United States
Environmental Protection
Agency

Technical Support Document for the 2006 Effluent Guidelines Program Plan

More information about this document can be found
at http://www.epa.gov/waterscience/guide/

December 2006

EPA-821R-06-018

PART II: RESULTS OF THE 2006 ANNUAL REVIEW OF INDUSTRIAL CATEGORIES WITH EXISTING ELGS

5.0 2006 ANNUAL REVIEW OF EXISTING EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS AND RANKING OF POINT SOURCE CATEGORIES

For the 2006 annual review, EPA conducted the following activities:

- Updated the reviews from previous years (i.e., revising the 2005 annual review results with new or corrected data);
- Performed new research: contacting industry to verify discharges, conducting literature searches, and collecting additional data; and
- Solicited information from stakeholders through comment response and other stakeholder outreach (e.g., meetings with industry trade groups).

This section summarizes the results from the 2005 annual review (Section 5.1), presents the results of the 2006 screening-level review (Section 5.2), and presents the prioritization of categories for the 2006 annual review (Section 5.3).

5.1 Summary of the Results from the 2005 Annual Review

EPA published its 2005 annual review of existing ELGs on August 29, 2005 (70 FR 51042). In the 2005 annual review, EPA identified 13 point source categories that represent the bulk of the estimated toxic discharges (as measured by TWPE) from existing industrial point source categories. EPA ranked each point source category by the amount of toxic pollutants in its discharge (as measured by TWPE) and identified the Steam Electric Power Generating and Pulp, Paper, and Paperboard Point Source Categories as the two categories with the highest TWPE. EPA identified 11 additional categories with potentially high TWPE discharge estimates. EPA collected and analyzed information on the pollutants discharged and wastewater treatment at these 11 categories but assigned a higher priority to investigating the Pulp, Paper, and Paperboard and Steam Electric Power Generating Point Source Categories.

In view of the annual nature of its reviews of existing ELGs, EPA believes that each annual review can and should influence succeeding annual reviews (e.g., by indicating data gaps, identifying new pollutants or pollution reduction technologies, or otherwise highlighting industrial categories for more detailed scrutiny in subsequent years). EPA used the findings, data and comments on the 2005 annual review to inform its 2006 annual review. The 2005 review built on the previous reviews by continuing to use the screening methodology, incorporating some refinements to assigning discharges to categories, and updating toxic weighting factors used to estimate potential hazards of toxic pollutant discharges. Likewise, EPA made similar refinements to assigning discharges to categories and updating toxic weighting factors used to estimate potential hazards of toxic pollutant discharges for the 2006 annual review.

5.2 Results of the 2006 Screening-Level Review

For the 2006 screening-level review, EPA combined the results of the *TRIReleases2002_v4* and the *PCSLoads2002_v4* databases, which are presented in Section 4.5 of this document. When combining the results of the databases, EPA made adjustments to the rankings for the following: discharges from industrial categories for which EPA is currently developing or revising ELGs, discharges from point source categories for which EPA has recently promulgated or revised ELGs, and discharges from facilities determined not to be representative of their category. Sections 5.2.1 through 5.2.3 discuss the rationale for these decisions. In addition, EPA created a final ranking using the *TRIReleases2003_v2* database, accounting for the same adjustments. The final combined database rankings represent the results of the 2006 screening-level review and are presented in Section 5.2.4.

5.2.1 Facilities for Which EPA is Currently Developing or Revising ELGs

EPA is currently considering revisions to ELGs for Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) (40 CFR 414) and the Inorganic Chemicals Manufacturing (40 CFR 415) Point Source Categories for facilities that produce chlorine or chlorinated hydrocarbons (CCH)[9]. Because the CCH rulemaking is underway, EPA excluded discharges from these facilities from further consideration under the current planning cycle. EPA subtracted the TWPE loads from facilities that produce chlorine or chlorinated hydrocarbons from the OCPSF and Inorganic Chemicals Manufacturing Point Source Category loads. Because facilities that produce chlorine and chlorinated hydrocarbons are only a subset of the OCPSF and Inorganic Chemicals Manufacturing Categories, EPA included loads for all other facilities in these two categories in ints prioritization of categories for further review.

5.2.2 Categories for Which EPA Recently Promulgated or Revised ELGs

For the 2006 annual review and development of category rankings, EPA did not prioritize point source categories for which ELGs were recently established or revised but not yet fully implemented, or were recently reviewed. In general, EPA removes a category from further consideration during a review cycle if EPA established, revised, or reviewed the category's ELGs within seven years prior to the current annual review. This seven-year period allows time for the ELGs to be incorporated into NPDES permits. For the 2006 annual review, this equates to any category with ELGs established or revised after 1999. Table 5-1 lists these categories.

Removing a point source category from further consideration in the development of the rankings does not mean that EPA eliminates the category from annual review. In cases where EPA is aware of the growth of a new segment within such category, or where new concerns are identified for previously unevaluated pollutants discharged by facilities in the category, EPA would apply closer scrutiny to the discharges from the category in deciding whether to consider it further during the current review cycle. For example, EPA plans to conduct a detailed study of the coal mining industry based on comments received on the 2006 Preliminary Plan, although the coal mining ELGs were revised in January 2002.

[9] EPA is also currently revising the CAFOs ELG; however, the TWPE associated with this category is low and does not affect the prioritization of categories based on TWPE.

Table 5-1. Point Source Categories That Have Undergone a Recent Rulemaking or Review

40 CFR Part Number	Point Source Category	Date of Rulemaking
451	Concentrated Aquatic Animal Production (or Aquaculture)	August 23, 2004
432	Meat and Poultry Products	September 8, 2004
413, 433, and 438	Metal Products and Machinery (including Metal Finishing and Electroplating)	May 13, 2003
122, 123, and 412	Concentrated Animal Feeding Operations (CAFOs)	February 12, 2003
420	Iron and Steel Manufacturing	October 17, 2002
434	Coal Mining (Coal Remining and Western Alkaline Coal Mining)	January 23, 2002
435	Oil & Gas Extraction (Synthetic-Based and Other Non-Aqueous Drilling Fluids)	February 21, 2001
136 and 437	Centralized Waste Treatment	December 22, 2000
442	Transportation Equipment Cleaning	August 14, 2000
444	Commercial Hazardous Waste Combustors	January 27, 2000
136 and 445	Landfills	January 19, 2000

Source: "Guidelines: Final, Proposed, and Under Development" at http://www.epa.gov/waterscience/guide. (U.S. EPA, 2006a).

5.2.3 Categories with One Facility Dominating the TWPE

EPA identified point source categories where only one facility was responsible for most of the TWPE reported to be discharged (i.e., where one facility's TWPE accounted for more than 95 percent of the category TWPE). Table 5-2 lists these categories. EPA identified four facilities that dominated the TWPE in the category to which they belonged. EPA investigated these facilities to determine if their discharges were representative of the category. If they were not, EPA subtracted the facility's TWPE from the total category TWPE and recalculated the category's ranking. EPA performed this analysis separately for each of the three databases. EPA's investigation of these facilities is detailed in a memorandum, entitled PCS and TRI Facilities that Dominate the Total Point Source Category TWPE (Kandle, 2006).

