	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	32	11.554	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	68	20.396	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	34	11.758	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	70	11.780	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	36	13.334	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	37	12.608	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	38	13.379	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	39	12.152	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	40	11.219	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	76	12.947	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	77	13.301	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	43	11.566	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	44	13.640	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	80	10.754	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	81	10.981	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	82	10.074	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	45	11.277	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	84	10.327	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	85	12.513	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	86	12.532	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	87	12.619	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	88	12.090	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	47	12.648	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	48	13.274	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	91	12.966	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	92	12.629	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	50	14.335	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	94	17.503	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	52	14.183	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	53	12.619	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	54	12.768	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	98	14.457	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	99	12.419	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	57	12.080	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	58	11.477	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	59	10.377	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	60	9.827	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	104	11.315	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	62	15.407	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	106	10.985	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	64	10.222	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	108	14.619	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	109	9.344	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	110	9.779	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	111	10.962	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	112	9.214	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	113	8.762	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	114	8.942	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	115	9.542	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	116	10.389	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	117	9.776	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	118	12.131	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	119	9.449	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	120	11.230	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	65	14.910	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	66	11.541	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	67	15.217	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	68	11.814	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	69	8.045	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	70	12.028	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	71	11.706	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	128	16.630	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	129	14.306	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	130	13.128	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	131	9.579	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	132	11.812	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	133	12.425	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	134	12.725	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	135	12.588	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	136	14.913	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	137	13.629	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	138	12.061	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	139	13.564	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	140	12.397	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	141	11.412	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	142	13.059	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	143	13.214	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	144	12.533	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	145	14.020	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	146	12.641	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	147	12.122	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	148	11.507	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	73	12.876	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	150	12.951	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	151	12.381	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	152	11.326	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	153	12.680	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	74	13.295	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	155	12.705	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	156	14.070	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	157	13.205	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	158	13.440	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	159	14.349	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	160	14.459	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	75	16.513	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	76	17.593	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	163	15.550	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	77	14.721	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	165	13.702	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	166	14.150	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	167	13.286	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	168	10.900	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	169	11.443	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	170	11.538	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	171	13.684	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	172	14.752	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	173	14.032	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	174	13.441	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	175	16.888	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	176	14.523	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	177	13.884	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	178	15.067	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	179	13.330	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	180	13.633	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	181	13.247	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	182	13.197	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	183	11.808	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	184	13.258	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	185	13.647	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	186	13.879	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	81	13.131	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	188	13.551	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	189	12.439	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	190	12.852	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	191	12.776	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	192	12.722	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	83	13.992	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	84	11.617	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	195	13.277	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	85	13.417	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	197	12.484	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	198	13.108	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	199	13.268	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	200	13.635	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	201	13.273	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	86	16.868	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	203	15.779	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	204	12.246	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	205	20.024	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	206	11.287	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	207	13.252	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	208	17.674	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	209	14.140	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	210	13.304	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	211	15.534	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	212	14.457	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	213	22.256	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	214	14.121	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	215	22.507	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	216	17.513	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	87	22.120	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	218	17.776	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	89	14.439	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	90	16.921	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	223	18.790	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	224	13.115	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	225	17.043	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	226	14.226	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	227	15.307	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	230	14.079	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	92	14.162	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	232	14.587	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	233	22.171	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	234	13.909	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	237	14.678	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	238	12.188	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	239	12.517	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	93	13.940	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	94	13.618	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	244	12.782	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	245	13.974	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	246	12.535	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	247	14.416	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	248	12.093	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	251	16.378	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	252	12.865	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	253	13.665	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	254	12.951	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	255	15.208	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	258	16.084	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	95	22.382	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	260	15.065	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	261	15.784	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	262	15.366	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	265	15.235	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	266	15.594	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	267	13.592	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	268	13.335	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	269	15.968	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	272	17.087	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	273	14.148	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	274	13.690	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	275	17.271	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	276	16.197	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	279	16.954	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	280	11.969	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	281	16.040	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	282	11.391	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	283	13.832	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	286	16.139	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	97	12.761	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	288	13.802	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	289	15.342	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	290	10.964	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	293	17.703	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	98	16.850	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	295	14.568	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	99	14.053	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	297	13.608	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	300	18.318	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	301	11.810	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	302	12.874	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	303	14.509	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	304	13.277	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	307	13.524	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	308	12.197	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	309	13.397	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	310	23.784	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	311	11.825	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	104	11.659	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	105	22.553	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	316	12.114	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	317	13.549	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	318	13.803	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	321	12.933	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	322	20.745	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	323	26.385	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	324	14.190	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	325	23.450	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	328	14.737	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	329	14.265	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	330	15.434	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	331	14.138	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM60	200.7	SP-A	332	18.613	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	109	13.532	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	110	14.969	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	111	14.290	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	112	14.003	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	339	11.251	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	342	15.371	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	343	17.555	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	344	16.383	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	345	14.647	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	346	18.438	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	349	14.797	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	350	14.913	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	113	10.441	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	352	12.387	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	114	15.701	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	356	16.246	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	357	15.041	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	358	14.948	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	359	16.516	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	360	15.928	UG/L	50	NC
LEAD	7439921	ISM60	200.7	SP-A	363	15.147	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	364	15.076	UG/L	50	ND
LEAD	7439921	ISM60	200.7	SP-A	365	14.781	UG/L	50	NC
LEAD	7439921	ESE04	1620	SP-A,B+C,D	1	16.712	UG/L	50	NC
LEAD	7439921	ESE04	1620	SP-A,B+C,D	2	12.090	UG/L	50	NC
LEAD	7439921	ESE04	1620	SP-A,B+C,D	3	12.006	UG/L	50	NC
LEAD	7439921	ESE04	1620	SP-A,B+C,D	4	8.388	UG/L	50	NC
LEAD	7439921	ESE04	1620	SP-A,B+C,D	5	8.236	UG/L	50	NC
ZINC	7440666	ISM60	200.7	SP-A	1	39.431	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	2	63.980	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	3	107.187	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	4	100.254	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	5	181.994	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	6	85.977	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	7	130.444	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	8	92.900	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	9	56.934	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	10	259.749	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	11	169.913	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	12	98.772	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	1	62.630	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	14	98.138	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	15	119.023	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	16	201.082	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	17	123.292	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	18	157.501	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	19	95.227	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	20	77.766	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	21	184.772	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	22	111.943	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	2	76.904	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	24	118.855	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	25	117.817	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	26	52.435	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	27	58.453	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	28	123.543	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	29	195.888	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	30	92.575	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	4	105.719	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	5	90.524	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	6	93.230	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	7	130.860	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	8	67.448	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	9	170.806	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	37	253.343	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	10	119.171	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	11	94.258	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	12	109.250	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	13	114.568	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	14	168.912	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	15	154.565	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	44	128.151	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	45	88.483	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	16	99.528	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	47	146.822	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	17	93.286	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	49	98.639	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	50	76.262	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	18	101.817	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	19	256.739	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	20	116.187	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	21	96.588	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	22	135.778	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	23	124.594	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	57	83.665	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	58	62.308	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	24	65.461	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	25	78.884	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	26	122.422	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	27	176.749	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	28	289.735	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	29	133.244	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	30	157.178	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	31	145.770	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	32	116.522	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	33	283.957	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	34	110.786	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	35	116.514	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	36	48.717	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	37	62.308	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	38	47.536	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	39	63.907	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	40	60.942	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	41	86.958	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	42	131.365	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	43	72.270	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	44	138.162	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	80	76.281	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	81	63.948	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	82	91.301	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	45	58.346	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	84	54.046	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	85	82.693	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	86	79.495	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	87	92.683	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	88	82.449	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	47	79.144	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	48	151.239	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	49	107.919	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	92	95.485	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	50	207.360	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	51	147.005	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	95	62.276	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	96	74.894	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	54	77.312	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	55	89.548	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	56	73.958	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	57	65.861	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	58	72.300	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	59	71.626	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	60	57.621	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	61	56.881	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	62	125.716	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	63	56.404	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	107	77.609	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	108	99.310	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	109	52.854	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	110	51.711	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	111	75.985	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	112	59.047	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	113	45.498	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	114	27.445	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	115	45.872	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	116	61.742	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	117	109.176	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	118	137.960	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	119	82.579	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	120	115.630	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	65	159.523	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	66	80.173	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	67	159.883	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	68	75.941	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	69	53.377	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	70	55.155	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	71	62.050	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	128	131.198	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	129	146.767	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	130	96.176	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	131	68.925	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	132	66.509	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	133	100.416	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	134	80.182	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	135	77.515	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	136	105.552	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	137	69.654	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	138	74.727	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	139	132.098	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	140	91.639	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	141	68.698	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	142	99.411	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	143	87.103	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	144	99.912	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	145	119.067	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	146	119.112	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	147	92.792	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	148	70.917	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	73	61.323	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	150	77.800	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	151	98.179	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	152	77.737	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	153	73.182	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	74	74.994	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	155	51.021	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	156	86.541	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	157	76.645	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	158	106.405	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	159	126.500	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	160	114.148	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	75	139.994	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	76	158.634	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	163	145.405	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	77	105.453	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	165	63.898	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	166	110.875	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	167	96.254	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	168	61.557	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	169	49.154	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	170	47.874	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	171	63.970	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	172	102.086	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	173	88.504	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	174	64.721	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	175	87.072	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	176	92.956	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	177	71.990	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	178	82.468	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	179	57.259	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	180	155.674	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	181	156.973	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	182	128.789	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	183	64.471	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	78	56.482	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	79	65.151	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	186	68.238	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	81	103.579	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	188	107.978	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	189	55.259	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	190	35.601	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	191	47.552	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	192	85.047	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	83	70.844	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	84	40.647	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	195	39.397	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	196	23.775	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	197	45.696	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	198	59.211	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	199	39.877	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	200	50.709	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	201	32.843	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	86	93.296	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	203	36.936	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	204	65.956	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	205	209.714	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	206	53.695	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	207	42.449	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	208	71.195	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	209	52.795	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	210	31.587	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	211	56.069	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	212	33.733	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	213	267.561	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	214	73.363	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	215	183.512	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	216	112.888	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	87	121.265	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	88	93.362	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	89	64.665	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	90	37.245	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	223	71.935	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	224	29.875	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	225	53.354	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	226	29.232	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	227	24.330	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	230	32.553	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	92	33.782	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	232	36.888	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	233	95.926	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	234	67.630	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	237	67.308	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	238	39.198	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	239	35.495	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	240	44.278	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	94	54.207	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	244	94.430	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	245	143.401	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	246	84.812	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	247	83.998	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	248	43.439	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	251	77.551	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	252	49.296	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	253	80.508	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	254	40.912	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	255	67.882	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	258	65.853	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	95	56.437	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	260	39.432	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	261	52.012	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	262	90.585	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	265	50.638	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	266	73.914	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	267	66.474	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	268	47.412	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	269	166.807	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	272	65.054	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	273	46.068	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	274	45.119	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	275	53.722	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	276	44.705	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	279	43.203	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	280	40.661	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	281	42.409	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	282	25.868	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	283	64.637	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	286	57.568	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	97	35.042	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	288	34.376	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	289	36.226	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	290	36.383	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	293	81.590	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	98	74.850	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	295	38.373	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	99	52.509	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	297	84.399	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	300	106.563	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	301	79.564	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	302	73.288	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	303	41.582	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	304	58.785	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	307	64.944	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	308	74.338	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	309	68.384	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	310	120.891	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	311	46.411	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	104	48.959	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	105	134.536	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	316	43.581	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	317	80.046	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	318	114.989	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	321	27.516	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	322	57.595	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	323	81.668	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	324	45.751	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	325	160.942	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	328	88.574	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	329	55.490	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	330	20.501	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	331	89.869	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	332	194.587	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	335	93.810	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	336	58.988	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	337	73.997	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	112	97.774	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM60	200.7	SP-A	339	62.640	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	342	70.334	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	343	120.623	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	344	145.605	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	345	86.372	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	346	198.661	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	349	144.535	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	350	117.905	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	351	57.388	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	352	59.234	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	353	125.823	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	356	209.204	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	357	111.593	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	358	119.978	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	359	152.117	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	360	196.369	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	363	157.369	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	364	121.313	UG/L	20	NC
ZINC	7440666	ISM60	200.7	SP-A	365	141.636	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-A,B+C,D	1	70.045	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-A,B+C,D	2	39.051	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-A,B+C,D	3	26.380	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-A,B+C,D	4	47.111	UG/L	20	NC
ZINC	7440666	ESE04	1620	SP-A,B+C,D	5	42.071	UG/L	20	NC

Subcategory=IRON -- Option=BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	1	0.114	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	8	0.124	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	15	0.164	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	22	0.536	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	29	0.294	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	36	0.221	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	44	0.178	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	50	0.170	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	57	0.272	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	64	0.249	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	71	0.806	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	78	0.485	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	85	0.203	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	93	0.461	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	99	0.232	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	106	0.159	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	120	0.136	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	127	0.543	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	134	0.250	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	141	0.115	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	148	0.483	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	155	0.261	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	162	0.402	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	170	0.175	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	176	0.356	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	182	0.088	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	189	0.082	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	196	0.252	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	203	0.310	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	210	0.145	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	217	0.101	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	243	0.079	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	249	0.171	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	257	0.116	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	263	0.118	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	270	0.487	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	277	0.792	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	284	0.115	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	291	0.116	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	305	0.116	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	312	0.546	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	319	0.410	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	326	0.556	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	333	0.095	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	340	0.100	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	347	0.103	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	354	0.476	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM52	SM4500-NH3F	SP-A	361	0.436	MG/L	0.05	NC
LEAD	7439921	ISM61	239.2	SP-A	308	3.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	315	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	322	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	328	2.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	336	1.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	343	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	350	2.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	356	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	363	4.990	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	8	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	16	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	22	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	29	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	37	1.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	41	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	50	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	59	4.990	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	64	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	71	3.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	78	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	85	2.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	90	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	97	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	104	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	111	1.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	120	3.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	125	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	132	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	139	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	147	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	153	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	160	1.000	UG/L	50.00	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM61	239.2	SP-A	167	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	177	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	180	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	191	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	197	3.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	204	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	211	4.990	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	218	2.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	225	3.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	232	12.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	239	17.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	246	23.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	254	18.990	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	260	8.990	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	267	12.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	274	13.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	279	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	286	1.000	UG/L	50.00	ND
LEAD	7439921	ISM61	239.2	SP-A	293	1.000	UG/L	50.00	NC
LEAD	7439921	ISM61	239.2	SP-A	302	1.000	UG/L	50.00	ND
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	1	1.253	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	8	0.233	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	15	1.322	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	22	1.689	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	29	3.806	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	36	0.921	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	44	1.026	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	50	2.388	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	57	2.035	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	64	0.800	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	71	2.713	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	78	2.604	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	85	0.804	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	93	0.878	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	99	1.167	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	106	0.945	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	120	1.590	MG/L	0.02	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	127	2.471	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	134	1.334	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	141	1.855	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	148	1.958	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	155	1.855	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	162	0.354	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	170	1.193	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	176	1.255	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	182	0.450	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	196	0.717	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	203	0.651	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	210	0.540	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	217	2.621	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	243	3.468	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	249	2.130	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	257	2.822	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	263	1.546	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	270	0.789	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	277	0.658	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	284	1.194	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	291	0.501	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	305	0.537	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	312	0.135	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	319	0.087	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	326	0.062	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	333	0.275	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	340	0.738	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	347	1.108	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	354	1.130	MG/L	0.02	NC
TOTAL CYANIDE	57125	ISM52	SM4500-CNC	SP-A	361	0.629	MG/L	0.02	NC
ZINC	7440666	ISM61	200.7	SP-A	308	9.990	UG/L	20.00	ND
ZINC	7440666	ISM61	200.7	SP-A	315	17.000	UG/L	20.00	NC
ZINC	7440666	ISM61	200.7	SP-A	322	9.990	UG/L	20.00	ND
ZINC	7440666	ISM61	200.7	SP-A	328	9.990	UG/L	20.00	ND
ZINC	7440666	ISM61	200.7	SP-A	336	9.990	UG/L	20.00	ND
ZINC	7440666	ISM61	200.7	SP-A	343	9.990	UG/L	20.00	NC
ZINC	7440666	ISM61	200.7	SP-A	350	50.000	UG/L	20.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM61	200.7	SP-A	356	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	363	72.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	8	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	16	13.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	22	13.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	29	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	37	21.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	41	45.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	50	13.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	59	85.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	64	54.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	71	48.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	78	18.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	85	14.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	90	26.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	97	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	104	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	111	37.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	120	25.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	125	20.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	132	219.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	139	17.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	147	14.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	153	76.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	160	68.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	167	86.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	177	10.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	180	35.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	191	12.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	197	9.990	UG/L	20	ND
ZINC	7440666	ISM61	200.7	SP-A	204	37.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	211	57.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	218	10.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	225	50.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	232	10.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	239	17.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	246	54.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM61	200.7	SP-A	254	30.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	260	39.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	267	16.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	274	75.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	279	140.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	286	87.990	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	293	46.000	UG/L	20	NC
ZINC	7440666	ISM61	200.7	SP-A	302	19.990	UG/L	20	NC