Table 5-2. Point Source Categories with One Facility Dominating the TWPE Discharges

Point Source Category	Facility with Over 95% of Category TWPE	City, State	Data Source	Pollutant Driving TWPE	Facility TWPE	% of Total Category TWPE	Action
Gum and Wood Chemicals Manufacturing	Hercules-Brunswick	Brunswick, GA	PCS 2002	Toxaphene (3,771,372 TWPE)	3,800,000	99.9%	Removed load from category TWPE
Plastic Molding and Forming	Innovia Films	Tecumseh, KS	PCS 2002	Carbon Disulfide (19,785 TWPE)	20,300	98.0%	Did not remove load from category TWPE
Miscellaneous Foods and Beverages	Bacardi Corporation	Catano, PR	PCS 2002	Sulfide (313,970 TWPE)	327,000	97.2%	Removed load from category TWPE
Gum and Wood Chemicals Manufacturing	Hercules-Brunswick	Brunswick, GA	TRI 2002	Carbon Disulfide (12,804 TWPE)	12,800	98.8%	Removed load from category TWPE
Aluminum Forming	Kaiser Aluminum & Chemical Corporation	Spokane, WA	TRI 2002	Polychlorinated Biphenyls (935,924 TWPE)	936,000	99.5%	Removed load from category TWPE
Gum and Wood Chemicals Manufacturing	Hercules-Brunswick	Brunswick, GA	TRI 2003	Carbon Disulfide (7,117 TWPE)	7,120	97.7%	Removed load from category TWPE

Source: *TRIReleases2002_v4*; *PCSLoads2002_v4*; *TRIReleases2003_v2*.

5.2.4 Results of the 2006 Screening-Level Review

After adjusting the category TWPE totals and rankings as described in Sections 5.2.1 through 5.2.3, EPA consolidated the PCS and TRI rankings into one set using the following steps:

- EPA combined the two lists of point source categories by adding each category's PCS TWPE and TRI TWPE. EPA noted that this may result in "double-counting" of chemicals a facility reported to both PCS and TRI, and "single-counting" of chemicals reported in only one of the databases. The combined databases do not count chemicals that may be discharged but are not reported to PCS or TRI.

- EPA then ranked the point source categories based on total PCS and TRI TWPE.

Table 5-3 presents the combined PCS 2002 and TRI 2002 rankings. These are the final category rankings accounting for all corrections made to the databases during the 2005 and 2006 annual reviews and removal of any categories and discharges as discussed in Sections 5.2.1 through 5.2.3.

Table 5-4 presents the final rankings for TRI 2003 excluding the categories for which EPA is currently developing or revising ELGs, categories for which EPA recently promulgated or revised ELGs, and discharges from facilities that dominate the category TWPE, but are not representative of the category. Four of the top five categories by TWPE from the combined TRI and PCS 2002 data (Table 5-3) are in the top five categories from the TRI 2003 data (Table 5-4), with only the Fertilizer Category not represented at the top of TRI 2003 rankings.

5.3 <u>Prioritization of Categories for the 2006 Annual Review</u>

Based on its screening level review, EPA was able to prioritize for further review (i.e., a detailed study or preliminary category review) those industrial categories whose pollutant discharges potentially pose the greatest hazards to human health or the environment because of their toxicity (i.e., categories that collectively discharge over 95 percent of the total TWPE). EPA also considered efficiency and implementation issues raised by stakeholders in identifying candidates for further review. By using this multilayered screening approach, the Agency concentrated its resources on those point source categories with the highest estimates of toxic-weighted pollutant discharges (based on best available data), while assigning a lower priority to categories that the Agency believes are not good candidates for ELGs revision at this time.

Table 5-5 lists the point source categories with existing ELGs, the level of review EPA performed as part of the 2006 annual review, and how the category was identified for further review, if applicable.

Table 5-3. Final PCS 2002 and TRI 2002 Combined Point Source Category Rankings

40 CFR Part	Point Source Category	PCS 2002 TWPE	TRI 2002 TWPE	Total TWPE	Cumulative Percentage of Total TWPE	Rank
430	Pulp, Paper and Paperboard	1,540,000	1,980,000	3,520,000	33.00%	1
423	Steam Electric Power Generation	982,000	833,000	1,810,000	50.04%	2
418	Fertilizer Manufacturing	1,370,000	9,060	1,380,000	62.99%	3
414	Organic Chemicals, Plastics and Synthetic Fibers	398,000	349,000	747,000	70.00%	4
419	Petroleum Refining	165,000	467,000	632,000	75.94%	5
455	Pesticide Chemicals Manufacturing	50,300	555,000	605,000	81.62%	6
440	Ore Mining and Dressing	410,000	70,200	480,000	86.13%	7
421	Nonferrous Metals Manufacturing	397,000	51,800	449,000	90.34%	8
415	Inorganic Chemicals	107,000	186,000	293,000	93.10%	9
463	Plastic Molding and Forming	20,700	113,000	134,000	94.35%	10
410	Textile Mills	123,000	3,710	127,000	95.54%	11
467	Aluminum Forming	61,500	4,360	65,900	96.16%	12
439	Pharmaceutical Manufacturing	48,600	11,100	59,700	96.72%	13
436	Mineral Mining and Processing	50,500	2,840	53,300	97.22%	14
429	Timber Products Processing	1,100	48,000	49,100	97.69%	15
422	Phosphate Manufacturing	44,300	300	44,600	98.10%	16
464	Metal Molding and Casting (Foundries)	9,880	16,000	25,900	98.35%	17
409	Sugar Processing	17,100	394	17,500	98.51%	18
424	Ferroalloy Manufacturing	7,130	9,910	17,000	98.67%	19
471	Nonferrous Metals Forming and Metal Powders	5,750	10,800	16,500	98.83%	20
NA	Miscellaneous Foods and Beverages	9,567	6,860	16,400	98.98%	21
407	Fruits and Vegetable Processing	4,350	9,450	13,800	99.11%	22
425	Leather Tanning and Finishing	3,260	9,880	13,100	99.23%	23
469	Electrical and Electronic Components	5,130	6,340	11,500	99.34%	24
457	Explosives	8,750	2,280	11,000	99.45%	25
468	Copper Forming	3,550	6,060	9,610	99.54%	26
428	Rubber Manufacturing	2,350	5,100	7,450	99.61%	27

Table 5-3 (Continued)