Subcategory=IRON -- Option=PSES1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
2378-TCDF	51207319	ESE08	1613B	SP-A +SP-B	1	10.000	PG/L	10.00	ND
2378-TCDF	51207319	ESE08	1613B	SP-A +SP-B	3	10.000	PG/L	10.00	ND
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	1	58.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	7	66.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	8	68.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	14	60.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	15	60.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	21	70.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	22	72.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	28	69.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	29	82.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	35	61.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	36	63.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	42	70.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	43	72.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	49	58.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	50	52.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	56	53.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	57	54.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	63	68.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	64	58.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	70	68.000	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	71	59.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	77	49.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	78	56.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	84	59.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	85	54.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	91	46.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	92	12.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	94	73.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	95	76.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	97	76.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	98	77.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	100	95.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	101	88.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	103	82.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	104	76.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	106	100.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	107	100.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	109	89.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	110	99.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	112	79.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	113	84.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	115	90.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	116	98.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	118	93.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	119	86.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	121	93.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	122	77.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	124	86.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	125	76.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	127	77.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	128	70.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	129	74.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	130	85.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	132	80.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	133	77.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	135	69.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	136	66.000	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	138	79.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	139	73.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	141	71.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	142	74.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	144	79.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	145	78.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	147	76.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	148	85.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	150	74.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	151	81.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	153	68.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	154	67.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	156	65.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	158	65.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	159	59.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	161	72.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	162	79.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	164	56.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	165	58.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	167	69.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	168	60.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	170	61.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	171	59.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	173	55.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	174	60.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	176	70.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	177	66.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	179	62.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	180	68.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	182	64.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	183	61.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	185	65.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	186	63.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	188	66.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	189	57.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	191	77.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	192	72.000	MG/L	0.05	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	194	58.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	195	65.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	197	67.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	198	72.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	200	59.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	201	69.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	203	70.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	204	67.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	205	67.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ISM62	SM4500-NH3E	SP-A	206	72.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE08	350.2	SP-A +SP-B	1	80.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE08	350.2	SP-A +SP-B	2	64.000	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE08	350.2	SP-A +SP-B	3	84.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE08	350.2	SP-A +SP-B	4	72.500	MG/L	0.05	NC
AMMONIA AS NITROGEN	7664417	ESE08	350.2	SP-A +SP-B	5	71.000	MG/L	0.05	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE08	1664	SP-A +SP-B	1	5.750	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE08	1664	SP-A +SP-B	2	5.875	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE08	1664	SP-A +SP-B	3	6.000	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE08	1664	SP-A +SP-B	4	5.750	MG/L	5.00	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE08	1664	SP-A +SP-B	5	6.000	MG/L	5.00	ND
LEAD	7439921	ISM62	200.7	SP-A	1	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	7	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	8	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	14	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	15	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	21	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	22	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	28	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	29	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	35	50.000	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	36	4.990	UG/L	50.00	ND
LEAD	7439921	ISM62	200.7	SP-A	42	7.000	UG/L	50.00	NC
LEAD	7439921	ISM62	200.7	SP-A	43	8.990	UG/L	50.00	NC
LEAD	7439921	ISM62	200.7	SP-A	49	9.990	UG/L	50.00	NC
LEAD	7439921	ISM62	200.7	SP-A	50	26.000	UG/L	50.00	NC
LEAD	7439921	ISM62	200.7	SP-A	56	13.000	UG/L	50.00	NC
LEAD	7439921	ISM62	200.7	SP-A	57	6.000	UG/L	50.00	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM62	200.7	SP-A	63	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	64	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	70	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	71	8.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	77	9.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	78	14.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	84	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	85	10.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	91	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	92	9.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	94	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	95	14.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	97	13.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	98	8.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	100	12.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	101	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	103	37.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	104	28.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	106	39.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	107	30.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	109	13.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	110	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	112	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	113	35.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	115	30.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	116	46.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	118	43.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	119	16.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	121	13.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	122	23.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	124	12.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	125	27.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	127	16.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	128	27.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	129	52.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	130	12.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	132	19.990	UG/L	50	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM62	200.7	SP-A	133	23.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	135	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	136	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	138	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	139	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	141	8.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	142	7.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	144	27.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	145	12.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	147	8.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	148	14.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	150	4.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	151	7.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	153	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	154	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	156	16.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	158	10.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	159	8.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	161	14.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	162	18.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	164	12.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	165	17.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	167	14.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	168	43.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	170	19.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	171	19.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	173	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	174	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	176	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	177	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	179	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	180	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	182	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	183	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	185	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	186	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	188	4.990	UG/L	50	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM62	200.7	SP-A	189	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	191	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	192	20.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	194	7.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	195	8.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	197	14.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	198	6.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	200	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	201	4.990	UG/L	50	ND
LEAD	7439921	ISM62	200.7	SP-A	203	29.990	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	204	41.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	205	52.000	UG/L	50	NC
LEAD	7439921	ISM62	200.7	SP-A	206	24.000	UG/L	50	NC
LEAD	7439921	ESE08	1620	SP-A +SP-B	1	44.200	UG/L	50	NC
LEAD	7439921	ESE08	1620	SP-A +SP-B	2	57.100	UG/L	50	NC
LEAD	7439921	ESE08	1620	SP-A +SP-B	3	37.250	UG/L	50	NC
LEAD	7439921	ESE08	1620	SP-A +SP-B	4	52.700	UG/L	50	NC
LEAD	7439921	ESE08	1620	SP-A +SP-B	5	67.500	UG/L	50	NC
ZINC	7440666	ISM62	200.7	SP-A	1	170.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	7	59.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	8	79.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	14	180.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	15	180.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	21	79.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	22	239.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	28	109.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	29	79.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	35	109.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	36	90.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	42	140.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	43	140.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	49	349.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	50	839.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	56	469.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	57	150.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	63	140.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	64	100.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM62	200.7	SP-A	70	140.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	71	330.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	77	310.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	78	430.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	84	90.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	85	300.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	91	129.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	92	389.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	95	460.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	97	430.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	98	200.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	100	360.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	101	119.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	103	930.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	104	759.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	106	970.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	107	759.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	109	310.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	110	129.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	112	100.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	113	709.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	115	670.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	116	990.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	118	910.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	119	430.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	121	340.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	122	509.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	124	270.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	125	569.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	127	310.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	128	589.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	129	1000.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	130	250.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	132	319.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	133	379.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	135	90.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	136	59.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM62	200.7	SP-A	138	90.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	139	70.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	141	150.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	142	140.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	144	400.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	145	230.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	147	219.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	148	319.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	150	150.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	151	170.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	153	170.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	154	200.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	156	699.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	158	239.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	159	209.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	161	360.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	162	540.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	164	310.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	165	449.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	167	319.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	168	899.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	170	449.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	171	519.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	173	319.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	174	289.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	176	400.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	177	400.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	179	330.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	180	289.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	182	209.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	183	209.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	185	200.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	186	180.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	188	239.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	189	159.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	191	150.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	192	560.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=IRON -- Option=PSES1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM62	200.7	SP-A	194	200.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	195	170.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	197	400.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	198	189.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	200	189.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	201	180.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	203	170.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	204	949.990	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	205	1200.000	UG/L	20	NC
ZINC	7440666	ISM62	200.7	SP-A	206	680.000	UG/L	20	NC
ZINC	7440666	ESE08	1620	SP-A +SP-B	1	1155.000	UG/L	20	NC
ZINC	7440666	ESE08	1620	SP-A +SP-B	2	1310.000	UG/L	20	NC
ZINC	7440666	ESE08	1620	SP-A +SP-B	3	1240.000	UG/L	20	NC
ZINC	7440666	ESE08	1620	SP-A +SP-B	4	1475.000	UG/L	20	NC
ZINC	7440666	ESE08	1620	SP-A +SP-B	5	1510.000	UG/L	20	NC

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
LEAD	7439921	ISM63	200.7	SP-A	7	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	35	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	63	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	91	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	126	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	155	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	187	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	215	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	243	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	278	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	306	1.000	UG/L	50	ND
LEAD	7439921	ISM63	200.7	SP-A	334	1.000	UG/L	50	ND
ZINC	7440666	ISM63	200.7	SP-A	7	35.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	17	27.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	21	20.990	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM63	200.7	SP-A	28	86.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	35	97.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	42	17.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	49	63.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	56	61.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	63	30.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	70	37.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	78	78.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	84	50.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	91	78.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	98	23.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	105	57.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	112	26.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	119	82.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	126	43.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	133	28.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	140	41.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	147	43.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	155	14.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	161	17.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	168	14.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	175	14.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	187	9.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	194	16.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	201	17.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	215	17.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	225	14.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	236	17.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	243	12.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	257	10.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	271	12.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	278	29.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	285	12.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	299	12.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	306	21.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	320	18.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	327	32.000	UG/L	20	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1 (continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
ZINC	7440666	ISM63	200.7	SP-A	334	10.990	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	342	8.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	348	27.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	355	12.000	UG/L	20	NC
ZINC	7440666	ISM63	200.7	SP-A	362	12.000	UG/L	20	NC

Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
CHROMIUM	7440473	ESE09	1620	SP-A +SP-B	1	43.700	UG/L	10	NC
CHROMIUM	7440473	ESE09	1620	SP-A +SP-B	2	27.550	UG/L	10	NC
CHROMIUM	7440473	ESE09	1620	SP-A +SP-B	3	13.050	UG/L	10	NC
CHROMIUM	7440473	ESE09	1620	SP-A +SP-B	4	10.000	UG/L	10	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE09	1664	SP-A +SP-B	1	16.167	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE09	1664	SP-A +SP-B	2	5.500	MG/L	5	ND
HEXANE EXTRACTABLE MATERIAL	C036	ESE09	1664	SP-A +SP-B	3	9.000	MG/L	5	NC
HEXANE EXTRACTABLE MATERIAL	C036	ESE09	1664	SP-A +SP-B	4	5.000	MG/L	5	ND
NICKEL	7440020	ISM64	200.7	SP-A	3	273.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	4	259.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	5	208.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	6	219.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	7	379.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	8	263.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	9	177.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	10	270.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	11	170.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	12	270.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	13	319.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	15	349.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	16	180.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	17	21.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	18	319.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	19	146.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	20	136.000	UG/L	40	NC

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1 ----------
(continued)

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
NICKEL	7440020	ISM64	200.7	SP-A	21	119.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	22	189.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	23	412.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	26	79.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	28	82.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	29	101.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	32	100.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	33	90.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	35	32.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	37	75.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	38	115.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	39	123.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	40	116.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	41	112.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	42	105.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	43	54.990	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	44	112.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	45	123.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	46	32.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	47	97.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	48	140.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	49	158.000	UG/L	40	NC
NICKEL	7440020	ISM64	200.7	SP-A	50	231.990	UG/L	40	NC
NICKEL	7440020	ESE09	1620	SP-A +SP-B	1	69.500	UG/L	40	NC
NICKEL	7440020	ESE09	1620	SP-A +SP-B	2	20.000	UG/L	40	ND
NICKEL	7440020	ESE09	1620	SP-A +SP-B	3	51.800	UG/L	40	NC
NICKEL	7440020	ESE09	1620	SP-A +SP-B	4	20.000	UG/L	40	ND
TOTAL SUSPENDED SOLIDS	C009	ESE09	160.2	SP-A +SP-B	1	13.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE09	160.2	SP-A +SP-B	2	4.000	MG/L	4	ND
TOTAL SUSPENDED SOLIDS	C009	ESE09	160.2	SP-A +SP-B	3	5.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE09	160.2	SP-A +SP-B	4	4.000	MG/L	4	ND

Appendix D: Aggregated Daily Data Used to Calculate Proposed Limitations and Standards

---------- Subcategory=OTHER -- Option=DRI_BPT ----------

Analyte Name	CAS_NO	Episode	Method	Sample Point	Sample Day	Concentration	Unit	Baseline Value	Meas Type
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	1	27.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	2	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	3	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	4	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	5	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	6	10.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	7	21.500	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	8	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	9	7.600	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	10	5.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ISM65	160.2	SP-A	11	3.000	MG/L	4	NC
TOTAL SUSPENDED SOLIDS	C009	ESE10	160.2	SP-A	1	4.000	MG/L	4	ND

Appendix E

MODIFIED DELTA-LOGNORMAL DISTRIBUTION

Appendix E

MODIFIED DELTA-LOGNORMAL DISTRIBUTION

This appendix describes the modified delta-lognormal distribution and the estimation of the episode-specific long-term averages and variability factors used to calculate the proposed limitations and standards.[1] This appendix provides the statistical methodology that was used to obtain the results presented in Section 12.

E.1 Basic Overview of the Modified Delta-Lognormal Distribution

EPA selected the modified delta-lognormal distribution to model pollutant effluent concentrations from the iron and steel industry in developing the long-term averages and variability factors. A typical effluent data set from a sampling episode or self-monitoring episode (see Section 12 for a discussion of the data associated with these episodes) consists of a mixture of measured (detected) and non-detected values. The modified delta-lognormal distribution is appropriate for such data sets because it models the data as a mixture of measurements that follow a lognormal distribution and non-detect measurements that occur with a certain probability. The model also allows for the possibility that non-detect measurements occur at multiple sample-specific detection limits. Because the data appeared to fit the modified delta-lognormal model reasonably well, EPA has determined that this model is appropriate for these data.

The modified delta-lognormal distribution is a modification of the 'delta distribution' originally developed by Aitchison and Brown.[2] While this distribution was originally developed to model economic data, other researchers have shown the application to environmental data.[3] The resulting mixed distributional model, which combines a continuous density portion with a discrete-valued spike at zero, is also known as the delta-lognormal distribution. The delta in the name refers to the proportion of the overall distribution contained in the discrete distributional spike at zero; that is, the proportion of zero amounts. The remaining non-zero, non-censored (NC) amounts are grouped together and fit to a lognormal distribution.

EPA modified this delta-lognormal distribution to incorporate multiple detection limits. In the modification of the delta portion, the single spike located at zero is replaced by a discrete distribution made up of multiple spikes. Each spike in this modification is associated with a distinct sample-specific detection limit associated with non-detected (ND) measurements in the

---

[1]In the remainder of this appendix, references to 'limitations' includes 'standards.'

[2]Aitchison, J. and Brown, J.A.C. (1963) The Lognormal Distribution. Cambridge University Press, pages 87-99.

[3]Owen, W.J. and T.A. DeRouen. 1980. "Estimation of the Mean for Lognormal Data Containing Zeroes and Left-Censored Values, with Applications to the Measurement of Worker Exposure to Air Contaminants." *Biometrics*, 36:707-719.

database.[4] A lognormal density is used to represent the set of measured values. This modification of the delta-lognormal distribution is illustrated in Figure E-1.

The following two subsections describe the delta and lognormal portions of the modified delta-lognormal distribution in further detail.

E.2 Continuous and Discrete Portions of the Modified Delta-Lognormal Distribution

The discrete portion of the modified delta-lognormal distribution models the non-detected values corresponding to the k reported sample-specific detection limits. In the model, δ represents the proportion of non-detected values in the dataset and is the sum of smaller fractions, δ_i, each representing the proportion of non-detected values associated with each distinct detection limit value. By letting D_i equal the value of the i^{th} smallest distinct detection limit in the data set and the random variable X_D represents a randomly chosen non-detected measurement, the cumulative distribution function of the discrete portion of the modified delta-lognormal model can be mathematically expressed as:

$$\Pr(X_D \le c) = \frac{1}{\delta} \sum_{i:D_i \le c} \delta_i \qquad 0 < c \tag{E-1}$$

The mean and variance of this discrete distribution can be calculated using the following formulas:

$$E(X_D) = \frac{1}{\delta} \sum_{i=1}^{k} \delta_i D_i \tag{E-2}$$

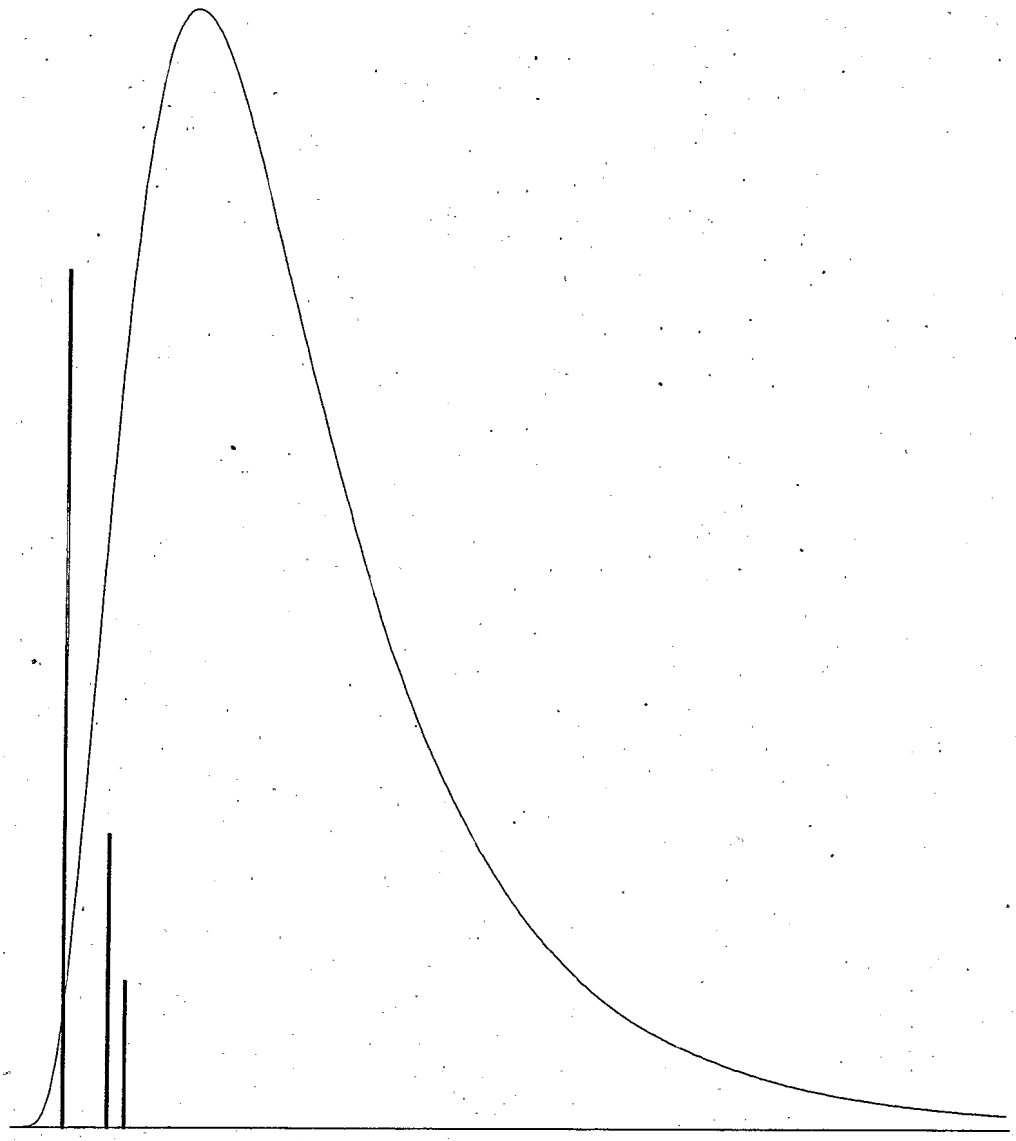
$$Var(X_D) = \frac{1}{\delta} \sum_{i=1}^{k} \delta_i \left(D_i - E(X_D)\right)^2 \tag{E-3}$$

The continuous, lognormal portion of the modified delta-lognormal distribution was used to model the detected measurements from the iron and steel industry database. The cumulative probability distribution of the continuous portion of the modified delta-lognormal distribution can be mathematically expressed as:

[4]Previously, EPA had modified the delta-lognormal model to account for non-detected measurements by placing the distributional "spike" at a single positive value, usually equal to the nominal method detection limit, rather than at zero. For further details, see Kahn and Rubin, 1989. This adaptation was used in developing limitations and standards for the organic chemicals, plastics, and synthetic fibers (OCPSF) and pesticides manufacturing rulemakings. EPA has used the current modification in several, more recent, rulemakings.

Figure E-1

Modified Delta – Lognormal Distribution



$$\Pr\left[X_C \le c\right] = \Phi\left[\frac{\ln(c)-\mu}{\sigma}\right] \tag{E-4}$$

where the random variable X_C represents a randomly chosen detected measurement, Φ is the standard normal distribution, and μ and σ are parameters of the distribution.

The expected value, $E(X_C)$, and the variance, $Var(X_C)$, of the lognormal distribution can be calculated as:

$$E\left(X_C\right) = \exp\left(\mu + \frac{\sigma^2}{2}\right) \tag{E-5}$$

$$Var\left(X_C\right) = \left[E\left(X_C\right)\right]^2 \left(\exp\left(\sigma^2\right) - 1\right) \tag{E-6}$$

E.3 Combining the Continuous and Discrete Portions

The continuous portion of the modified delta-lognormal distribution is combined with the discrete portion to model data sets that contain a mixture of non-detected and detected measurements. It is possible to fit a wide variety of observed effluent data sets to the modified delta-lognormal distribution. Multiple detection limits for non-detect measurements are incorporated, as are measured ("detected") values. The same basic framework can be used even if there are no non-detected values in the data set (in this case, it is the same as the lognormal distribution). Thus, the modified delta-lognormal distribution offers a large degree of flexibility in modeling effluent data.

The modified delta-lognormal random variable U can be expressed as a combination of three other independent variables, that is,

$$U = I_u X_D + \left(1 - I_u\right) X_C \tag{E-7}$$

where X_D represents a random non-detect from the discrete portion of the distribution, X_C represents a random detected measurement from the continuous lognormal portion, and I_u is an indicator variable signaling whether any particular random measurement, u, is non-detected or non-censored (that is, I_u=1 if u is non-detected; I_u=0 if u is non-censored). Using a weighted sum, the cumulative distribution function from the discrete portion of the distribution (equation 1) can be combined with the function from the continuous portion (equation 4) to obtain the overall cumulative probability distribution of the modified delta-lognormal distribution as follows,

$$\Pr\left(U \le c\right) = \sum_{i:D_i \le c} \delta_i + \left(1 - \delta\right) \Phi\left[\frac{\ln(c)-\mu}{\sigma}\right] \tag{E-8}$$

where D_i is the value of the i^{th} sample-specific detection limit.

The expected value of the random variable U can be derived as a weighted sum of the expected values of the discrete and continuous portions of the distribution (equations 2 and 5, respectively) as follows

$$E(U) = \delta E(X_D) + (1-\delta) E(X_C) \tag{E-9}$$

In a similar manner, the expected value of the random variable squared can be written as a weighted sum of the expected values of the squares of the discrete and continuous portions of the distribution as follows

$$E(U^2) = \delta E(X_D^2) + (1-\delta) E(X_C^2) \tag{E-10}$$

Although written in terms of U, the following relationship holds for all random variables, U, X_D, and X_C.

$$E(U^2) = Var(U) + [E(U)]^2 \tag{E-11}$$

So using equation 11 to solve for Var(U), and applying the relationships in equations 9 and 10, the variance of U can be obtained as

$$\mathrm{Var}(U) = \delta\left(\mathrm{Var}(X_D) + [\mathrm{E}(X_D)]^2\right) + (1-\delta)\left(\mathrm{Var}(X_C) + [\mathrm{E}(X_C)]^2\right) - [\mathrm{E}(U)]^2 \tag{E-12}$$

E.4 Episode-specific Estimates Under the Modified Delta-Lognormal Distribution

In order to use the modified delta-lognormal model to calculate the proposed limitations, the parameters of the distribution are estimated from the data. These estimates are then used to calculate the proposed limitations.

The parameters $\hat{\delta}_i$ and $\hat{\delta}$ are estimated from the data using the following formulas:

$$\hat{\delta}_i = \frac{1}{n}\sum_{j=1}^{n_d} I(d_j = D_i)$$
$$\hat{\delta} = \frac{n_d}{n} \tag{E-13}$$

where n_d is the number of non-detected measurements, d_j, $j = 1$ to n_d, are the detection limits for the non-detected measurements, n is the number of measurements (both detected and non-detected) and I(...) is an indicator function equal to one if the phrase within the parentheses is

true and zero otherwise. The "hat" over the parameters indicates that they are estimated from the data.

The expected value and the variance of the lognormal portion of the modified delta-lognormal distribution can be calculated from the data as:

$$\hat{E}(X_D) = \frac{1}{\hat{\delta}} \sum_{i=1}^{k} \hat{\delta}_i D_i \tag{E-14}$$

$$\hat{Var}(X_D) = \frac{1}{\hat{\delta}} \sum_{i=1}^{k} \hat{\delta}_i \left(D_i - E(X_D)\right)^2 \tag{E-15}$$

The parameters of the continuous portion of the modified delta-lognormal distribution, $\hat{\mu}$ and $\hat{\sigma}^2$, are estimated by

$$\hat{\mu} = \sum_{i=1}^{n_c} \frac{\ln(x_i)}{n_c}$$
$$\hat{\sigma}^2 = \sum_{i=1}^{n_c} \frac{\left(\ln(x_i) - \hat{\mu}\right)^2}{n_c - 1} \tag{E-16}$$

where x_i is the ith detected measurement value and n_c is the number of detected measurements. Note that $n = n_d + n_c$.

The expected value and the variance of the lognormal portion of the modified delta-lognormal distribution can be calculated from the data as:

$$\hat{E}(X_C) = \exp\left(\hat{\mu} + \frac{\hat{\sigma}^2}{2}\right) \tag{E-17}$$

$$\hat{Var}(X_C) = \left[\hat{E}(X_C)\right]^2 \left(\exp\left(\hat{\sigma}^2\right) - 1\right) \tag{E-18}$$

Finally, the expected value and variance of the modified delta-lognormal distribution can be estimated using the following formulas:

$$\hat{E}(U) = \hat{\delta}\,\hat{E}(X_D) + \left(1 - \hat{\delta}\right)\hat{E}(X_C) \tag{E-19}$$

$$\hat{V}ar(U) = \hat{\delta}\left(\hat{V}ar(X_D) + \left[\hat{E}(X_D)\right]^2\right) + \left(1-\hat{\delta}\right)\left(\hat{V}ar(X_C) + \left[\hat{E}(X_C)\right]^2\right) - \left[\hat{E}(U)\right]^2 \quad \text{(E-20)}$$

Equations 17 through 20 are particularly important in the estimation of episode-specific long-term averages and variability factors as described in the following sections. These sections are preceded by a section that identifies the episode data set requirements.

E.4.1 Episode Data Set Requirements

Estimates of the necessary parameters for the lognormal portion of the distribution can be calculated with as few as two distinct detected values in a data set. (In order to calculate the variance of the modified delta-lognormal distribution, two distinct detected values are the minimum number that can be used and still obtain an estimate of the variance for the distribution.)

If an episode data set for a pollutant contained three or more observations with two or more distinct detected concentration values, then EPA used the modified delta-lognormal distribution to calculate long-term averages and variability factors. If the episode data set for a pollutant did not meet these requirements, EPA used an arithmetic average to calculate the episode-specific long-term average and excluded the dataset from the variability factor calculations (because the variability could not be calculated).

In statistical terms, each measurement was assumed to be independently and identically distributed from the other measurements of that pollutant in the episode data set.

The next two sections apply the modified delta-lognormal distribution to the data for estimating episode-specific long-term averages and variability factors for the iron and steel industry.

E.4.2 Estimation of Episode-specific Long-Term Averages

If an episode dataset for a pollutant mets the requirements described in the last section, then EPA calculated the long-term average using equation 19. Otherwise, EPA calculated the long-term average as the arithmetic average[5] of the daily values where the sample-specific detection limit was used for each non-detected measurement.

E.4.3 Estimation of Episode-Specific Variability Factors

For each episode, EPA estimated the daily variability factors by fitting a modified delta-lognormal distribution to the daily measurements for each pollutant. In contrast, EPA estimated monthly variability factors by fitting a modified delta-lognormal distribution to the

[5]EPA also used the arithmetic average of daily values in costing the technology options. See Section 12.7.1.

monthly averages for the pollutant at the episode. EPA developed these averages using the same number of measurements as the assumed monitoring frequency for the pollutant. EPA is assuming that all pollutants will be monitored weekly (approximately four times a month).[6]

E.4.3.1 Estimation of Episode-specific Daily Variability Factors

The episode-specific daily variability factor is a function of the expected value, and the 99th percentile of the modified delta-lognormal distribution fit to the daily concentration values of the pollutant in the wastewater from the episode. The expected value, was estimated using equation 19 (the expected value is the same as the episode-specific long-term average).

The 99th percentile of the modified delta-lognormal distribution fit to each data set was estimated by using an iterative approach. First, the pollutant-specific detection limits were ordered from smallest to largest. Next, the cumulative distribution function, p, for each detection limit was computed. The general form, for a given value c, was:

$$p = \sum_{i:D_i \le c} \hat{\delta}_i + \left(1-\hat{\delta}\right)\Phi\left[\frac{\ln(c)-\hat{\mu}}{\hat{\sigma}}\right] \qquad \text{(E-21)}$$

where Φ is the standard normal cumulative distribution function. Next, the interval containing the 99th percentile was identified. Finally, the 99th percentile of the modified delta-lognormal distribution was calculated. The following steps were completed to compute the estimated 99th percentile of each data subset:

Step 1 Using equation 21, k values of p at $c=D_m$, m=1,...,k were computed and labeled p_m.

Step 2 The smallest value of m (m=1,...,k), such that $p_m \ge 0.99$, was determined and labeled as p_j. If no such m existed, steps 3 and 4 were skipped and step 5 was computed instead.

Step 3 Computed $p^* = p_j - \hat{\delta}_j$.

[6]Compliance with the monthly average limitations will be required in the final rulemaking regardless of the number of samples analyzed and averaged.

Step 4 If $p^* < 0.99$, then $\hat{P}99 = D_j$
else if $p^* \geq 0.99$, then

$$\hat{P}99 = \exp\left(\hat{\mu} + \hat{\sigma}\Phi^{-1}\left[\frac{0.99 - \sum_{i=1}^{j-1}\hat{\delta}_i}{1-\hat{\delta}}\right]\right) \quad \text{(E-22)}$$

where Φ^{-1} is the inverse normal distribution function.

Step 5 If no such m exists such that $p_m > 0.99$ (m=1,...,k), then

$$\hat{P}99 = \exp\left(\hat{\mu} + \hat{\sigma}\Phi^{-1}\left[\frac{0.99 - \hat{\delta}}{1-\hat{\delta}}\right]\right) \quad \text{(E-23)}$$

The episode-specific daily variability factor, VF1, was then calculated as:

$$VF1 = \frac{\hat{P}99}{\hat{E}(U)} \quad \text{(E-24)}$$

E.4.3.2 Estimation of Episode-Specific Monthly Variability Factors

EPA estimated the monthly variability factors by fitting a modified delta-lognormal distribution to the monthly averages. These equations use the same basic parameters, μ and σ, calculated for the daily variability factors. Episode-specific monthly variability factors were based on 4-day monthly averages because the monitoring frequency was assumed to be weekly (approximately four times a month).

In order to calculate the 4-day variability factors (VF4), the assumption was made that the approximating distribution of $\overline{U}_4$, the sample mean for a random sample of four independent concentrations, was also derived from the modified delta-lognormal distribution.[7] To obtain the expected value of the 4-day averages, equation 19 is modified for the mean of the distribution of 4-day averages in equation 25:

$$\hat{E}\left(\overline{U}_4\right) = \hat{\delta}_4\,\hat{E}\left(\overline{X}_4\right)_D + \left(1-\hat{\delta}_4\right)\hat{E}\left(\overline{X}_4\right)_C \quad (25)$$

[7]As described in section 12.4, when non-detected measurements are aggregated with non-censored measurements, EPA determined that the result should be considered non-censored.

where $(\overline{X}_4)_D$ denotes the mean of the discrete portion of the distribution of the average of four independent concentrations, (i.e., when all observations are non-detected values) and $(\overline{X}_4)_C$ denotes the mean of the continuous lognormal portion (i.e., when any observations are detected).