40 CFR Part	Point Source Category	PCS 2002 TWPE	TRI 2002 TWPE	Total TWPE	Cumulative Percentage of Total TWPE	Rank
NA	Tobacco Products	2	7,120	7,130	99.67%	28
465	Coil Coating	6,390	39	6,430	99.73%	29
406	Grain Mills Manufacturing	964	4,660	5,620	99.79%	30
411	Cement Manufacturing	2,190	2,030	4,210	99.83%	31
426	Glass Manufacturing	1,410	2,540	3,950	99.86%	32
461	Battery Manufacturing	88	3,150	3,230	99.89%	33
405	Dairy Products Processing	43	2,830	2,870	99.92%	34
417	Soaps and Detergents Manufacturing	270	1,750	2,020	99.94%	35
NA	Printing & Publishing	1,680	209	1,890	99.96%	36
408	Canned and Preserved Seafood	867	138	1,000	99.97%	37
NA	Independent And Stand Alone Labs	610	177	787	99.97%	38
443	Paving and Roofing Materials (Tars and Asphalt)	487	104	592	99.98%	39
458	Carbon Black Manufacturing	-	514	514	99.98%	40
446	Paint Formulating	-	503	503	99.99%	41
466	Porcelain Enameling	17	398	415	99.99%	42
460	Hospital	5	382	387	100.00%	43
NA	Construction and Development	188	-	188	100.00%	44
454	Gum and Wood Chemicals	32	156	188	100.00%	45
447	Ink Formulating	-	94	94	100.00%	46
427	Asbestos Manufacturing	-	6	6	100.00%	47
459	Photographic	-	-	-	100.00%	48
NA	Photo Processing	-	-	-	100.00%	49
Total		**5,860,000**	**4,790,000**	**10,700,000**		

Source: *TRIReleases2002_v4*; *PCSLoads2002_v4*.
NA – Not applicable; no existing ELGs apply to discharges.

Table 5-4. Final TRI 2003 Rankings

40 CFR Part	Point Source Category	Total Pounds Released	TWPE
430	Pulp, Paper and Paperboard	21,100,000	2,880,000
423	Steam Electric Power Generation	3,350,000	1,060,000
414	Organic Chemicals, Plastics and Synthetic Fibers	37,900,000	1,020,000
419	Petroleum Refining	17,300,000	498,000
455	Pesticide Chemicals Manufacturing	1,930,000	485,000
429	Timber Products Processing	40,000	249,000
415	Inorganic Chemicals	8,830,000	182,000
463	Plastic Molding and Forming	1,490,000	107,000
421	Nonferrous Metals Manufacturing	2,760,000	78,400
440	Ore Mining and Dressing	597,000	77,600
424	Ferroalloy Manufacturing	438,000	24,500
464	Metal Molding and Casting (Foundries)	220,000	12,800
439	Pharmaceutical Manufacturing	2,110,000	12,100
471	Nonferrous Metals Forming and Metal Powders	1,280,000	10,600
418	Fertilizer Manufacturing	5,280,000	10,300
411	Cement Manufacturing	4,590	10,200
425	Leather Tanning and Finishing	368,000	9,250
407	Fruits and Vegetable Processing	7,320,000	7,170
468	Copper Forming	172,000	6,720
469	Electrical and Electronic Components	3,780,000	6,630
NA	Tobacco Products	443,000	6,520
NA	Miscellaneous Foods and Beverages	5,560,000	5,440
426	Glass Manufacturing	253,000	4,650
461	Battery Manufacturing	38,500	4,510
428	Rubber Manufacturing	727,000	4,400
417	Soaps and Detergents Manufacturing	109,000	4,000
406	Grain Mills Manufacturing	1,810,000	3,800
405	Dairy Products Processing	4,640,000	3,620
467	Aluminum Forming	958,000	3,520
410	Textile Mills	451,000	3,450
436	Mineral Mining and Processing	2,180,000	2,890
443	Paving and Roofing Materials (Tars and Asphalt)	737	518
446	Paint Formulating	88,600	514
458	Carbon Black Manufacturing	11	483
422	Phosphate Manufacturing	65,700	480
466	Porcelain Enameling	70,700	363
409	Sugar Processing	339,000	309
NA	Printing & Publishing	15,400	297
NA	Independent and Stand Alone Labs	80,100	202
408	Canned and Preserved Seafood	237,000	179
454	Gum and Wood Chemicals	23,700	164
457	Explosives	27,400	47
465	Coil Coating	608	45
447	Ink Formulating	5,490	45
427	Asbestos Manufacturing	676	5

Source: *TRIReleases2003_v2*.
NA – Not applicable; no existing ELGs apply to discharges.

Table 5-5. 2006 Annual Review of Categories with Existing ELGs: Level of Review

40 CFR Part	Point Source Category	Level of Review	Source of Identification for Further Review
405	Dairy Products Processing	Screening-Level Review	NA[a]
406	Grain Mills Manufacturing	Screening-Level Review	NA[a]
407	Fruits and Vegetable Processing	Screening-Level Review	NA[a]
408	Canned and Preserved Seafood	Screening-Level Review	NA[a]
409	Sugar Processing	Screening-Level Review	NA[a]
410	Textile Mills	Preliminary Review	TWPE
411	Cement Manufacturing	Screening-Level Review	NA[a]
412	Concentrated Animal Feeding Operations	Screening-Level Review	NA[a]
413	Electroplating	Screening-Level Review	NA[a]
414	Organic Chemicals, Plastics and Synthetic Fibers	Preliminary Review	TWPE
415	Inorganic Chemicals	Preliminary Review	TWPE
417	Soaps and Detergents Manufacturing	Screening-Level Review	NA[a]
418	Fertilizer Manufacturing	Preliminary Review	TWPE
419	Petroleum Refining	Preliminary Review	TWPE
420	Iron and Steel Manufacturing	Screening-Level Review	NA[a]
421	Nonferrous Metals Manufacturing	Preliminary Review	TWPE
422	Phosphate Manufacturing	Screening-Level Review	NA[a]
423	Steam Electric Power Generation	Detailed Study	TWPE
424	Ferroalloy Manufacturing	Screening-Level Review	NA[a]
425	Leather Tanning and Finishing	Screening-Level Review	NA[a]
426	Glass Manufacturing	Screening-Level Review	NA[a]
427	Asbestos Manufacturing	Screening-Level Review	NA[a]
428	Rubber Manufacturing	Preliminary Review	TWPE
429	Timber Products Processing	Screening-Level Review	NA[a]
430	Pulp, Paper and Paperboard	Detailed Study	TWPE
432	Meat and Poultry Products	Screening-Level Review	NA[a]
433	Metal Finishing	Screening-Level Review	NA[a]
434	Coal Mining	Preliminary Review	Comments
435	Oil & Gas Extraction	Preliminary Review (of Coal Bed Methane Operations)	Comments
436	Mineral Mining and Processing	Screening-Level Review	NA[a]
437	Centralized Waste Treaters	Screening-Level Review	NA[a]
438	Metal Products and Machinery	Screening-Level Review	NA[a]
439	Pharmaceutical Manufacturing	Screening-Level Review	NA[a]
440	Ore Mining and Dressing	Preliminary Review	TWPE
442	Transportation Equipment Cleaning	Screening-Level Review	NA[a]

Table 5-5 (Continued)

40 CFR Part	Point Source Category	Level of Review	Source of Identification for Further Review
443	Paving and Roofing Materials (Tars and Asphalt)	Screening-Level Review	NA[a]
444	Waste Combustors (Commercial Incinerators Combusting Hazardous Waste)	Screening-Level Review	NA[a]
445	Landfills	Screening-Level Review	NA[a]
446	Paint Formulating	Screening-Level Review	NA[a]
447	Ink Formulating	Screening-Level Review	NA[a]
451	Aquatic Animal Production Industry	Screening-Level Review	NA[a]
454	Gum and Wood Chemicals	Screening-Level Review	NA[a]
455	Pesticide Chemicals Manufacturing	Preliminary Review	TWPE
457	Explosives	Screening-Level Review	NA[a]
458	Carbon Black Manufacturing	Screening-Level Review	NA[a]
459	Photographic	Screening-Level Review	NA[a]
460	Hospital	Screening-Level Review	NA[a]
461	Battery Manufacturing	Screening-Level Review	NA[a]
463	Plastic Molding and Forming	Preliminary Review	TWPE
464	Metal Molding and Casting (Foundries)	Screening-Level Review	NA[a]
465	Coil Coating	Screening-Level Review	NA[a]
466	Porcelain Enameling	Preliminary Review	TWPE
467	Aluminum Forming	Screening-Level Review	NA[a]
468	Copper Forming	Screening-Level Review	NA[a]
469	Electrical and Electronic Components	Screening-Level Review	NA[a]
471	Nonferrous Metals Forming and Metal Powders	Screening-Level Review	NA[a]

[a]For categories with only a screening-level review, the source of identification is not applicable, as EPA conducts a screening-level review of all categories subject to existing effluent guidelines. The “source of identification” is only applicable for those industries selected for further review.
NA – Not available.

5.3.1 Detailed Study of Existing ELGs

As a result of its 2005 screening-level review, EPA identified two point source categories with existing effluent guidelines and pretreatment standards for detailed study because they ranked first and second in combined TWPE rankings: Pulp, Paper, and Paperboard (Part 430) and Steam Electric Power Generating (Part 423). EPA's detailed studies generally examine the following: (1) wastewater characteristics and pollutant sources; (2) the pollutants driving the toxic-weighted pollutant discharges; (3) availability of pollution prevention and treatment; (4) the geographic distribution of facilities in the industry; (5) any pollutant discharge trends within the industry; and (6) any relevant economic factors. First, EPA attempts to verify the screening-level results and to fill in data gaps. Next, EPA considers costs and performance of applicable and demonstrated technology, process change, or pollution prevention alternatives that can effectively reduce the pollutants remaining in the industrial category's wastewater. Lastly, EPA considers the affordability or economic achievability of the technology, process change, or pollution prevention measures identified above.

Types of data sources that EPA may consult in conducting its detailed studies include, but are not limited to: (1) U.S. Economic Census; (2) TRI and PCS data; (3) trade associations and reporting facilities to verify reported releases and facility categorization; (4) regulatory authorities (states and EPA regions) to understand how category facilities are permitted; (5) NPDES permits and their supporting fact sheets; (6) EPA effluent guidelines technical development documents; (7) relevant EPA preliminary data summaries or study reports; and (8) technical literature on pollutant sources and control technologies.

For more information about the pulp, paper, and paperboard and steam electric power generating detailed studies, see the *Final Report: Pulp, Paper, and Paperboard Detailed Study* and the *Detailed Summary Report: Steam Electric Detailed Study* (U.S. EPA, 2006c; U.S. EPA, 2006b).

5.3.2 Preliminary Review

Preliminary reviews are similar to detailed studies and have the same purpose. During preliminary reviews, EPA generally examines the same items listed above for detailed studies. However, EPA’s preliminary review of a category and available pollution prevention and treatment options is less rigorous than its detailed studies. While EPA collects and analyzes hazard and technology-based information on categories undergoing preliminary review, it assigns a higher priority to investigating categories undergoing detailed studies.

EPA identified 11 point source categories for preliminary review based on their contribution to the overall TWPE. EPA also identified the coal mining industry and coal bed methane operations (under the Oil and Gas Extraction Point Source Category) for preliminary review based on comments on the 2006 Preliminary Plan. The 13 existing preliminary reviews are listed below along with a reference to where they are discussed in this report:

- Coal Bed Methane (Section 6.0);
- Coal Mining (Section 7.0);
- Fertilizer Manufacturing (Section 8.0);

- Inorganic Chemicals (Section 9.0);
- Nonferrous Metals Manufacturing (Section 10.0);
- Organic Chemicals, Plastics, and Synthetic Fibers (Section 11.0);
- Ore Mining and Dressing (Section 12.0);
- Pesticide Chemicals (Section 13.0);
- Petroleum Refining (Section 14.0);
- Plastics Molding and Forming (Section 15.0);
- Porcelain Enameling (Section 16.0);
- Rubber Manufacturing (Section 17.0); and
- Textile Mills (Section 18.0).

5.4 References

Kandle, Meghan. 2006. Eastern Research Group, Inc. Memorandum to Public Record for the Effluent Guidelines Program Plan, EPA Docket Number OW-2004-0032. "PCS and TRI Facilities that Dominate the Total Point Source Category TWPE." (November). DCN 04076.

U.S. EPA. 2006a. *Guidelines: Final, Proposed, and Under Development*. "Industrial Waters Pollution Control." Available online at: http://www.epa.gov/waterscience/guide.

U.S. EPA. 2006b. *Detailed Summary Report: Steam Electric Detailed Study*. EPA-821-R-06-015. Washington, DC. (November). DCN 03401.

U.S. EPA. 2006c. *Final Report: Pulp, Paper, and Paperboard Detailed Study*. EPA-821-R-06-016. Washington, DC. (November). DCN 03400.

6.0 COAL BED METHANE SUBCATEGORY OF THE OIL AND GAS EXTRACTION CATEGORY (40 CFR PART 435)

EPA selected the coal bed methane (CBM) industry, a potential new subcategory of the Oil and Gas Extraction Category, for additional review as part of the 2006 annual review, because of comments received and changes in the industry since the 2004 annual review. In 2004, EPA determined that discharges from the CBM industry would be adequately controlled by permit writers using best professional judgment (BPJ). In addition, EPA received comments during the 2005 annual review from citizens and environmental advocacy groups requesting development of a regulation. For its 2006 annual review, EPA collected additional data on the number of U.S. wells producing CBM and their produced water disposal practices. EPA also gathered additional information on potential treatment technologies for CBM-produced water discharges. In particular, EPA conducted a site visit in the Powder River Basin, Wyoming and observed a number of CBM-produced water treatment technologies (U.S. EPA, 2006). This section summarizes EPA's 2006 annual review of the discharges associated with CBM production.

In conducting this 2006 annual review, EPA found that it will need to gather more information to determine whether it would be appropriate to conduct a rulemaking to potentially revise the effluent guidelines for the Oil and Gas Extraction Category to include limits for CBM. Therefore, EPA selected the CBM Subcategory for a detailed study in the 2007 and 2008 annual reviews. EPA intends to submit an Information Collection Request (ICR) to the Office of Management and Budget (OMB) for their review and approval under the Paperwork Reduction Act, 33 U.S.C. 3501, et seq.