First, it was assumed that the probability of detection (δ) on each of the four days was independent of the measurements on the other three days (as explained in Section E.4.1, daily measurements were also assumed to be independent) and therefore, $\delta_4 = \delta^4$. Because the measurements are assumed to be independent, the following relationships hold:

$$\begin{aligned}
\hat{E}\left(\overline{U}_4\right) &= \hat{E}(U) \\
\hat{V}ar\left(\overline{U}_4\right) &= \frac{\hat{V}ar(U)}{4} \\
\hat{E}\left(\left(\overline{X}_4\right)_D\right) &= \hat{E}(X_D) \\
\hat{V}ar\left(\left(\overline{X}_4\right)_D\right) &= \frac{\hat{V}ar(X_D)}{4}
\end{aligned} \tag{E-26}$$

Substituting into equation 26 and solving for the expected value of the continuous portion of the distribution gives:

$$\hat{E}\left(\overline{X}_4\right)_C = \frac{\hat{E}(U) - \hat{\delta}^4\,\hat{E}(X_D)}{1-\hat{\delta}^4} \tag{E-27}$$

Using the relationship in equation 19 for the averages of 4 daily measurements and substituting terms from equation 25 and solving for the variance of the continuous portion of $\overline{U}_4$ gives:

$$\hat{V}ar\left(\overline{X}_4\right)_C = \frac{\frac{\hat{V}ar(U)}{4} + \left[\hat{E}(U)\right]^2 - \hat{\delta}^4\left(\frac{\hat{V}ar(X_D)}{4} + \left[\hat{E}(X_D)\right]^2\right)}{1-\hat{\delta}^4} - \left[\hat{E}\left(\overline{X}_4\right)_C\right]^2 \tag{E-28}$$

Using equations 17 and 18 and solving for the parameters of the lognormal distribution describing the distribution of $\left(\overline{X}_4\right)_C$ gives:

$$\hat{\sigma}_4^2 = \ln\left(\frac{\hat{V}ar\left(\overline{X}_4\right)_C}{\left(\hat{E}\left(\overline{X}_4\right)_C\right)^2} + 1\right)$$

and

(E-29)

$$\hat{\mu}_4 = \ln\left(\hat{E}\left(\overline{X}_4\right)_C\right) - \frac{\hat{\sigma}_4^2}{2}$$

In finding the estimated 95th percentile of the average of four observations, four non-detects, not all at the same sample-specific detection limit, can generate an average that is not necessarily equal to D_1, D_2,..., or D_k. Consequently, more than k discrete points exist in the distribution of the 4-day averages. For example, the average of four non-detects at k=2 detection limits, are at the following discrete points with the associated probabilities:

i	D_i^*	δ_i^*
1	D_1	δ_1^4
2	$(3D_1 + D_2)/4$	$4\delta_1^3\delta_2$
3	$(2D_1 + 2D_2)/4$	$6\delta_1^2\delta_2^2$
4	$(D_1 + 3D_2)/4$	$4\delta_1\delta_2^3$
5	D_2	δ_2^4

When all four observations are non-detected values, and when k distinct non-detected values exist, the multinomial distribution can be used to determine associated probabilities. That is,

$$\Pr\left[\overline{U}_4 = \frac{\sum_{i=1}^{k} u_i D_i}{4}\right] = \frac{4!}{u_1!u_2!\ldots u_k!}\prod_{i=1}^{k}\delta_i^{u_i} \qquad \text{(E-30)}$$

where u_i is the number of non-detected measurements in the data set with the D_i detection limit. The number of possible discrete points, k^*, for k=1,2,3,4, and 5 are as follows:

k	k^*
1	1
2	5
3	15
4	35
5	70

To find the estimated 95th percentile of the distribution of the average of four observations, the same basic steps (described in Section 4.3.1) as for the 99th percentile of the distribution of daily observations, were used with the following changes:

Step 1 Change P_{99} to P_{95}, and 0.99 to 0.95.
Step 2 Change D_m to D_m^*, the weighted averages of the sample-specific detection limits.
Step 3 Change δ_i to δ_i^*.
Step 4 Change k to k^*, the number of possible discrete points based on k detection limits.
Step 5 Change the estimates of δ, $\hat{\mu}$,and $\hat{\sigma}$ to estimates of δ^4, $\hat{\mu}_4$ and $\hat{\sigma}_4$ respectively.

Then, using $\hat{E}(\overline{U}_4) = \hat{E}(U)$, the estimate of the episode-specific 4-day variability factor, VF4, was calculated as:

$$VF4 = \frac{\hat{P}95}{\hat{E}(U)} \qquad \text{(E-31)}$$

E.4.3.3 Evaluation of Episode-Specific Variability Factors

Estimates of the necessary parameters for the lognormal portion of the distribution can be calculated with as few as two distinct measured values in a data set (in order to calculate the variance); however, these estimates can be unstable (as can estimates from larger data sets). As stated in Section E.4.1, EPA used the modified delta-lognormal distribution to develop episode-specific variability factors for data sets that had a three or more observations with two or more distinct measured concentration values.

To identify situations producing unexpected results, EPA reviewed all of the variability factors and compared daily to monthly variability factors. EPA used several criteria to determine if the episode-specific daily and monthly variability factors should be included in calculating the option variability factors. One criteria that EPA used was that the daily and monthly variability factors should be greater than 1.0. A variability factor less than 1.0 would result in a unexpected result where the estimated 99th percentile would be less than the long-term average. This would be an indication that the estimate of $\hat{\sigma}$ (the log standard deviation) was unstable. A second criteria was that the daily variability factor had to be greater than the monthly variability factor. A third criteria was that not all of the sample-specific detection limits could exceed the values of the non-censored values. All the episode-specific variability factors used for the proposed limitations and standards met these criteria.

E.5 References

Aitchison, J. and J.A.C. Brown. 1963. *The Lognormal Distribution.* Cambridge University Press, New York.

Barakat, R. 1976. "Sums of Independent Lognormally Distributed Random Variables." *Journal of the Optical Society of America*, **66:** 211-216.

Cohen, A. Clifford. 1976. Progressively Censored Sampling in the Three Parameter Log-Normal Distribution. *Technometrics*, 18:99-103.

Crow, E.L. and K. Shimizu. 1988. *Lognormal Distributions: Theory and Applications.* Marcel Dekker, Inc., New York.

Kahn, H.D., and M.B. Rubin. 1989. "Use of Statistical Methods in Industrial Water Pollution Control Regulations in the United States." *Environmental Monitoring and Assessment.* Vol. 12:129-148.

Owen, W.J. and T.A. DeRouen. 1980. Estimation of the Mean for Lognormal Data Containing Zeroes and Left-Censored Values, with Applications to the Measurement of Worker Exposure to Air Contaminants. *Biometrics*, 36:707-719.

U.S. Environmental Protection Agency. 2000. Development Document for Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Point Source Category. Volume I, Volume II. EPA 440/1-87/009.

Appendix F

ATTACHMENTS FOR SECTION 12

Appendix F

ATTACHMENTS FOR SECTION 12

Subcategory Abbreviations:

Abbreviation	Subcategory
COKE_BYPROD	Cokemaking, By-Product Segment
FINISHING	Steel Finishing
INT_HOTFORM	Integrated and Stand-Alone Hot Forming
INT_STEEL	Integrated Steelmaking
IRON	Ironmaking
NONINT_STEEL_HOTFORM	Non-Integrated Steelmaking and Hot Forming
OTHER	Other Operations

Option Abbreviations:

Abbreviation	Option
CARBON_BAT1	Carbon and Alloy Segment, Option BAT1
SPECIALTY_BAT1	Stainless Steel Segment, Option BAT1
DRI_BPT	Direct Iron Reduction, Option BPT

Other Abbreviations:

Abbreviation	Definition
CAS_NO	Chemical Abstract Service Number
Est	Estimated
LTA	Long-Term Average
ND	Non-Detect
Obs	Number of Daily Values; OR Observed (e.g., Obs Mean)
STD	Standard Deviation
V.F.	Variability Factor

Attachment 12-1. Summary Statistics for Proposed Pollutants and Subcategories

Subcategory=COKE_BYPROD -- Option=BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ISM50	1.30	54	6	0.47	1.25	1.34	0.46	0.56	3.20	0.10	1.43	MG/L
AMMONIA AS NITROGEN	ISM51	2.94	8	0	0.65	3.05	2.94	0.65	1.90	3.80	.	.	MG/L
BENZO(A)PYRENE	ESE01	10.08	5	5	0.18	10.00	.	.	.	.	10.00	10.40	UG/L
HEXANE EXTRACTABLE MATERIAL	ESE01	7.11	5	2	2.88	5.90	7.97	3.72	5.72	12.26	5.73	5.90	MG/L
MERCURY	ESE01	0.20	5	5	0,00	0.20	.	.	.	.	0.20	0.20	UG/L
MERCURY	ESE02	0.11	5	0	0.04	0.10	0.11	0.04	0.06	0.17	.	.	UG/L
MERCURY	ISM51	0.39	2	2	0.00	0.39	.	.	.	.	0.39	0.39	UG/L
NAPHTHALENE	ESE01	10.08	5	5	0.18	10.00	.	.	.	.	10.00	10.40	UG/L
NAPHTHALENE	ISM50	12.66	56	53	13.13	10.00	59.66	35.22	35.00	100.00	10.00	10.00	UG/L
PHENOL	ESE01	10.08	5	5	0.18	10.00	.	.	.	.	10.00	10.40	UG/L
SELENIUM	ESE01	110.90	5	0	11.70	109.00	110.90	11.70	99.50	130.00	.	.	UG/L
THIOCYANATE	ESE01	0.39	5	0	0.15	0.37	0.39	0.15	0.22	0.60	.	.	MG/L
THIOCYANATE	ISM51	1.05	8	0	0.08	1.00	1.05	0.08	1.00	1.20	.	.	MG/L
TOTAL CYANIDE	ESE01	3.41	5	0	0.52	3.30	3.41	0.52	2.71	3.94	.	.	MG/L
TOTAL CYANIDE	ISM50	1.77	56	0	0.79	1.63	1.77	0.79	0.78	5.64	.	.	MG/L
TOTAL SUSPENDED SOLIDS	ESE01	18.50	3	0	4.27	19.00	18.50	4.27	14.00	22.50	.	.	MG/L
TOTAL SUSPENDED SOLIDS	ISM50	15.86	56	1	19.99	12.50	16.07	20.11	3.00	148.00	4.00	4.00	MG/L

Subcategory=COKE_BYPROD -- Option=BAT3

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ISM52	0.27	48	0	0.19	0.21	0.27	0.19	0.08	0.81	.	.	MG/L
TOTAL CYANIDE	ISM52	1.30	47	0	0.90	1.13	1.30	0.90	0.06	3.81	.	.	MG/L

Subcategory=COKE_BYPROD -- Option=PSES1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ISM53	48.59	14	0	3.41	48.35	48.59	3.41	41.70	54.30	.	.	MG/L
AMMONIA AS NITROGEN	ISM54	25.77	53	0	11.48	23.80	25.77	11.48	7.00	56.00	.	.	MG/L

Attachment 12-1. Summary Statistics for Proposed Pollutants and Subcategories

Subcategory=COKE_BYPROD -- Option=PSES1 (continued)

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ISM55	33.77	13	0	9.45	32.00	33.77	9.45	21.00	50.00	.	.	MG/L
NAPHTHALENE	ESE03	204.98	4	2	199.12	108.25	309.97	273.61	116.49	503.44	100.00	100.00	UG/L
PHENOL	ESE03	160771.52	5	0	108500.63	176600.00	160771.52	108500.63	16402.80	313800.00	.	.	UG/L
SELENIUM	ESE01	712.20	5	0	86.51	715.00	712.20	86.51	585.00	793.00	.	.	UG/L
THIOCYANATE	ESE03	209.80	5	0	34.58	216.00	209.80	34.58	166.00	259.00	.	.	MG/L
TOTAL CYANIDE	ISM56	6.22	52	0	2.05	6.25	6.22	2.05	0.52	10.80	.	.	MG/L

Subcategory=FINISHING -- Option=CARBON_BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
CHROMIUM	ISM57	28.71	262	62	30.66	20.99	34.43	33.06	9.99	326.00	9.99	19.99	UG/L
CHROMIUM	ESE04	9.21	5	0	4.49	9.50	9.21	4.49	4.05	15.40	.	.	UG/L
CHROMIUM	ESE05	11.15	5	3	4.17	9.00	14.38	5.90	10.20	18.55	9.00	9.00	UG/L
CHROMIUM	ISM58	50.77	259	251	8.50	50.00	75.00	44.40	19.99	140.00	50.00	50.00	UG/L
HEXANE EXTRACTABLE MATERIAL	ESE04	6.56	5	2	0.57	6.55	6.90	0.42	6.55	7.37	5.85	6.26	MG/L
HEXANE EXTRACTABLE MATERIAL	ESE05	6.00	5	5	0.18	6.00	.	.	.	.	5.75	6.25	MG/L
HEXAVALENT CHROMIUM	ESE04	0.01	5	5	0.00	0.01	.	.	.	.	0.01	0.01	MG/L
HEXAVALENT CHROMIUM	ESE05	0.01	5	3	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	MG/L
LEAD	ISM57	5.06	262	257	0.61	4.99	8.80	2.59	6.00	12.00	4.99	4.99	UG/L
LEAD	ESE04	2.00	5	5	0.00	2.00	.	.	.	.	2.00	2.00	UG/L
LEAD	ESE05	2.00	5	5	0.00	2.00	.	.	.	.	2.00	2.00	UG/L
TOTAL SUSPENDED SOLIDS	ISM57	9.45	262	1	5.44	8.35	9.48	5.42	1.20	40.00	1.00	1.00	MG/L
TOTAL SUSPENDED SOLIDS	ESE04	6.10	5	3	3.47	4.00	9.25	3.89	6.50	12.00	4.00	4.00	MG/L
TOTAL SUSPENDED SOLIDS	ESE05	4.30	5	2	0.45	4.00	4.50	0.50	4.00	5.00	4.00	4.00	MG/L
TOTAL SUSPENDED SOLIDS	ISM58	4.65	259	0	7.23	3.40	4.65	7.23	1.00	102.00	.	.	MG/L
ZINC	ISM57	36.26	261	25	40.31	24.00	38.94	41.49	9.99	404.00	9.99	25.00	UG/L
ZINC	ESE04	41.07	5	1	51.31	16.20	48.84	55.75	12.20	131.00	10.00	10.00	UG/L
ZINC	ESE05	11.42	5	1	4.16	9.80	12.28	4.26	9.00	18.40	8.00	8.00	UG/L

Attachment 12-1. Summary Statistics for Proposed Pollutants and Subcategories

Subcategory=FINISHING -- Option=SPECIALTY_BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ESE06	1.75	5	0	0.50	1.89	1.75	0.50	0.96	2.31	.	.	MG/L
AMMONIA AS NITROGEN	ISM59	21.55	12	0	5.73	20.60	21.55	5.73	12.00	32.70	.	.	MG/L
CHROMIUM	ESE06	132.24	5	0	95.59	82.90	132.24	95.59	69.50	298.00	.	.	UG/L
CHROMIUM	ISM59	74.29	24	0	15.94	74.00	74.29	15.94	34.00	122.00	.	.	UG/L
FLUORIDE	ESE06	16.30	5	0	2.68	15.80	16.30	2.68	14.00	20.60	.	.	MG/L
HEXANE EXTRACTABLE MATERIAL	ESE06	6.20	5	4	0.82	6.00	7.63	.	7.63	7.63	5.50	6.00	MG/L
HEXAVALENT CHROMIUM	ESE06	0.12	5	0	0.06	0.09	0.12	0.06	0.07	0.22	.	.	MG/L
HEXAVALENT CHROMIUM	ISM59	0.03	24	0	0.01	0.03	0.03	0.01	0.02	0.04	.	.	MG/L
NICKEL	ESE06	28.84	5	1	9.45	25.20	31.55	8.38	24.95	42.65	18.00	18.00	UG/L
NICKEL	ISM59	58.12	24	0	12.97	57.00	58.12	12.97	34.00	90.00	.	.	UG/L
TOTAL SUSPENDED SOLIDS	ESE06	4.00	5	5	0.00	4.00	.	.	.	.	4.00	4.00	MG/L
TOTAL SUSPENDED SOLIDS	ISM59	2.85	24	3	1.46	3.20	3.11	1.37	1.00	5.80	1.00	1.00	MG/L