6.1 Current Applicability of Effluent Limitations Guideline for Oil and Gas Extraction

As described below, the Oil and Gas Extraction ELGs do not currently regulate pollutant discharges from CBM extraction operations. EPA promulgated BPT limitations for the Oil and Gas Extraction Category (40 CFR Part 435) on April 13, 1979 (44 FR 22069). BAT, BCT, and NSPS limitations were promulgated on March 4, 1993 (58 FR 12454) for Subpart A: Offshore Subcategory and on December 16, 1996 (61 FR 66086) for Subpart D: Coastal Subcategory. None of these oil and gas extraction rulemakings considered CBM extraction in any of the supporting analyses or records. Specifically, EPA did not consider CBM production in developing the 1979 national technology-based ELGs for Subpart C: Onshore Subcategory and Subpart E: Agricultural and Wildlife Water Use Subcategory of the Oil and Gas Extraction Category, because there was no significant CBM production in 1979 (O'Farrell, 1989).

Additionally, EPA did not consider CBM production in developing the Coal Mining ELGs. EPA established ELGs for coal mine operations based on the use of the "best practicable control technology currently available" (BPT) for existing sources in the Coal Mining Category (40 CFR 434) on April 26, 1977 (42 FR 21380). These ELGs were revised on October 9, 1985 (50 FR 41296). More recently, EPA revised these ELGs again on January 23, 2002 (67 FR 3370) by adding two new subcategories to address pre-existing discharges at coal remining operations and drainage from coal mining reclamation and other non-process areas in the arid and semi-arid western United States. None of these coal mining rulemakings considered CBM extraction in any of the supporting analyses or records.

Table 6-1 lists the existing subcategories for the Oil and Gas Extraction Category and describes their applicability.

Table 6-1. Applicability of Subcategories in the Oil and Gas Extraction Category

Subpart	Subpart Name	Subpart Applicability
A	Offshore	Applicable to facilities engaged in field exploration, drilling, well production, and well treatment that are located in waters that are offshore. Offshore is defined as seaward of the inner boundary of the territorial seas.
B	Reserved	
C	Onshore	Applicable to facilities engaged in field exploration, drilling, well completion, and well treatment that are located onshore. Onshore is defined as landward of the inner boundary of the territorial seas.
D	Coastal	Applicable to facilities engaged in field exploration, drilling, well production, and well treatment that are located in coastal waters. Coastal is defined as landward of the inner boundary of the territorial seas or landward of the inner boundary of the territorial seas and bounded on the inland side by the line defined by the inner boundary of the territorial seas.
E	Agricultural and Wildlife Water Use	Applicable to onshore facilities engaged in field exploration, drilling, well completion, and well treatment that are located in the United States west of the 98th meridian for which the produced water has a use in agriculture or wildlife propagation when discharged to navigable waters.
F	Stripper[a]	Applicable to onshore facilities engaged in production and well treatment that produce 10 barrels per well per calendar day or less of crude oil and are operating at the maximum feasible rate of production.
G	General Provisions[a]	Prevents oil and gas facilities applicable to 40 CFR Part 435 Subparts A through F from circumventing the ELGs by moving effluent discharges from one subcategory to another for disposal under less stringent requirements.

Source: *Development Document for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Oil and Gas Extraction Point Source Category* (U.S. EPA, 1976).
[a]No pollutants are regulated in Subparts F or G.

6.1.1 CBM Extraction as a Potential New Subcategory of the Oil and Gas Extraction Category

EPA considers CBM extraction a potential new subcategory of the Oil and Gas Extraction Category. First, the product extracted by the CBM industry – coal bed natural gas[10] – is virtually identical to the conventional natural gas extracted by facilities subject to the Oil and Gas Extraction ELGs, both of which consist largely of methane. Reflecting this similarity in product, both CBM operations and conventional oil and gas extraction operations fall within SIC code 1311: Crude Petroleum and Natural Gas. CBM operations simply constitute another process for extracting natural gas, and are therefore reasonably considered part of the Oil and Gas Extraction Category.

[10] Coal bed methane (CBM) is also referred to as coal bed natural gas (CBNG or CNG). Prior to refining, extracted natural gas typically consists of methane (approximately 95 percent), ethane (approximately 2.5 percent), and other gases such as propane, butane, pentane, nitrogen, and carbon dioxide (EIA, 2006a).

EPA also considered whether CBM extraction could be considered a potential subcategory of the Coal Mining Category. However, the product produced by coal mining – a solid mineral – is entirely different from the product produced by CBM extraction – a natural gas. *Cf. Amoco Prod. Co. v. S. Ute Indian Tribe*, 526 U.S. 865, 887 (finding that the term “coal” in the Coal Lands Act did not encompass the CBM gas because Congress likely “viewed the extraction of CBM gas as drilling for natural gas, not mining coal.”). Therefore, EPA does not believe that the CBM industry is appropriately considered a potential new subcategory of the Coal Mining Category.

6.1.2 CBM Industry Current Permitting Practices

Produced water from CBM is a pollutant subject to regulation under the CWA. See Northern Plains Resource Council v. Fidelity Exploration and Development Co., 325 F.3d 1155 (9th Cir. 2003). Although EPA considers CBM to be a potential new subcategory of the Oil and Gas Extraction Category, the ELGs for this category does not currently apply to CBM discharges. Therefore, because the discharge of produced water from CBM extraction is not subject to an existing ELG, permit writers must develop technology-based limits on a case-by-case basis using their BPJ. See 40 CFR 122.44(a)(1). In developing the BPJ-based limits, the permit writer must take into account the same statutory factors EPA would use in promulgating a national categorical ELG, as they apply to the particular facility. See 40 CFR 125.3(d).

Currently there exists a wide range of regulatory controls for CBM-produced waters that vary from state to state and permit to permit. Permit writers often model permit limits on ELGs for industries considered similar to CBM, which has led to inconsistencies among permits. One inconsistency is that the permitting authorities of CBM wells in eastern states do not use the Oil and Gas Extraction ELGs. These ELGs prohibit the discharge of produced waters east of the 98^{th} meridian. See 40 CFR Part 435.32 and 435.52. Rather, permit writers east of the 98^{th} meridian rely on the Coal Mining ELGs, which allow discharge of treated wastewater to surface waters (Veil, 2002). Those in western states (west of the 98^{th} meridian) have modeled their BPJ permit limits on the Agricultural and Wildlife Water Use Subcategory of the Oil and Gas Extraction ELGs (Subpart E, 40 CFR Part 435), which allows the discharge of some produced waters. Onshore facilities regulated by the Oil and Gas Extraction ELGs must meet the following conditions in order to discharge produced water:

- The produced water must be generated from facilities that are engaged in production, drilling, well completion, and well treatment in the oil and gas extraction industry and be located in the continental United States and west of the 98^{th} meridian (40 CFR 435.50);

- The produced water must be used in agriculture or wildlife propagation when discharged into navigable waters (40 CFR 435.50); and

- The produced water discharges must not exceed an oil and grease daily maximum limitation of 35 mg/L (40 CFR 435.52(b)).

EPA also defined the term "use in agricultural or wildlife propagation'' to mean that "the produced water is of good enough quality to be used for wildlife or livestock watering or other agricultural uses and that the produced water is actually put to such use during periods of discharge." [Emphasis added]. See 40 CFR 435.51(c).