Subcategory=INT_HOTFORM -- Option=CARBON_BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
HEXANE EXTRACTABLE MATERIAL	ESE04	6.49	3	1	1.15	6.34	7.02	0.97	6.34	7.71	5.41	5.41	MG/L
HEXANE EXTRACTABLE MATERIAL	ESE07	6.63	4	1	1.11	6.52	7.01	1.00	6.00	8.00	5.50	5.50	MG/L
LEAD	ESE04	19.33	3	3	7.51	15.00	.	.	.	.	15.00	28.00	UG/L
LEAD	ESE07	4.58	4	1	5.02	2.10	5.43	5.77	2.10	12.10	2.00	2.00	UG/L
TOTAL SUSPENDED SOLIDS	ESE04	13.33	3	1	8.62	15.00	18.00	4.24	15.00	21.00	4.00	4.00	MG/L
TOTAL SUSPENDED SOLIDS	ESE07	6.25	4	3	4.50	4.00	13.00	.	13.00	13.00	4.00	4.00	MG/L
ZINC	ESE04	3.20	3	3	0.69	2.80	.	.	.	.	2.80	4.00	UG/L
ZINC	ESE07	171.50	4	0	50.32	150.00	171.50	50.32	140.00	246.00	.	.	UG/L

Subcategory=INT_STEEL -- Option=BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
LEAD	ISM60	14.12	323	224	2.95	13.63	15.43	3.69	10.34	30.93	8.04	22.55	UG/L

Attachment 12-1. Summary Statistics for Proposed Pollutants and Subcategories

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
LEAD	ESE04	11.49	5	0	3.47	12.01	11.49	3.47	8.24	16.71	.	.	UG/L
ZINC	ISM60	90.51	323	0	46.84	79.14	90.51	46.84	20.50	289.73	.	.	UG/L
ZINC	ESE04	44.93	5	0	15.99	42.07	44.93	15.99	26.38	70.05	.	.	UG/L

Subcategory=IRON -- Option=BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
AMMONIA AS NITROGEN	ISM52	0.27	48	0	0.19	0.21	0.27	0.19	0.08	0.81	.	.	MG/L
LEAD	ISM61	3.38	52	29	5.03	1.00	6.39	6.46	1.00	23.00	1.00	1.00	UG/L
TOTAL CYANIDE	ISM52	1.30	47	0	0.90	1.13	1.30	0.90	0.06	3.81	.	.	MG/L
ZINC	ISM61	37.01	52	10	38.34	20.49	43.45	40.10	9.99	219.99	9.99	9.99	UG/L

Subcategory=IRON -- Option=PSES1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
2378-TCDF	ESE08	10.00	2	2	0.00	10.00	.	.	.	.	10.00	10.00	PG/L
AMMONIA AS NITROGEN	ISM62	70.08	104	0	13.01	69.00	70.08	13.01	12.00	100.00	.	.	MG/L
AMMONIA AS NITROGEN	ESE08	74.40	5	0	8.01	72.50	74.40	8.01	64.00	84.50	.	.	MG/L
HEXANE EXTRACTABLE MATERIAL	ESE08	5.88	5	5	0.13	5.88	.	.	.	.	5.75	6.00	MG/L
LEAD	ISM62	14.07	104	34	12.16	8.99	17.84	12.18	4.99	52.00	4.99	50.00	UG/L
LEAD	ESE08	51.75	5	0	11.67	52.70	51.75	11.67	37.25	67.50	.	.	UG/L
ZINC	ISM62	343.10	103	0	256.86	270.00	343.10	256.86	59.99	1200.00	.	.	UG/L
ZINC	ESE08	1338.00	5	0	151.85	1310.00	1338.00	151.85	1155.00	1510.00	.	.	UG/L

Attachment 12-1. Summary Statistics for Proposed Pollutants and Subcategories

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
LEAD	ISM63	1.00	12	12	0.00	1.00	.	.	.	.	1.00	1.00	UG/L
ZINC	ISM63	31.55	45	0	23.75	21.99	31.55	23.75	8.00	97.99	.	.	UG/L

Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
CHROMIUM	ESE09	23.58	4	1	15.45	20.30	28.10	15.33	13.05	43.70	10.00	10.00	UG/L
HEXANE EXTRACTABLE MATERIAL	ESE09	8.92	4	2	5.15	7.25	12.58	5.07	9.00	16.17	5.00	5.50	MG/L
NICKEL	ISM64	169.35	40	0	98.84	138.00	169.35	98.84	21.99	412.99	.	.	UG/L
NICKEL	ESE09	40.33	4	2	24.56	35.90	60.65	12.52	51.80	69.50	20.00	20.00	UG/L
TOTAL SUSPENDED SOLIDS	ESE09	6.75	4	2	4.56	4.75	9.50	5.66	5.50	13.50	4.00	4.00	MG/L

Subcategory=OTHER -- Option=DRI_BPT

Analyte	Episode	Episode Mean	Total Number Values	Num ND	Obs Std Dev	Obs Median Value	Mean Value NC	Std Dev NC	Min Value NC	Max Value NC	Min Value ND	Max Value ND	Unit
TOTAL SUSPENDED SOLIDS	ISM65	10.83	11	0	7.20	10.00	10.83	7.20	3.00	27.00	.	.	MG/L
TOTAL SUSPENDED SOLIDS	ESE10	4.00	1	1	.	4.00	.	.	.	.	4.00	4.00	MG/L

Attachment 12-2. Episode-Specific Long-Term Averages and Variability Factors

Assuming Underlying Modified Delta-Lognormal Distribution

Subcategory=COKE_BYPROD -- Option=BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
AMMONIA AS NITROGEN	7664417	MG/L	ISM50	350.2	54	6	1.301	1.306	0.489	2.140	1.334
AMMONIA AS NITROGEN	7664417	MG/L	ISM51	SM4500NH3-E	8	0	2.938	2.953	0.721	1.701	1.213
BENZO(A)PYRENE	50328	UG/L	ESE01	1625	5	5	10.080	10.080	0.179	.	.
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE01	1664	5	2	7.111	7.241	3.087	2.574	1.385
MERCURY	7439976	UG/L	ESE01	1620	5	5	0.200	0.200	0.000	.	.
MERCURY	7439976	UG/L	ESE02	1620	5	0	0.109	.	0.043	2.222	1.345
MERCURY	7439976	UG/L	ISM51	245.1	2	2	0.390	0.390	0.000	.	.
NAPHTHALENE	91203	UG/L	ESE01	1625	5	5	10.080	10.080	0.179	.	.
NAPHTHALENE	91203	UG/L	ISM50	625	56	53	12.661	12.808	14.619	6.841	2.284
PHENOL	108952	UG/L	ESE01	1625	5	5	10.080	10.080	0.179	.	.
SELENIUM	7782492	UG/L	ESE01	1620	5	0	110.900	111.004	11.329	1.261	1.086
THIOCYANATE	302045	MG/L	ESE01	SM4500-CN M.	5	0	0.391	0.397	0.158	2.263	1.355
THIOCYANATE	302045	MG/L	ISM51	SM4500CN-M	8	0	1.050	1.050	0.073	1.173	1.058
TOTAL CYANIDE	57125	MG/L	ESE01	335.2	5	0	3.414	3.423	0.539	1.421	1.134
TOTAL CYANIDE	57125	MG/L	ISM50	335.2	56	0	1.775	1.765	0.663	2.180	1.335
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE01	160.2	3	0	18.500	18.689	4.560	1.700	1.212
TOTAL SUSPENDED SOLIDS	C009	MG/L	ISM50	NA	56	1	15.857	15.149	12.988	4.262	1.806

Subcategory=COKE_BYPROD -- Option=BAT3

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
AMMONIA AS NITROGEN	7664417	MG/L	ISM52	SM4500-NH3F	48	0	0.275	0.276	0.206	3.773	1.698
TOTAL CYANIDE	57125	MG/L	ISM52	SM4500-CNC	47	0	1.303	1.448	1.625	5.434	2.062

Subcategory=COKE_BYPROD -- Option=PSES1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
AMMONIA AS NITROGEN	7664417	MG/L	ISM53	SM4500-NH3	14	0	48.586	48.595	3.445	1.176	1.059
AMMONIA AS NITROGEN	7664417	MG/L	ISM54	4500NH, BE	53	0	25.766	25.976	12.936	2.676	1.453
AMMONIA AS NITROGEN	7664417	MG/L	ISM55	417/350.2	13	0	33.769	33.856	9.481	1.825	1.245
NAPHTHALENE	91203	UG/L	ESE03	1625	4	2	204.983	256.864	434.537	7.898	2.567

Attachment 12-2. Episode-Specific Long-Term Averages and Variability Factors

Assuming Underlying Modified Delta-Lognormal Distribution

Subcategory=COKE_BYPROD -- Option=PSES1 (Continued)

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
PHENOL	108952	UG/L	ESE03	1625	5	0	160771.520	217719.466	355459.496	7.403	2.510
SELENIUM	7782492	UG/L	ESE01	1620	5	0	712.200	713.431	90.070	1.329	1.107
THIOCYANATE	302045	MG/L	ESE03	4500-CN	5	0	209.800	210.383	35.036	1.449	1.143
TOTAL CYANIDE	57125	MG/L	ISM56	335.2	52	0	6.219	6.482	3.493	2.849	1.492

Subcategory=FINISHING -- Option=CARBON_BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
CHROMIUM	7440473	UG/L	ISM57	200.7	262	62	28.708	27.794	22.019	3.889	1.741
CHROMIUM	7440473	UG/L	ESE04	1620	5	0	9.210	9.540	5.451	2.990	1.524
CHROMIUM	7440473	UG/L	ESE05	1620	5	3	11.150	11.417	5.147	2.760	1.416
CHROMIUM	7440473	UG/L	ISM58	SM3120B	259	251	50.772	50.871	11.172	1.674	1.147
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE04	1664	5	2	6.563	6.566	0.543	1.193	1.068
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE05	1664	5	5	6.000	6.000	0.177	.	.
HEXAVALENT CHROMIUM	18540299	MG/L	ESE04	218.4	5	5	0.010	0.010	0.000	.	.
HEXAVALENT CHROMIUM	18540299	MG/L	ESE05	218.4	5	3	0.011	0.011	0.001	1.189	1.082
LEAD	7439921	UG/L	ISM57	200.7	262	257	5.063	5.064	0.647	1.649	1.115
LEAD	7439921	UG/L	ESE04	1620	5	5	2.000	2.000	0.000	.	.
LEAD	7439921	UG/L	ESE05	1620	5	5	2.000	2.000	0.000	.	.
TOTAL SUSPENDED SOLIDS	C009	MG/L	ISM57	160.2	262	1	9.445	9.387	4.736	2.695	1.459
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE04	160.2	5	3	6.100	6.281	3.948	3.289	1.577
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE05	160.2	5	2	4.300	4.306	0.464	1.320	1.091
TOTAL SUSPENDED SOLIDS	C009	MG/L	ISM58	SM209C	259	0	4.649	4.252	2.598	3.163	1.563
ZINC	7440666	UG/L	ISM57	200.7	261	25	36.263	34.591	28.289	4.055	1.767
ZINC	7440666	UG/L	ESE04	1620	5	1	41.070	45.719	72.975	7.360	2.480
ZINC	7440666	UG/L	ESE05	1620	5	1	11.420	11.523	4.036	2.091	1.311

Attachment 12-2. Episode-Specific Long-Term Averages and Variability Factors

Assuming Underlying Modified Delta-Lognormal Distribution

Subcategory=FINISHING -- Option=SPECIALTY_BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
AMMONIA AS NITROGEN	7664417	MG/L	ESE06	350.2	5	0	1.752	1.780	0.615	2.063	1.306
AMMONIA AS NITROGEN	7664417	MG/L	ISM59	NA	12	0	21.550	21.638	6.049	1.823	1.245
CHROMIUM	7440473	UG/L	ESE06	1620	5	0	132.240	134.138	87.197	3.336	1.602
CHROMIUM	7440473	UG/L	ISM59	NA	24	0	74.287	74.479	17.152	1.654	1.200
FLUORIDE	16984488	MG/L	ESE06	340.2	5	0	16.300	16.335	2.582	1.424	1.135
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE06	1664	5	4	6.200	6.200	0.823	.	.
HEXAVALENT CHROMIUM	18540299	MG/L	ESE06	218.4	5	0	0.122	0.124	0.062	2.692	1.456
HEXAVALENT CHROMIUM	18540299	MG/L	ISM59	NA	24	0	0.030	0.030	0.006	1.612	1.188
NICKEL	7440020	UG/L	ESE06	1620	5	1	28.840	29.033	9.239	1.882	1.280
NICKEL	7440020	UG/L	ISM59	NA	24	0	58.121	58.192	13.155	1.640	1.196
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE06	160.2	5	5	4.000	4.000	0.000	.	.
TOTAL SUSPENDED SOLIDS	C009	MG/L	ISM59	NA	24	3	2.846	2.908	1.824	3.147	1.579

Subcategory=INT_HOTFORM -- Option=CARBON_BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE04	1664	3	1	6.485	6.507	1.113	1.449	1.145
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE07	1664	4	1	6.633	6.651	1.105	1.441	1.142
LEAD	7439921	UG/L	ESE04	1620	3	3	19.333	19.333	7.506	.	.
LEAD	7439921	UG/L	ESE07	1620	4	1	4.575	5.208	7.484	6.797	2.347
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE04	160.2	3	1	13.333	13.505	7.623	2.202	1.505
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE07	160.2	4	3	6.250	6.250	4.500	.	.
ZINC	7440666	UG/L	ESE04	1620	3	3	3.200	3.200	0.693	.	.
ZINC	7440666	UG/L	ESE07	1620	4	0	171.500	172.678	46.553	1.788	1.236

Subcategory=INT_STEEL -- Option=BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
LEAD	7439921	UG/L	ISM60	200.7	323	224	14.125	14.120	2.835	1.593	1.173
LEAD	7439921	UG/L	ESE04	1620	5	0	11.486	11.581	3.494	1.902	1.266
ZINC	7440666	UG/L	ISM60	200.7	323	0	90.507	90.557	47.444	2.785	1.478

Attachment 12-2. Episode-Specific Long-Term Averages and Variability Factors

Assuming Underlying Modified Delta-Lognormal Distribution

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
ZINC	7440666	UG/L	ESE04	1620	5	0	44.932	45.492	16.507	2.130	1.323

Subcategory=IRON -- Option=BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
AMMONIA AS NITROGEN	7664417	MG/L	ISM52	SM4500-NH3F	48	0	0.275	0.276	0.206	3.773	1.698
LEAD	7439921	UG/L	ISM61	239.2	52	29	3.384	3.469	6.411	8.566	2.695
TOTAL CYANIDE	57125	MG/L	ISM52	SM4500-CNC	47	0	1.303	1.448	1.625	5.434	2.062
ZINC	7440666	UG/L	ISM61	200.7	52	10	37.013	36.798	38.296	5.045	1.984

Subcategory=IRON -- Option=PSES1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
2378-TCDF	51207319	PG/L	ESE08	1613B	2	2	10.000	10.000	0.000	.	.
AMMONIA AS NITROGEN	7664417	MG/L	ISM62	SM4500-NH3E	104	0	70.077	70.492	16.968	1.689	1.209
AMMONIA AS NITROGEN	7664417	MG/L	ESE08	350.2	5	0	74.400	74.489	8.089	1.279	1.092
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE08	1664	5	5	5.875	5.875	0.125	.	.
LEAD	7439921	UG/L	ISM62	200.7	104	34	14.072	14.057	12.548	4.171	1.838
LEAD	7439921	UG/L	ESE08	1620	5	0	51.750	52.040	12.123	1.663	1.202
ZINC	7440666	UG/L	ISM62	200.7	103	0	343.103	345.513	288.065	4.163	1.783
ZINC	7440666	UG/L	ESE08	1620	5	0	1338.000	1339.751	153.042	1.295	1.097

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
LEAD	7439921	UG/L	ISM63	200.7	12	12	1.000	1.000	0.000	.	.
ZINC	7440666	UG/L	ISM63	200.7	45	0	31.551	31.336	24.100	3.871	1.719

Attachment 12-2. Episode-Specific Long-Term Averages and Variability Factors

Assuming Underlying Modified Delta-Lognormal Distribution

Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
CHROMIUM	7440473	UG/L	ESE09	1620	4	1	23.575	25.124	19.590	3.852	1.729
HEXANE EXTRACTABLE MATERIAL	C036	MG/L	ESE09	1664	4	2	8.917	9.196	5.636	3.071	1.556
NICKEL	7440020	UG/L	ISM64	200.7	40	0	169.345	175.622	133.236	3.824	1.709
NICKEL	7440020	UG/L	ESE09	1620	4	2	40.325	40.655	22.575	2.262	1.481
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE09	160.2	4	2	6.750	7.271	6.187	4.366	1.801

Subcategory=OTHER -- Option=DRI_BPT

Analyte	CAS_NO	Unit	Episode	Method	# Obs	# NDs	Obs Mean	Est. LTA	Est. STD	1-Day V.F.	Monthly V.F.
TOTAL SUSPENDED SOLIDS	C009	MG/L	ISM65	160.2	11	0	10.827	11.017	7.664	3.540	1.647
TOTAL SUSPENDED SOLIDS	C009	MG/L	ESE10	160.2	1	1	4.000	4.000	.	.	.

Attachment 12-3. Concentration-Based Limitations

After Transfers of Long-Term Averages, Variability Factors, and Limitations

Subcategory=COKE_BYPROD -- Option=BAT3

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
AMMONIA AS NITROGEN	7664417	0.05	MG/L	MG/L	0.28	3.77	1.70	1.04	0.47
BENZO(A)PYRENE	50328	10.00	UG/L	UG/L	10.08	6.84	2.28	68.95	23.02
CYANIDE	57125	0.02	MG/L	MG/L	1.45	5.43	2.06	7.87	2.99
MERCURY	7439976	0.20	UG/L	UG/L	0.30	2.22	1.35	0.66	0.40
NAPHTHALENE	91203	10.00	UG/L	UG/L	11.44	6.84	2.28	78.29	26.13
OIL AND GREASE	C036	5.00	MG/L	MG/L	7.24	2.57	1.39	18.64	10.03
PHENOL	108952	10.00	UG/L	UG/L	10.08	2.50	1.41	25.17	14.17
SELENIUM	7782492	5.00	UG/L	UG/L	111.00	1.26	1.09	139.94	120.56
THIOCYANATE	302045	0.10	MG/L	MG/L	0.72	1.72	1.21	1.24	0.87
TSS	C009	4.00	MG/L	MG/L	16.92	2.98	1.51	50.43	25.54

Subcategory=COKE_BYPROD -- Option=PSES1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
AMMONIA AS NITROGEN	7664417	0.05	MG/L	MG/L	33.86	1.89	1.25	64.06	42.40
CYANIDE	57125	0.02	MG/L	MG/L	6.48	2.85	1.49	18.47	9.67
NAPHTHALENE	91203	10.00	UG/L	UG/L	256.86	7.90	2.57	2,028.78	659.29
PHENOL	108952	10.00	UG/L	UG/L	217,719.47	7.40	2.51	1,611,820.35	546,369.65
SELENIUM	7782492	5.00	UG/L	UG/L	713.43	1.33	1.11	948.35	789.84
THIOCYANATE	302045	0.10	MG/L	MG/L	210.38	1.45	1.14	304.91	240.38

Subcategory=FINISHING -- Option=CARBON_BAT1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
CHROMIUM	7440473	10.00	UG/L	UG/L	19.61	2.83	1.46	55.45	28.57
CHROMIUM (VI)	18540299	0.01	MG/L	MG/L	0.01	1.19	1.08	0.01	0.01
LEAD	7439921	50.00	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
OIL AND GREASE	C036	5.00	MG/L	MG/L	6.28	1.19	1.07	7.50	6.71
TSS	C009	4.00	MG/L	MG/L	5.29	2.62	1.42	13.85	7.53
ZINC	7440666	20.00	UG/L	UG/L	34.59	4.50	1.85	155.73	64.09

Attachment 12-3. Concentration-Based Limitations

After Transfers of Long-Term Averages, Variability Factors, and Limitations

---------- Subcategory=FINISHING -- Option=SPECIALTY_BAT1 ----------

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
AMMONIA AS NITROGEN	7664417	0.05	MG/L	MG/L	11.71	1.94	1.28	22.75	14.94
CHROMIUM	7440473	10.00	UG/L	UG/L	104.31	2.50	1.40	260.25	146.11
CHROMIUM (VI)	18540299	0.01	MG/L	MG/L	0.08	2.15	1.32	0.17	0.10
FLUORIDE	16984488	0.10	MG/L	MG/L	16.34	1.42	1.14	23.25	18.54
NICKEL	7440020	40.00	UG/L	UG/L	43.61	1.76	1.24	76.80	54.00
OIL AND GREASE	C036	5.00	MG/L	MG/L	6.20	1.44	1.14	8.96	7.09
TSS	C009	4.00	MG/L	MG/L	4.00	3.15	1.58	12.59	6.32

---------- Subcategory=INT_HOTFORM -- Option=CARBON_BAT1 ----------

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
LEAD	7439921	50	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
OIL AND GREASE	C036	5	MG/L	MG/L	6.58	1.44	1.14	9.50	7.52
TSS	C009	4	MG/L	MG/L	9.88	2.20	1.50	21.75	14.87
ZINC	7440666	20	UG/L	UG/L	87.94	1.79	1.24	157.24	108.68

---------- Subcategory=INT_HOTFORM -- Option=SPECIALTY_BAT1 ----------

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
CHROMIUM	7440473	10	UG/L	UG/L	25.12	3.85	1.73	96.78	43.43
NICKEL	7440020	40	UG/L	UG/L	108.14	3.04	1.60	329.03	172.50
OIL AND GREASE	C036	5	MG/L	MG/L	9.20	3.07	1.56	28.24	14.31
TSS	C009	4	MG/L	MG/L	7.27	4.37	1.80	31.74	13.09

---------- Subcategory=INT_STEEL -- Option=BAT1 ----------

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
LEAD	7439921	50	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
ZINC	7440666	20	UG/L	UG/L	68.02	2.46	1.40	167.20	95.26

Attachment 12-3. Concentration-Based Limitations

After Transfers of Long-Term Averages, Variability Factors, and Limitations

Subcategory=IRON -- Option=BAT1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
AMMONIA AS NITROGEN	7664417	0.05	MG/L	MG/L	0.28	3.77	1.70	1.04	0.47
CYANIDE	57125	0.02	MG/L	MG/L	1.45	5.43	2.06	7.87	2.99
LEAD	7439921	50.00	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
OIL AND GREASE	C036	5.00	MG/L	MG/L	5.88	1.44	1.14	8.49	6.72
PHENOL	108952	10.00	UG/L	UG/L	10.00	7.40	2.51	74.03	25.09
TCDF	51207319	10.00	PG/L	PG/L	10.00	.	.	.	.
ZINC	7440666	20.00	UG/L	UG/L	36.80	5.04	1.98	185.64	73.01

Subcategory=IRON -- Option=PSES1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
AMMONIA AS NITROGEN	7664417	0.05	MG/L	MG/L	72.49	1.48	1.15	107.56	83.40
LEAD	7439921	50.00	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
OIL AND GREASE	C036	5.00	MG/L	MG/L	5.88	1.44	1.14	8.49	6.72
TCDF	51207319	10.00	PG/L	PG/L	10.00	.	.	.	.
ZINC	7440666	20.00	UG/L	UG/L	842.63	2.73	1.44	2,299.30	1,213.23

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
LEAD	7439921	50	UG/L	UG/L	50.00	2.92	1.52	145.85	76.01
ZINC	7440666	20	UG/L	UG/L	31.34	3.87	1.72	121.30	53.87

Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
CHROMIUM	7440473	10	UG/L	UG/L	25.12	3.85	1.73	96.78	43.43
NICKEL	7440020	40	UG/L	UG/L	108.14	3.04	1.60	329.03	172.50

Attachment 12-3. Concentration-Based Limitations

After Transfers of Long-Term Averages, Variability Factors, and Limitations

Subcategory=OTHER -- Option=DRI_BPT

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
TSS	C009	4	MG/L	MG/L	7.51	3.54	1.65	26.58	12.36

Subcategory=OTHER -- Option=FORGING

Analyte	CAS Number	Baseline Value	Baseline Unit	Unit	LTA	1-Day V.F.	Monthly V.F.	Daily Limit	Monthly Limit
OIL AND GREASE	C036	5	MG/L	MG/L	7.89	2.26	1.35	18.87	10.92
TSS	C009	4	MG/L	MG/L	8.57	3.28	1.65	26.75	13.98

Attachment 12-4 Production Values

Subcategory	Option	General Process[1]	Manufacturing Process[1]	Production[2] (gal/ton)
Cokemaking	BAT1	By-Product	n/a	158
		Non-recovery	n/a	0
	BAT3	By-Product	n/a	158
		Non-recovery	n/a	0
	PSES1	By-Product	n/a	158
		Non-recovery	n/a	0
Steel Finishing	CARBON_BAT1	Acid Pickling - Hydrochloric	Strip, Sheet	50
			Bar, Billet, Rod, Coil	490
			Pipe, Tube	1,020
			Plate	35
		Acid Pickling - Sulfuric	Strip, Sheet	230
			Bar, Billet, Rod, Coil	280
			Pipe, Tube	500
			Plate	35
		Acid Regeneration	fume scrubbers (gal/min)	100
		Annealing without water quench	n/a	0
		Cold Forming	Single Stand, recirculation	1
			Single Stand, dir. application	3
			Multiple Stand, recirculation	25
			Multiple Stand, dir. application	275
			Multiple Stand, Combination	143

Subcategory	Option	General Process[1]	Manufacturing Process[1]	Production[2] (gal/ton)
Steel Finishing (continued)	CARBON_BAT1 (continued)	Alkaline Cleaning	Strip, Sheet	350
			Pipe, Tube	20
		Continuous Annealing Lines	n/a	20
		Hot Coating	Galvanizing, terne & other metals	550
		Electroplating	Strip, Sheet: Tin/Chrome	1,100
			Strip, Sheet: Zinc, Other metals	550
			Plate	35
		Wet air pollution control devices	fume scrubbers (gal/min)	15
Steel Finishing	SPECIALTY_BAT1	Acid Pickling and other descaling	Bar, Billet	230
			Pipe, tube	770
			Strip, Sheet	700
			Plate	35
		Acid Regeneration	fume scrubbers (gal/min)	100
		Annealing without water quench	n/a	0
		Cold Forming	Single Stand, recirculation	3
			Single Stand, dir. application	35
			Multiple Stand, recirculation	16
			Multiple Stand, dir. application	275
			Multiple Stand, Combination	143
		Alkaline Cleaning	Strip, Sheet	2,500
			Pipe, tube	20
		Continuous Annealing Lines	n/a	20
		Wet air pollution control devices	fume scrubbers (gal/min)	15

Subcategory	Option	General Process[1]	Manufacturing Process[1]	Production[2] (gal/ton)
Integrated and Stand-Alone Hot Forming	CARBON_BAT1	n/a	n/a	100
	SPECIALTY_BAT1	n/a	n/a	100
Integrated Steelmaking	BAT1	Basic Oxygen Furnaces	Semi-wet air controls	10
			Wet - open combustion	20
			Wet - suppressed combustion	20
		Ladle Metallurgy	n/a	0
		Vacuum Degassing	n/a	15
		Continuous Casting	n/a	20
Ironmaking	BAT1	Sintering	n/a	75
			dry air pollution control	0
		Blast	n/a	25
			dry air pollution control	0
	PSES1	Sintering	n/a	75
		Blast	n/a	25
Non-Integrated Steelmaking and Hot Forming	CARBON_BAT1	Electric Arc Furnaces	n/a	0
		Vacuum Degassing	n/a	10
		Continuous Casting	n/a	10
		Hot Forming	n/a	50
	SPECIALTY_BAT1	Electric Arc Furnaces	n/a	0
		Vacuum Degassing	n/a	10
		Continuous Casting	n/a	10
		Hot Forming	n/a	50
		Ladle Metallurgy	n/a	0

Subcategory	Option	General Process[1]	Manufacturing Process[1]	Production[2] (gal/ton)
Other Operations	DRI_BPT	n/a	n/a	90
	FORGING	n/a	n/a	100
	BRIQUETTING	n/a	n/a	0

[1]Processes are only identified where there are differences between production values.
[2]Units are gal/ton except for fume scrubbers (gal/min)

Attachment 12-5. Production-Normalized Limitations

Subcategory=COKE_BYPROD -- Option=BAT3

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	BY-PRODUCT	N/A	158	0.000364	0.00137	0.000618	LBS/TON
AMMONIA AS NITROGEN	7664417	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
BENZO(A)PYRENE	50328	BY-PRODUCT	N/A	158	0.0000133	0.0000909	0.0000304	LBS/TON
BENZO(A)PYRENE	50328	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
CYANIDE	57125	BY-PRODUCT	N/A	158	0.00191	0.0104	0.00394	LBS/TON
CYANIDE	57125	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
MERCURY	7439976	BY-PRODUCT	N/A	158	0.000000389	0.000000864	0.000000523	LBS/TON
MERCURY	7439976	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
NAPHTHALENE	91203	BY-PRODUCT	N/A	158	0.0000151	0.000103	0.0000345	LBS/TON
NAPHTHALENE	91203	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
OIL AND GREASE	C036	BY-PRODUCT	N/A	158	0.00955	0.0246	0.0132	LBS/TON
OIL AND GREASE	C036	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
PHENOL	108952	BY-PRODUCT	N/A	158	0.0000133	0.0000332	0.0000187	LBS/TON
PHENOL	108952	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
SELENIUM	7782492	BY-PRODUCT	N/A	158	0.000146	0.000185	0.000159	LBS/TON
SELENIUM	7782492	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
THIOCYANATE	302045	BY-PRODUCT	N/A	158	0.000954	0.00164	0.00115	LBS/TON
THIOCYANATE	302045	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
TOTAL RESIDUAL CHLORINE	7782505	BY-PRODUCT	N/A	158	.	0.000659	.	LBS/TON
TOTAL RESIDUAL CHLORINE	7782505	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
TSS	C009	BY-PRODUCT	N/A	158	0.0223	0.0665	0.0337	LBS/TON
TSS	C009	NON-RECOVERY	N/A	0	.	.	.	LBS/TON

Subcategory=COKE_BYPROD -- Option=PSES1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	BY-PRODUCT	N/A	158	0.0446	0.0845	0.0559	LBS/TON
AMMONIA AS NITROGEN	7664417	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
CYANIDE	57125	BY-PRODUCT	N/A	158	0.00855	0.0244	0.0128	LBS/TON
CYANIDE	57125	NON-RECOVERY	N/A	0	.	.	.	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=COKE_BYPROD -- Option=PSES1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
NAPHTHALENE	91203	BY-PRODUCT	N/A	158	0.000339	0.00268	0.000869	LBS/TON
NAPHTHALENE	91203	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
PHENOL	108952	BY-PRODUCT	N/A	158	0.287	2.13	0.720	LBS/TON
PHENOL	108952	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
SELENIUM	7782492	BY-PRODUCT	N/A	158	0.000941	0.00125	0.00104	LBS/TON
SELENIUM	7782492	NON-RECOVERY	N/A	0	.	.	.	LBS/TON
THIOCYANATE	302045	BY-PRODUCT	N/A	158	0.277	0.402	0.317	LBS/TON
THIOCYANATE	302045	NON-RECOVERY	N/A	0	.	.	.	LBS/TON