6.2 Summary of Comments Received Regarding the Coal Bed Methane Industry

EPA received comments on the 2005 annual review from the Tongue River Water Users' Association and Natural Resources Defense Council (NRDC), both requesting development of ELGs to regulate CBM-produced water discharge. Specifically, the Tongue River Water Users' Association requested protection of the Tongue River's existing sodium levels so that it can continue to be used for irrigation (EPA-HQ-OW-2004-0032-1048). NRDC cited the need for consistent, national regulations instead of state-determined permitting based on BPJ (EPA-HQ-OW-2004-0032-1090). Additionally, Cook Inlet Keeper commented on the 2003 annual review that EPA should expand its examination of available data on the impacts of CBM-produced water discharges (EPA-HQ-OW-2003-0074-0735).

In addition to considering these public comments, EPA collected information related to four factors of CBM-produced water discharges:

- Factor 1: the amount and type of pollutants in an industrial category's discharge, and the relative hazard posed by that discharge.
- Factor 2: the performance and cost of applicable and demonstrated wastewater treatment technologies, process changes, or pollution prevention alternatives that could effectively reduce the pollutants in the industrial category's wastewater.
- Factor 3: the affordability or economic achievability of any technology identified using the second factor.
- Factor 4: the opportunity to eliminate inefficiencies or impediments to pollution prevention or technological innovation, or opportunities to promote innovative approaches such as water quality trading, including within-plant trading.

EPA's analysis of the CBM industrial sector using these four factors is summarized in this section and in the record supporting the 2006 Plan (Johnston, 2006).

6.3 CBM Industry Profile

EPA obtained data on the number of CBM operations in the United States from the Energy Information Administration (EIA) and oil and gas industry trade groups. Table 6-2 presents the current and potential U.S. sources of CBM, listed by coal basin. Figure 6-1 indicates the location of the key CBM basins in the United States. The EIA recorded that, in 2004, CBM production (1.72 trillion cubic feet, tcf) and proved reserves (18.4 tcf) accounted for approximately 8.7 and 9.6 percent, respectively, of the total U.S. natural gas production and reserve capacity (EIA, 2006a).

6.3.1 Data on CBM-Produced Water Discharges

Table 6-2 also indicates if EPA has documented water discharges from the listed CBM basin. Although CBM-produced water can be disposed of through evaporation/infiltration impoundments, stock watering ponds, irrigation, and injection, some CBM operators discharge to surface waters. EPA collected available information on surface discharges in the Black Warrior Basin in Alabama and the Powder River Basin (primarily in Wyoming), such as by searching state NPDES permit databases by type of facility. In the Black Warrior Basin, most operators discharge to surface water, such as the Black Warrior River, although some operators inject produced water with high total dissolved solids (TDS). In Wyoming in general, surface discharge is a predominant water disposal method. Wyoming issued over 4,000 NPDES permits for the discharge of CBM-produced water (WDEQ, 2006). In the much smaller Montana portion of the Powder River Basin, EPA identified one NPDES permit (for 13 outfalls) allowing surface discharge of CBM-produced water (MDEQ, 2001).

The New Mexico Oil Conservation Division estimates that approximately 95 percent of produced water from the San Juan and Raton basins is injected, with the other 5 percent stored in impoundments (NMOCD, 2004). The impoundments may or may not discharge, with any discharge likely in the New Mexico portion of the Raton Basin (U.S. EPA, 2004). EPA identified at least 12 NPDES permits allowing CBM-produced water discharge in Colorado (Veil, 2002). In the other major commercial basins, operators typically do not discharge produced water. EPA also observed a number of CBM-produced water management practices (ERG, 2006a; ERG, 2006b).

In the 2007 and 2008 annual reviews, EPA will collect more information on the volume and pollutant characteristics of CBM-produced water discharges for the different CBM basins and formations.

Table 6-2. United States CBM Sources and Production

CBM Basin Name	Location (States)	Development Status	Number of Producing Wells	Total CBM Production[a] (bcf)	Potential CBM Production (tcf)	EPA Documented CBM-Produced Water Discharge
Arkoma-Cherokee	AR, MO, NE, OK	Commercial Production	1,350	90	5	Unknown
Black Warrior	AL, MS	Commercial Production	3,500	1,418	4	Surface Water Discharge Identified
Central and Northern Appalachian	KY, MD, OH, PA, TN, VA, WV	Commercial Production	~2,000	437	13	Unknown
Greater Green River	CO, WY	Exploratory[b]	200	2	2.5	Unknown
Gulf Coast	AL, AR, LA, MS, TX	Exploratory[b]	~20	<1	3	Unknown
Hanna-Carbon	WY	Exploratory[b]	NA	<1	6	Unknown
Powder River	MT, WY	Commercial Production	15,455[c]	878	27	Surface Water Discharge Identified
Raton	CO, NM	Commercial Production	Several hundred	139	4	Limited Surface Water Discharge Identified (12 NPDES Permits Identified)
San Juan	CO, NM	Commercial Production	3,100[d]	9,464	10	Unknown
Uinta-Piceance	CO, UT	Commercial Production	>200[e]	452	6	Unknown
Wind River	WY	Exploratory[b]	NA	<1	2.5	Unknown
All Other CBM Basins[f]			NA	80.3		Unknown
Total CBM Production			**>26,000**	**12,901**	**163**	

Sources: *Handbook on Coal Bed Methane Produced Water* (ALL, 2003); *CBM in the U.S. – Past, Present, and Future* (EIA, 2004); *U.S. Lowers-48 Coal and Coalbed Resources* (GTI, 2000); Coalbed Methane Wells in the Powder River Basin (WOGCC, 2005); Number of Wells in Black Warrior Basin (OGB, 2006); Coalbed Methane Permits (WDEQ, 2006).
[a]Production volume cumulative through December 31, 2002.
[b]Exploratory indicates that the basin may have some gas sales, but the main activity is still exploratory.
[c]Includes wells in Wyoming portion of Powder River Basin only.
[d]In 2000.
[e]Includes Uinta wells only.
[f]Includes CBM reserves in Alaska and the Illinois Basin.
NA – Not applicable; production has not begun in this basin yet.