Subcategory=FINISHING -- Option=CARBON_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
CHROMIUM	7440473	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.0000802	0.000227	0.000117	LBS/TON
CHROMIUM	7440473	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.000167	0.000472	0.000243	LBS/TON
CHROMIUM	7440473	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.00000573	0.0000162	0.00000834	LBS/TON
CHROMIUM	7440473	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.00000818	0.0000231	0.0000119	LBS/TON
CHROMIUM	7440473	ACID PICKLING-SULFURIC	BAR,BILLET,ROD,COIL	280	0.0000458	0.000130	0.0000668	LBS/TON
CHROMIUM	7440473	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.0000818	0.000231	0.000119	LBS/TON
CHROMIUM	7440473	ACID PICKLING-SULFURIC	PLATE	35	0.00000573	0.0000162	0.00000834	LBS/TON
CHROMIUM	7440473	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0000376	0.000106	0.0000548	LBS/TON
CHROMIUM	7440473	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0236	0.0666	0.0343	LBS/DAY
CHROMIUM	7440473	ALKALINE CLEANING	PIPE,TUBE	20	0.00000327	0.00000925	0.00000477	LBS/TON
CHROMIUM	7440473	ALKALINE CLEANING	STRIP,SHEET	350	0.0000573	0.000162	0.0000834	LBS/TON
CHROMIUM	7440473	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
CHROMIUM	7440473	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000234	0.0000662	0.0000341	LBS/TON
CHROMIUM	7440473	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0000450	0.000127	0.0000656	LBS/TON
CHROMIUM	7440473	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.000000491	0.00000139	0.000000715	LBS/TON
CHROMIUM	7440473	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.00000409	0.0000116	0.00000596	LBS/TON
CHROMIUM	7440473	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.000000164	0.000000463	0.000000238	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
CHROMIUM	7440473	CONTINUOUS ANNEALING LINES	N/A	20	0.00000327	0.00000925	0.00000477	LBS/TON
CHROMIUM	7440473	ELECTROPLATING	PLATE	35	0.00000573	0.0000162	0.00000834	LBS/TON
CHROMIUM	7440473	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.000180	0.000509	0.000262	LBS/TON
CHROMIUM	7440473	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.0000900	0.000255	0.000131	LBS/TON
CHROMIUM	7440473	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.0000900	0.000255	0.000131	LBS/TON
CHROMIUM	7440473	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.00353	0.00999	0.00515	LBS/DAY
CHROMIUM (VI)	18540299	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.0000427	0.0000508	0.0000463	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.0000890	0.000106	0.0000963	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.00000305	0.00000363	0.00000330	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.00000436	0.00000518	0.00000472	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-SULFURIC	BAR,BILLET,ROD,COIL	280	0.0000244	0.0000290	0.0000264	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.0000436	0.0000518	0.0000472	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-SULFURIC	PLATE	35	0.00000305	0.00000363	0.00000330	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0000201	0.0000238	0.0000217	LBS/TON
CHROMIUM (VI)	18540299	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0126	0.0149	0.0136	LBS/DAY
CHROMIUM (VI)	18540299	ALKALINE CLEANING	PIPE,TUBE	20	0.00000174	0.00000207	0.00000189	LBS/TON
CHROMIUM (VI)	18540299	ALKALINE CLEANING	STRIP,SHEET	350	0.0000305	0.0000363	0.0000330	LBS/TON
CHROMIUM (VI)	18540299	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000125	0.0000148	0.0000135	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0000240	0.0000285	0.0000260	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.000000262	0.000000311	0.000000283	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.00000218	0.00000259	0.00000236	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.0000000872	0.000000104	0.0000000944	LBS/TON
CHROMIUM (VI)	18540299	CONTINUOUS ANNEALING LINES	N/A	20	0.00000174	0.00000207	0.00000189	LBS/TON
CHROMIUM (VI)	18540299	ELECTROPLATING	PLATE	35	0.00000305	0.00000363	0.00000330	LBS/TON
CHROMIUM (VI)	18540299	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.0000959	0.000114	0.000104	LBS/TON
CHROMIUM (VI)	18540299	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.0000480	0.0000570	0.0000519	LBS/TON
CHROMIUM (VI)	18540299	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.0000480	0.0000570	0.0000519	LBS/TON
CHROMIUM (VI)	18540299	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.00188	0.00224	0.00204	LBS/DAY
LEAD	7439921	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.000204	0.000596	0.000311	LBS/TON
LEAD	7439921	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.000426	0.00124	0.000647	LBS/TON
LEAD	7439921	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.0000146	0.0000426	0.0000222	LBS/TON
LEAD	7439921	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.0000209	0.0000609	0.0000317	LBS/TON
LEAD	7439921	ACID PICKLING-SULFURIC	BAR,BILLET,ROD,COIL	280	0.000117	0.000341	0.000178	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
LEAD	7439921	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.000209	0.000609	0.000317	LBS/TON
LEAD	7439921	ACID PICKLING-SULFURIC	PLATE	35	0.0000146	0.0000426	0.0000222	LBS/TON
LEAD	7439921	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0000960	0.000280	0.000146	LBS/TON
LEAD	7439921	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0601	0.175	0.0913	LBS/DAY
LEAD	7439921	ALKALINE CLEANING	PIPE,TUBE	20	0.00000835	0.0000243	0.0000127	LBS/TON
LEAD	7439921	ALKALINE CLEANING	STRIP,SHEET	350	0.000146	0.000426	0.000222	LBS/TON
LEAD	7439921	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
LEAD	7439921	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000597	0.000174	0.0000907	LBS/TON
LEAD	7439921	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.000115	0.000335	0.000174	LBS/TON
LEAD	7439921	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.00000125	0.00000365	0.00000190	LBS/TON
LEAD	7439921	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.0000104	0.0000304	0.0000159	LBS/TON
LEAD	7439921	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.000000417	0.00000122	0.000000634	LBS/TON
LEAD	7439921	CONTINUOUS ANNEALING LINES	N/A	20	0.00000835	0.0000243	0.0000127	LBS/TON
LEAD	7439921	ELECTROPLATING	PLATE	35	0.0000146	0.0000426	0.0000222	LBS/TON
LEAD	7439921	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.000459	0.00134	0.000698	LBS/TON
LEAD	7439921	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.000229	0.000669	0.000349	LBS/TON
LEAD	7439921	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.000229	0.000669	0.000349	LBS/TON
LEAD	7439921	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.00901	0.0263	0.0137	LBS/DAY
OIL AND GREASE	C036	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.0257	0.0307	0.0274	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.0535	0.0638	0.0571	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.00184	0.00219	0.00196	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.00262	0.00313	0.00280	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-SULFURIC	BAR,BILLET,ROD,COIL	280	0.0147	0.0175	0.0157	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.0262	0.0313	0.0280	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-SULFURIC	PLATE	35	0.00184	0.00219	0.00196	LBS/TON
OIL AND GREASE	C036	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0121	0.0144	0.0129	LBS/TON
OIL AND GREASE	C036	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	7.55	9.01	8.07	LBS/DAY
OIL AND GREASE	C036	ALKALINE CLEANING	PIPE,TUBE	20	0.00105	0.00125	0.00112	LBS/TON
OIL AND GREASE	C036	ALKALINE CLEANING	STRIP,SHEET	350	0.0184	0.0219	0.0196	LBS/TON
OIL AND GREASE	C036	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
OIL AND GREASE	C036	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.00750	0.00895	0.00801	LBS/TON
OIL AND GREASE	C036	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0144	0.0172	0.0154	LBS/TON
OIL AND GREASE	C036	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.000157	0.000188	0.000168	LBS/TON
OIL AND GREASE	C036	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.00131	0.00156	0.00140	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
OIL AND GREASE	C036	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.0000524	0.0000626	0.0000560	LBS/TON
OIL AND GREASE	C036	CONTINUOUS ANNEALING LINES	N/A	20	0.00105	0.00125	0.00112	LBS/TON
OIL AND GREASE	C036	ELECTROPLATING	PLATE	35	0.00184	0.00219	0.00196	LBS/TON
OIL AND GREASE	C036	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.0577	0.0688	0.0616	LBS/TON
OIL AND GREASE	C036	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.0288	0.0344	0.0308	LBS/TON
OIL AND GREASE	C036	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.0288	0.0344	0.0308	LBS/TON
OIL AND GREASE	C036	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	1.13	1.35	1.21	LBS/DAY
TSS	C009	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.0216	0.0566	0.0308	LBS/TON
TSS	C009	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.0451	0.118	0.0641	LBS/TON
TSS	C009	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.00155	0.00405	0.00220	LBS/TON
TSS	C009	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.00221	0.00578	0.00314	LBS/TON
TSS	C009	ACID PICKLING-SULFURIC	BAR,BILLET;ROD,COIL	280	0.0124	0.0324	0.0176	LBS/TON
TSS	C009	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.0221	0.0578	0.0314	LBS/TON
TSS	C009	ACID PICKLING-SULFURIC	PLATE	35	0.00155	0.00405	0.00220	LBS/TON
TSS	C009	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0102	0.0266	0.0145	LBS/TON
TSS	C009	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	6.36	16.6	9.05	LBS/DAY
TSS	C009	ALKALINE CLEANING	PIPE,TUBE	20	0.000883	0.00231	0.00126	LBS/TON
TSS	C009	ALKALINE CLEANING	STRIP,SHEET	350	0.0155	0.0405	0.0220	LBS/TON
TSS	C009	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
TSS	C009	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.00632	0.0165	0.00899	LBS/TON
TSS	C009	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0121	0.0318	0.0173	LBS/TON
TSS	C009	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.000133	0.000347	0.000189	LBS/TON
TSS	C009	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.00110	0.00289	0.00157	LBS/TON
TSS	C009	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.0000442	0.000116	0.0000628	LBS/TON
TSS	C009	CONTINUOUS ANNEALING LINES	N/A	20	0.000883	0.00231	0.00126	LBS/TON
TSS	C009	ELECTROPLATING	PLATE	35	0.00155	0.00405	0.00220	LBS/TON
TSS	C009	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.0486	0.127	0.0691	LBS/TON
TSS	C009	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.0243	0.0636	0.0346	LBS/TON
TSS	C009	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.0243	0.0636	0.0346	LBS/TON
TSS	C009	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.954	2.50	1.36	LBS/DAY
ZINC	7440666	ACID PICKLING-HYDROCHLORIC	BAR,BILLET,ROD,COIL	490	0.000141	0.000637	0.000262	LBS/TON
ZINC	7440666	ACID PICKLING-HYDROCHLORIC	PIPE,TUBE	1020	0.000294	0.00133	0.000546	LBS/TON
ZINC	7440666	ACID PICKLING-HYDROCHLORIC	PLATE	35	0.0000101	0.0000455	0.0000187	LBS/TON
ZINC	7440666	ACID PICKLING-HYDROCHLORIC	STRIP,SHEET	50	0.0000144	0.0000650	0.0000267	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=CARBON_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
ZINC	7440666	ACID PICKLING-SULFURIC	BAR,BILLET,ROD,COIL	280	0.0000808	0.000364	0.000150	LBS/TON
ZINC	7440666	ACID PICKLING-SULFURIC	PIPE,TUBE	500	0.000144	0.000650	0.000267	LBS/TON
ZINC	7440666	ACID PICKLING-SULFURIC	PLATE	35	0.0000101	0.0000455	0.0000187	LBS/TON
ZINC	7440666	ACID PICKLING-SULFURIC	STRIP,SHEET	230	0.0000664	0.000299	0.000123	LBS/TON
ZINC	7440666	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0416	0.187	0.0770	LBS/DAY
ZINC	7440666	ALKALINE CLEANING	PIPE,TUBE	20	0.00000577	0.0000260	0.0000107	LBS/TON
ZINC	7440666	ALKALINE CLEANING	STRIP,SHEET	350	0.000101	0.000455	0.000187	LBS/TON
ZINC	7440666	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
ZINC	7440666	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000413	0.000186	0.0000765	LBS/TON
ZINC	7440666	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0000794	0.000357	0.000147	LBS/TON
ZINC	7440666	COLD FORMING	DIR.APPLICATION-SINGLE STAND	3	0.000000866	0.00000390	0.00000160	LBS/TON
ZINC	7440666	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	25	0.00000722	0.0000325	0.0000134	LBS/TON
ZINC	7440666	COLD FORMING	RECIRCULATION-SINGLE STAND	1	0.000000289	0.00000130	0.000000535	LBS/TON
ZINC	7440666	CONTINUOUS ANNEALING LINES	N/A	20	0.00000577	0.0000260	0.0000107	LBS/TON
ZINC	7440666	ELECTROPLATING	PLATE	35	0.0000101	0.0000455	0.0000187	LBS/TON
ZINC	7440666	ELECTROPLATING	STRIP,SHEET:TIN,CHROMIUM	1100	0.000318	0.00143	0.000588	LBS/TON
ZINC	7440666	ELECTROPLATING	STRIP,SHEET:ZINC,OTHER METALS	550	0.000159	0.000715	0.000294	LBS/TON
ZINC	7440666	HOT COATING	GALVANIZING,TERNE&OTHER METALS	550	0.000159	0.000715	0.000294	LBS/TON
ZINC	7440666	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.00624	0.0281	0.0116	LBS/DAY

Subcategory=FINISHING -- Option=SPECIALTY_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.0225	0.0437	0.0287	LBS/TON
AMMONIA AS NITROGEN	7664417	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.0752	0.146	0.0960	LBS/TON
AMMONIA AS NITROGEN	7664417	ACID PICKLING&OTHER DESCALI	PLATE	35	0.00342	0.00665	0.00436	LBS/TON
AMMONIA AS NITROGEN	7664417	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.0684	0.133	0.0873	LBS/TON
AMMONIA AS NITROGEN	7664417	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	14.1	27.3	17.9	LBS/DAY
AMMONIA AS NITROGEN	7664417	ALKALINE CLEANING	PIPE, TUBE	20	0.00195	0.00380	0.00249	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton).	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	ALKALINE CLEANING	STRIP,SHEET	2500	0.244	0.475	0.312	LBS/TON
AMMONIA AS NITROGEN	7664417	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
AMMONIA AS NITROGEN	7664417	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0140	0.0272	0.0178	LBS/TON
AMMONIA AS NITROGEN	7664417	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0269	0.0522	0.0343	LBS/TON
AMMONIA AS NITROGEN	7664417	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.00342	0.00665	0.00436	LBS/TON
AMMONIA AS NITROGEN	7664417	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.00156	0.00304	0.00199	LBS/TON
AMMONIA AS NITROGEN	7664417	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.000293	0.000570	0.000374	LBS/TON
AMMONIA AS NITROGEN	7664417	CONTINUOUS ANNEALING LINES	N/A	20	0.00195	0.00380	0.00249	LBS/TON
AMMONIA AS NITROGEN	7664417	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	2.11	4.10	2.69	LBS/DAY
CHROMIUM	7440473	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.000200	0.000500	0.000280	LBS/TON
CHROMIUM	7440473	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.000670	0.00167	0.000939	LBS/TON
CHROMIUM	7440473	ACID PICKLING&OTHER DESCALI	PLATE	35	0.0000305	0.0000760	0.0000427	LBS/TON
CHROMIUM	7440473	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.000609	0.00152	0.000854	LBS/TON
CHROMIUM	7440473	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.125	0.313	0.176	LBS/DAY
CHROMIUM	7440473	ALKALINE CLEANING	PIPE, TUBE	20	0.0000174	0.0000434	0.0000244	LBS/TON
CHROMIUM	7440473	ALKALINE CLEANING	STRIP,SHEET	2500	0.00218	0.00543	0.00305	LBS/TON
CHROMIUM	7440473	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
CHROMIUM	7440473	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.000124	0.000311	0.000174	LBS/TON
CHROMIUM	7440473	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.000239	0.000597	0.000335	LBS/TON
CHROMIUM	7440473	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.0000305	0.0000760	0.0000427	LBS/TON
CHROMIUM	7440473	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.0000139	0.0000348	0.0000195	LBS/TON
CHROMIUM	7440473	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.00000261	0.00000652	0.00000366	LBS/TON
CHROMIUM	7440473	CONTINUOUS ANNEALING LINES	N/A	20	0.0000174	0.0000434	0.0000244	LBS/TON
CHROMIUM	7440473	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.0188	0.0469	0.0263	LBS/DAY
CHROMIUM (VI)	18540299	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.000148	0.000318	0.000196	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.000495	0.00107	0.000655	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING&OTHER DESCALI	PLATE	35	0.0000225	0.0000484	0.0000298	LBS/TON
CHROMIUM (VI)	18540299	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.000450	0.000969	0.000595	LBS/TON
CHROMIUM (VI)	18540299	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0926	0.199	0.122	LBS/DAY
CHROMIUM (VI)	18540299	ALKALINE CLEANING	PIPE, TUBE	20	0.0000129	0.0000277	0.0000170	LBS/TON
CHROMIUM (VI)	18540299	ALKALINE CLEANING	STRIP,SHEET	2500	0.00161	0.00346	0.00213	LBS/TON
CHROMIUM (VI)	18540299	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000919	0.000198	0.000122	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.000177	0.000381	0.000234	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
CHROMIUM (VI)	18540299	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.0000225	0.0000484	0.0000298	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.0000103	0.0000221	0.0000136	LBS/TON
CHROMIUM (VI)	18540299	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.00000193	0.00000415	0.00000255	LBS/TON
CHROMIUM (VI)	18540299	CONTINUOUS ANNEALING LINES	N/A	20	0.0000129	0.0000277	0.0000170	LBS/TON
CHROMIUM (VI)	18540299	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.0139	0.0299	0.0184	LBS/DAY
FLUORIDE	16984488	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.0314	0.0446	0.0356	LBS/TON
FLUORIDE	16984488	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.105	0.149	0.119	LBS/TON
FLUORIDE	16984488	ACID PICKLING&OTHER DESCALI	PLATE	35	0.00477	0.00679	0.00542	LBS/TON
FLUORIDE	16984488	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.0954	0.136	0.108	LBS/TON
FLUORIDE	16984488	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	19.6	27.9	22.3	LBS/DAY
FLUORIDE	16984488	ALKALINE CLEANING	PIPE, TUBE	20	0.00273	0.00388	0.00309	LBS/TON
FLUORIDE	16984488	ALKALINE CLEANING	STRIP,SHEET	2500	0.341	0.485	0.387	LBS/TON
FLUORIDE	16984488	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
FLUORIDE	16984488	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0195	0.0278	0.0221	LBS/TON
FLUORIDE	16984488	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0375	0.0534	0.0426	LBS/TON
FLUORIDE	16984488	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.00477	0.00679	0.00542	LBS/TON
FLUORIDE	16984488	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.00218	0.00311	0.00248	LBS/TON
FLUORIDE	16984488	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.000409	0.000582	0.000464	LBS/TON
FLUORIDE	16984488	CONTINUOUS ANNEALING LINES	N/A	20	0.00273	0.00388	0.00309	LBS/TON
FLUORIDE	16984488	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	2.94	4.19	3.34	LBS/DAY
NICKEL	7440020	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.0000837	0.000147	0.000104	LBS/TON
NICKEL	7440020	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.000280	0.000494	0.000347	LBS/TON
NICKEL	7440020	ACID PICKLING&OTHER DESCALI	PLATE	35	0.0000127	0.0000224	0.0000158	LBS/TON
NICKEL	7440020	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.000255	0.000449	0.000315	LBS/TON
NICKEL	7440020	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	0.0524	0.0923	0.0649	LBS/DAY
NICKEL	7440020	ALKALINE CLEANING	PIPE, TUBE	20	0.00000728	0.0000128	0.00000901	LBS/TON
NICKEL	7440020	ALKALINE CLEANING	STRIP,SHEET	2500	0.000910	0.00160	0.00113	LBS/TON
NICKEL	7440020	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
NICKEL	7440020	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.0000520	0.0000917	0.0000644	LBS/TON
NICKEL	7440020	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.000100	0.000176	0.000124	LBS/TON
NICKEL	7440020	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.0000127	0.0000224	0.0000158	LBS/TON
NICKEL	7440020	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.00000582	0.0000103	0.00000721	LBS/TON
NICKEL	7440020	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.00000109	0.00000192	0.00000135	LBS/TON
NICKEL	7440020	CONTINUOUS ANNEALING LINES	N/A	20	0.00000728	0.0000128	0.00000901	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=FINISHING -- Option=SPECIALTY_BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
NICKEL	7440020	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.00786	0.0138	0.00973	LBS/DAY
OIL AND GREASE	C036	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.0119	0.0172	0.0136	LBS/TON
OIL AND GREASE	C036	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.0398	0.0576	0.0456	LBS/TON
OIL AND GREASE	C036	ACID PICKLING&OTHER DESCALI	PLATE	35	0.00181	0.00262	0.00207	LBS/TON
OIL AND GREASE	C036	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.0362	0.0523	0.0414	LBS/TON
OIL AND GREASE	C036	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	7.45	10.8	8.52	LBS/DAY
OIL AND GREASE	C036	ALKALINE CLEANING	PIPE, TUBE	20	0.00103	0.00149	0.00118	LBS/TON
OIL AND GREASE	C036	ALKALINE CLEANING	STRIP,SHEET	2500	0.129	0.187	0.148	LBS/TON
OIL AND GREASE	C036	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
OIL AND GREASE	C036	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.00740	0.0107	0.00846	LBS/TON
OIL AND GREASE	C036	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.0142	0.0206	0.0163	LBS/TON
OIL AND GREASE	C036	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.00181	0.00262	0.00207	LBS/TON
OIL AND GREASE	C036	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.000828	0.00120	0.000947	LBS/TON
OIL AND GREASE	C036	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.000155	0.000224	0.000177	LBS/TON
OIL AND GREASE	C036	CONTINUOUS ANNEALING LINES	N/A	20	0.00103	0.00149	0.00118	LBS/TON
OIL AND GREASE	C036	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	1.12	1.61	1.28	LBS/DAY
TSS	C009	ACID PICKLING&OTHER DESCALI	BAR,BILLET	230	0.00768	0.0242	0.0121	LBS/TON
TSS	C009	ACID PICKLING&OTHER DESCALI	PIPE, TUBE	770	0.0257	0.0809	0.0406	LBS/TON
TSS	C009	ACID PICKLING&OTHER DESCALI	PLATE	35	0.00117	0.00368	0.00184	LBS/TON
TSS	C009	ACID PICKLING&OTHER DESCALI	STRIP,SHEET	700	0.0234	0.0735	0.0369	LBS/TON
TSS	C009	ACID REGENERATION	FUME SCRUBBER(GAL/MIN)	100	4.81	15.1	7.59	LBS/DAY
TSS	C009	ALKALINE CLEANING	PIPE, TUBE	20	0.000668	0.00210	0.00105	LBS/TON
TSS	C009	ALKALINE CLEANING	STRIP,SHEET	2500	0.0835	0.263	0.132	LBS/TON
TSS	C009	ANNEALING W/O WATER QUENCH	N/A	0	.	.	.	LBS/TON
TSS	C009	COLD FORMING	COMBINATION-MULTIPLE STANDS	143	0.00477	0.0150	0.00754	LBS/TON
TSS	C009	COLD FORMING	DIR.APPLICATION-MULTIPLE STANDS	275	0.00918	0.0289	0.0145	LBS/TON
TSS	C009	COLD FORMING	DIR.APPLICATION-SINGLE STAND	35	0.00117	0.00368	0.00184	LBS/TON
TSS	C009	COLD FORMING	RECIRCULATION-MULTIPLE STANDS	16	0.000534	0.00168	0.000843	LBS/TON
TSS	C009	COLD FORMING	RECIRCULATION-SINGLE STAND	3	0.000100	0.000315	0.000158	LBS/TON
TSS	C009	CONTINUOUS ANNEALING LINES	N/A	20	0.000668	0.00210	0.00105	LBS/TON
TSS	C009	WET AIR POLLUTION CONTROL D	FUME SCRUBBER(GAL/MIN)	15	0.721	2.27	1.14	LBS/DAY

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=INT_HOTFORM -- Option=CARBON_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
LEAD	7439921	N/A	N/A	100	0.0000417	0.000122	0.0000634	LBS/TON
OIL AND GREASE	C036	N/A	N/A	100	0.00549	0.00793	0.00628	LBS/TON
TSS	C009	N/A	N/A	100	0.00824	0.0182	0.0124	LBS/TON
ZINC	7440666	N/A	N/A	100	0.0000734	0.000131	0.0000907	LBS/TON

Subcategory=INT_HOTFORM -- Option=SPECIALTY_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
CHROMIUM	7440473	N/A	N/A	100	0.0000210	0.0000808	0.0000362	LBS/TON
NICKEL	7440020	N/A	N/A	100	0.0000902	0.000275	0.000144	LBS/TON
OIL AND GREASE	C036	N/A	N/A	100	0.00767	0.0236	0.0119	LBS/TON
TSS	C009	N/A	N/A	100	0.00607	0.0265	0.0109	LBS/TON

Subcategory=INT_STEEL -- Option=BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
LEAD	7439921	BASIC OXYGEN FURNACES	SEMI-WET AIR CONTROLS	10	0.00000417	0.0000122	0.00000634	LBS/TON
LEAD	7439921	BASIC OXYGEN FURNACES	WET-OPEN COMBUSTION	20	0.00000835	0.0000243	0.0000127	LBS/TON
LEAD	7439921	BASIC OXYGEN FURNACES	WET-SUPPRESSED COMBUSTION	20	0.00000835	0.0000243	0.0000127	LBS/TON
LEAD	7439921	CONTINUOUS CASTING	N/A	20	0.00000835	0.0000243	0.0000127	LBS/TON
LEAD	7439921	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
LEAD	7439921	VACUUM DEGASSING	N/A	15	0.00000626	0.0000183	0.00000951	LBS/TON
ZINC	7440666	BASIC OXYGEN FURNACES	SEMI-WET AIR CONTROLS	10	0.00000568	0.0000140	0.00000795	LBS/TON
ZINC	7440666	BASIC OXYGEN FURNACES	WET-OPEN COMBUSTION	20	0.0000114	0.0000279	0.0000159	LBS/TON
ZINC	7440666	BASIC OXYGEN FURNACES	WET-SUPPRESSED COMBUSTION	20	0.0000114	0.0000279	0.0000159	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=INT_STEEL -- Option=BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
ZINC	7440666	CONTINUOUS CASTING	N/A	20	0.0000114	0.0000279	0.0000159	LBS/TON
ZINC	7440666	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
ZINC	7440666	VACUUM DEGASSING	N/A	15	0.00000852	0.0000209	0.0000119	LBS/TON

Subcategory=IRON -- Option=BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	BLAST	N/A	25	0.0000576	0.000217	0.0000977	LBS/TON
AMMONIA AS NITROGEN	7664417	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
AMMONIA AS NITROGEN	7664417	SINTERING	N/A	75	0.000173	0.000652	0.000293	LBS/TON
CYANIDE	57125	BLAST	N/A	25	0.000302	0.00164	0.000623	LBS/TON
CYANIDE	57125	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
CYANIDE	57125	SINTERING	N/A	75	0.000907	0.00493	0.00187	LBS/TON
LEAD	7439921	BLAST	N/A	25	0.0000104	0.0000304	0.0000159	LBS/TON
LEAD	7439921	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
LEAD	7439921	SINTERING	N/A	75	0.0000313	0.0000913	0.0000476	LBS/TON
OIL AND GREASE	C036	BLAST	N/A	25	0.00123	0.00177	0.00140	LBS/TON
OIL AND GREASE	C036	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
OIL AND GREASE	C036	SINTERING	N/A	75	0.00368	0.00531	0.00420	LBS/TON
PHENOL	108952	BLAST	N/A	25	0.00000209	0.0000154	0.00000523	LBS/TON
PHENOL	108952	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
PHENOL	108952	SINTERING	N/A	75	0.00000626	0.0000463	0.0000157	LBS/TON
TCDF	51207319	BLAST	N/A	25	.	.	.	LBS/TON
TCDF	51207319	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
TCDF	51207319	SINTERING	N/A	75	.	.	.	LBS/TON
TOTAL RESIDUAL CHLORINE	7782505	BLAST	N/A	25	.	0.000104	.	LBS/TON
TOTAL RESIDUAL CHLORINE	7782505	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
TOTAL RESIDUAL CHLORINE	7782505	SINTERING	N/A	75	.	0.000313	.	LBS/TON
TSS	C009	BLAST	N/A	25	.	0.00836	0.00313	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=IRON -- Option=BAT1 (continued)

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
TSS	C009	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
TSS	C009	SINTERING	N/A	75	.	0.0251	0.00939	LBS/TON
ZINC	7440666	BLAST	N/A	25	0.00000768	0.0000387	0.0000152	LBS/TON
ZINC	7440666	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
ZINC	7440666	SINTERING	N/A	75	0.0000230	0.000116	0.0000457	LBS/TON

Subcategory=IRON -- Option=PSES1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
AMMONIA AS NITROGEN	7664417	BLAST	N/A	25	0.0151	0.0224	0.0174	LBS/TON
AMMONIA AS NITROGEN	7664417	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
AMMONIA AS NITROGEN	7664417	SINTERING	N/A	75	0.0454	0.0673	0.0522	LBS/TON
LEAD	7439921	BLAST	N/A	25	0.0000104	0.0000304	0.0000159	LBS/TON
LEAD	7439921	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
LEAD	7439921	SINTERING	N/A	75	0.0000313	0.0000913	0.0000476	LBS/TON
OIL AND GREASE	C036	BLAST	N/A	25	0.00123	0.00177	0.00140	LBS/TON
OIL AND GREASE	C036	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
OIL AND GREASE	C036	SINTERING	N/A	75	0.00368	0.00531	0.00420	LBS/TON
TCDF	51207319	BLAST	N/A	25	.	.	.	LBS/TON
TCDF	51207319	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
TCDF	51207319	SINTERING	N/A	75	.	.	.	LBS/TON
ZINC	7440666	BLAST	N/A	25	0.000176	0.000480	0.000253	LBS/TON
ZINC	7440666	SINTERING	DRY AIR POLLUTION CONTROL	0	.	.	.	LBS/TON
ZINC	7440666	SINTERING	N/A	75	0.000527	0.00144	0.000759	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=NONINT_STEEL_HOTFORM -- Option=CARBON_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
LEAD	7439921	CONTINUOUS CASTING	N/A	10	0.00000417	0.0000122	0.00000634	LBS/TON
LEAD	7439921	ELECTRIC ARC FURNACES	N/A	0	.	.	.	LBS/TON
LEAD	7439921	HOT FORMING	N/A	50	0.0000209	0.0000609	0.0000317	LBS/TON
LEAD	7439921	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
LEAD	7439921	VACUUM DEGASSING	N/A	10	0.00000417	0.0000122	0.00000634	LBS/TON
ZINC	7440666	CONTINUOUS CASTING	N/A	10	0.00000262	0.0000101	0.00000450	LBS/TON
ZINC	7440666	ELECTRIC ARC FURNACES	N/A	0	.	.	.	LBS/TON
ZINC	7440666	HOT FORMING	N/A	50	0.0000131	0.0000506	0.0000225	LBS/TON
ZINC	7440666	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
ZINC	7440666	VACUUM DEGASSING	N/A	10	0.00000262	0.0000101	0.00000450	LBS/TON

Subcategory=NONINT_STEEL_HOTFORM -- Option=SPECIALTY_BAT1

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
CHROMIUM	7440473	CONTINUOUS CASTING	N/A	10	0.00000210	0.00000808	0.00000362	LBS/TON
CHROMIUM	7440473	ELECTRIC ARC FURNACES	N/A	0	.	.	.	LBS/TON
CHROMIUM	7440473	HOT FORMING	N/A	50	0.0000105	0.0000404	0.0000181	LBS/TON
CHROMIUM	7440473	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
CHROMIUM	7440473	VACUUM DEGASSING	N/A	10	0.00000210	0.00000808	0.00000362	LBS/TON
NICKEL	7440020	CONTINUOUS CASTING	N/A	10	0.00000902	0.0000275	0.0000144	LBS/TON
NICKEL	7440020	ELECTRIC ARC FURNACES	N/A	0	.	.	.	LBS/TON
NICKEL	7440020	HOT FORMING	N/A	50	0.0000451	0.000137	0.0000720	LBS/TON
NICKEL	7440020	LADLE METALLURGY	N/A	0	.	.	.	LBS/TON
NICKEL	7440020	VACUUM DEGASSING	N/A	10	0.00000902	0.0000275	0.0000144	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.

Attachment 12-5. Production-Normalized Limitations

Subcategory=OTHER -- Option=DRI_BPT

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
TSS	C009	N/A	N/A	90	0.00564	0.0200	0.00929	LBS/TON

Subcategory=OTHER -- Option=FORGING

Analyte	CAS Number	General Process	Manufacturing Process	Production (gal/ton)	Production-normalized LTA	Production-normalized Daily Limit	Production-normalized Monthly Limit	Production-normalized Unit
OIL AND GREASE	C036	N/A	N/A	100	0.00658	0.0149	0.00889	LBS/TON
TSS	C009	N/A	N/A	100	0.00716	0.0235	0.0118	LBS/TON

If the production-normalized unit is LBS/DAY, then the production unit is GAL/MIN rather than GAL/TON.