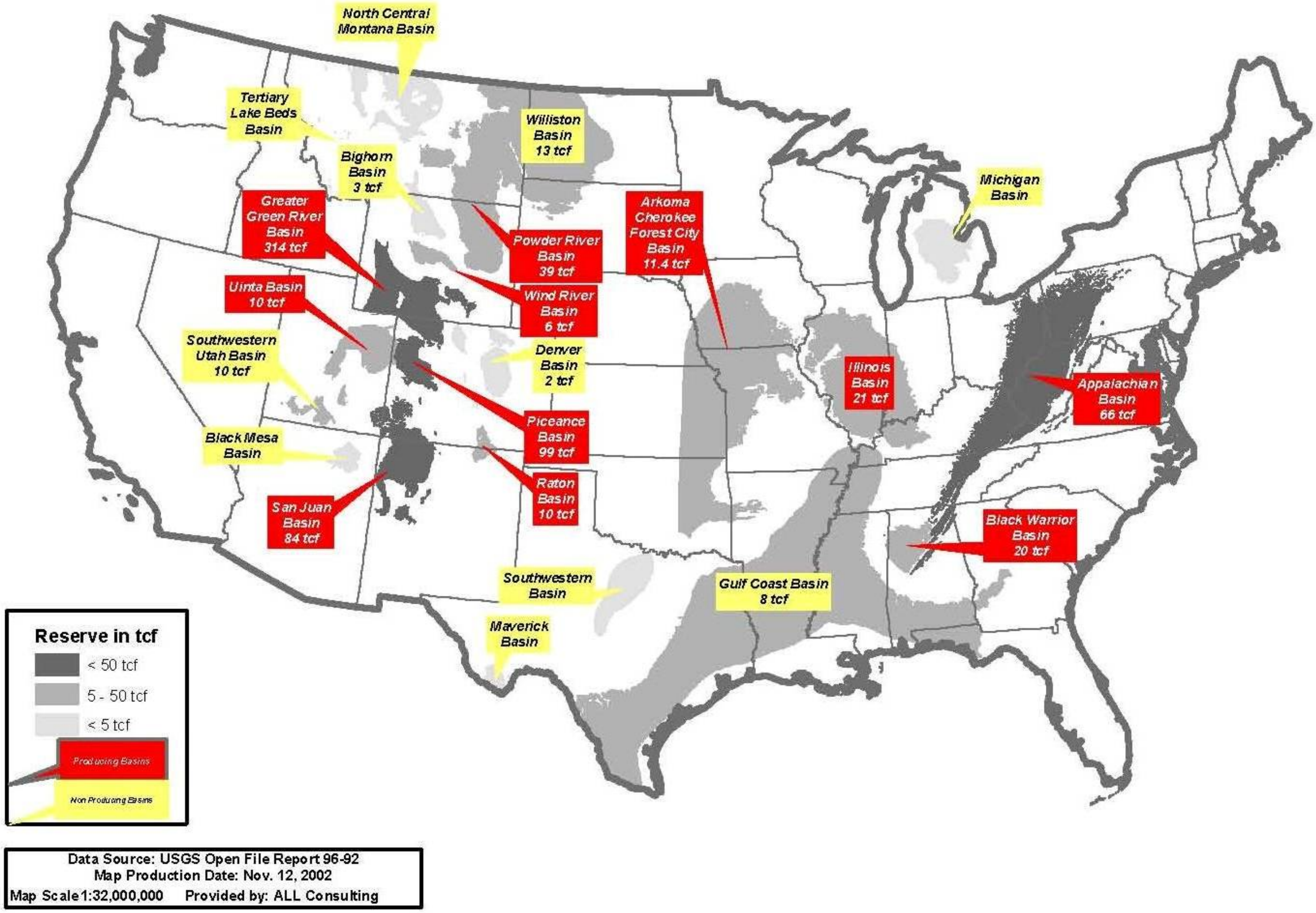

Figure 6-1. Coal Bed Methane Basins in the United States (ALL, 2003)

6.3.2 Future CBM Basin Exploration

Most of the basins listed in Table 6-1 under "all other CBM basins," have not yet been extensively explored and are not expected to have substantial commercial potential, except Alaska. Alaska, which is included in the "all other basins" category, has potentially enormous reserves coupled with numerous development issues. Alaskan reserves may contain as high as one quadrillion cubic feet of gas in 13 basins, but the economically recoverable portion has yet to be determined (ALL, 2003). Alaskan CBM basins may not be exploited due to lack of data, lack of infrastructure, and high exploration costs (ALL, 2003). However, CBM-produced water in Alaska would be similar to water from other CBM basins: produced in large quantities, saline, and possibly containing other pollutants such as metals (Northern Alaska Environmental Center, 2006).

Future CBM Basin exploration may be linked to the ability to manage and dispose of CBM-produced waters. For example, "after a decade of steady growth in the number of [CBM] wells and [CBM] gas production in the Powder River Basin (including dramatic growth from 1998 to 2003), production dropped about 5 percent from 2003 to 2004…[A]ccording to industry representatives, this reduction was apparently due in part to difficulties in managing and disposing of [CBM-produced] water. Partly as a consequence of these difficulties, industry is now considering other disposal options including injection and more expensive water treatment methods. But if difficulties in disposing and/or permitting [CBM-produced] water discharges were, in fact, the root causes of reduced production in 2004, additional acceptable options for managing the water will be needed or production may continue to level off or decline" (Ruckelshaus, 2005).

6.4 Oil and Gas Extraction Category 2005 Annual Review

For the 2005 annual review of this category, EPA used available industry, state, and EPA literature but did not use PCS or TRI data. EPA selected the Oil and Gas Extraction Category for further review because of comments received on the Preliminary 2006 Plan and changes in the CBM portion of the oil and gas industry. The PCS and TRI databases classify data by SIC codes, which do not distinguish CBM production from traditional oil and natural gas recovery. Therefore, the 2005 screening-level review of PCS and TRI data did not provide insight into discharges associated with CBM.

6.5 CBM Production

The geologic process that progressively converts plant material to coal (coalification) generates large quantities of natural gas that are stored in the coal seams. The natural gas consists of approximately 96 percent methane, 3.5 percent nitrogen, and trace amounts of carbon dioxide (U.S. EPA, 2004). The natural gas contained in and removed from the coal seams is called CBM. The increased pressures from water in the coal seams force the natural gas to adsorb to the coal (U.S. DOE, 2006).

The softest coals (peats and lignites) are associated with high porosity, high water content, and biogenic methane. In higher rank coals (bituminous), porosity, water, and biogenic methane production decreases, but the heat associated with the higher rank coals breaks down the more complex organics to produce methane. The hardest anthracite coals are associated with low porosity, low water content, and little methane generation (ALL, 2003). The most sought-after coal formations for CBM development, therefore, tend to be mid-rank bituminous coals. Coal formations in the eastern United States tend to be higher rank, with lower water content than western coal formations. They also tend to have greater methane content per ton of coal than western coal formations in the key basins, but often require fracturing to release the methane because of their low porosity (ALL, 2003).

To extract CBM, operators drill wells into coal-bearing formations. Often, these formations are not as deep as those containing conventional hydrocarbon reserves, particularly in western regions. In the Powder River Basin, for example, some of the methane-bearing formations are shallow, at hundreds to one thousand feet below land surface, compared to conventional oil and natural gas well depths averaging approximately 6,000 feet (U.S. DOE, 2005). CBM wells can be drilled using water well drilling equipment, not the rigs designed for conventional hydrocarbon extraction, which are used to drill several thousands of feet into typical conventional reservoirs (Apache Corporation, 2006).

CBM wells typically have either openhole or perforated/slotted casing completion, similar to those for conventional oil or gas wells. However, openhole completions, which are less expensive than perforated or slotted completions, are used more for CBM than for conventional oil and gas, which can use them only under certain circumstances (NaturalGas.org, 2004). For example, openhole completion is widely used in Wyoming's Powder River Basin (ALL, 2003). Figure 6-2 shows the profile of a typical western CBM well using openhole completion.

Extraction of CBM requires drilling and pumping the water from the coal seam, similar to typical natural gas production. Methane and water are produced at individual wells and piped to a metering facility, where the amount of production is recorded. The methane then flows to a compressor station, where the gas is compressed and then shipped via pipeline (De Bruin, 2001). As at conventional hydrocarbon production facilities, the produced water then becomes a by-product of the gas extraction process, requiring some form of management (i.e., use or disposal).

Removing the water from the formation is necessary to produce CBM. The water removal from the formation reduces the pressure and allows the CBM to release from the coal to produce flowing natural gas (Wheaton, 2006; U.S. DOE, 2006). Unlike conventional gas extraction, which usually produces relatively small amounts of water (removing water is not necessary to release conventional gas reserves), CBM extraction produces large amounts of water, sometimes saline.

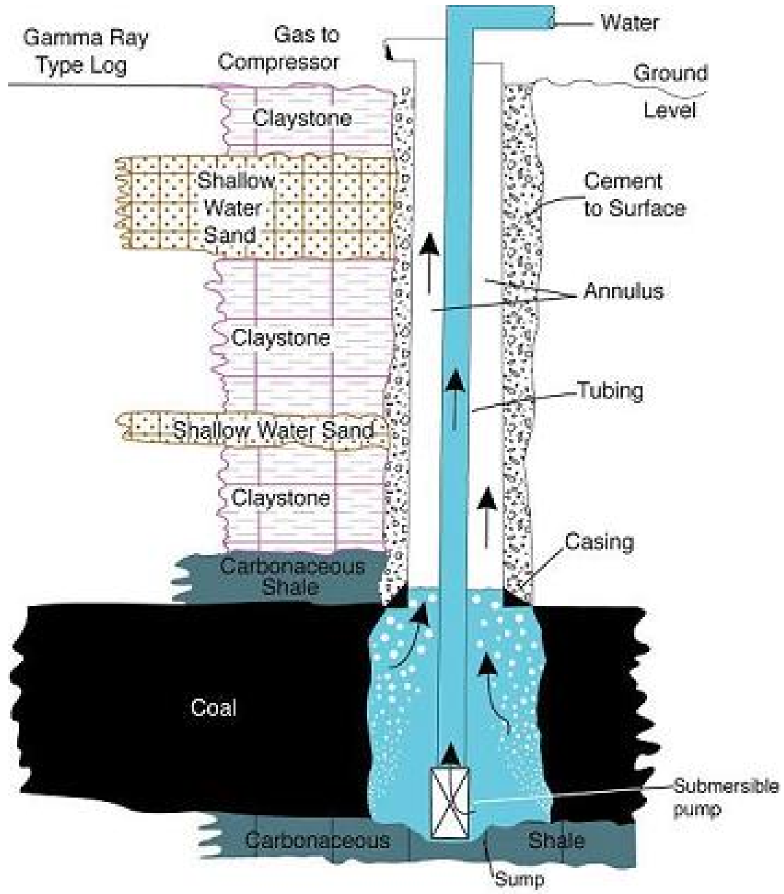

Figure 6-2. Profile of a Typical Western CBM Well with Openhole Completion (DeBruin, 2001)

A CBM well's typical lifespan is between 5 and 15 years, with maximum methane production achieved after one to six months of water removal (Horsley & Witten, 2001). CBM wells go through the following production stages:

- Early stage where large amounts of water are produced to reduce the underground pressure, which encourages the release of the natural gas;
- Stable stage where the amount of natural gas produced from the well increases as the amount of water removed from the coal seam decreases; and
- Late stage where the amount of gas produced declines and water production remains low (De Bruin, 2001).

As previously stated, EPA will collect more information on the future exploration of CBM across the United States (e.g., production and number of wells) and the expected timelines for development.

6.6 CBM-Produced Water Sources and Characteristics

The production of CBM requires large quantities of water to be removed from under ground (U.S. EPA, 2004). The quantity and quality of CBM-produced water varies between basins, within basins, between coal seams, and over a well's lifetime. Generally, the western basins with their soft coal formations tend to produce more water than the hard-coal eastern basins. Also, basins with a longer production history, such as the San Juan basin, produce less total water and less water per well than the more recently developed basins, such as the Powder River Basin. Table 6-3 presents the amount of water produced in some of the CBM basins. The Powder River Basin produces the most water, overall and per well.

Table 6-3. Water Production from CBM Extraction

Basin Name	Average Water Production per Well (gal/day)	Yearly Average Water Production per Basin (MGD)
Arkoma-Cherokee	<900-2,600	ND
Black Warrior	1,800	1,950
Powder River	12,600	12,600
Raton	8,380	1,400
San Juan	800	900
Uinta	6,770	970

Source: *Water Produced with Coal-Bed Methane* (USGS, 2000); *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives* (ALL, 2003).
ND – No data available.

As previously stated, EPA will collect more information on the volume and pollutant characteristics on CBM-produced water discharges for the different CBM basins and formations.

6.6.1 CBM-Produced Water Pollutants of Concern

Total dissolved solids (TDS) is the major pollutant of concern for CBM-produced water. TDS includes any dissolved minerals, salts, metals, cations, or anions in water. TDS concentrations in CBM-produced water generally range from 200 mg/L to 4,000 mg/L in the western United States and from 500 to 27,000 mg/L in the eastern United States, with occasional concentrations exceeding 50,000 mg/L. For comparison, 500 mg/L TDS is recommended for potable water and 1,000 to 2,000 mg/L TDS is recommended for irrigation and stock ponds (USGS, 2000). Table 6-4 presents TDS concentrations for the major CBM basins.

Table 6-4. CBM-Produced Water TDS Concentrations

Basin	Minimum TDS Concentration (mg/L)	Maximum TDS Concentration (mg/L)
Appalachian	<10,000	>10,000 (>1%)
Arkoma-Cherokee	ND	90,000 (9.0%)
Black Warrior	<50	60,000 (0.06%)
Green River	ND	>10,000
Piceance	1,000	6,000
Powder River	244	8,000[a] (0.81%)
Raton	310	>3,500 (0.35%)
San Juan	180	171,000 (1.7%)
Uinta	6,350	42,700 (4.3%)
Wind River	2,000	11,000

Source: *Technical Support Document for the 2004 Effluent Guidelines Program Plan* (U.S. EPA, 2004); *Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin* (U.S. EPA, 2003); Proceedings from the Produced Water Forum in Farmington, NM (NMOCD, 2004); *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives* (ALL, 2003); Analysis of Discharge Data for Six Industry Categories (Bartram, 2003).
[a]Typical maximum TDS concentrations are approximately 8,000 mg/L; however, concentrations as high as 50,000 mg/L have been measured.
TDS – Total dissolved solids.
ND – No data available.

CBM-produced water may also contain trace amounts of metals, volatile and semivolatile organic compounds, polymers, surfactants, biocides, iron-chelating agents, and other compounds associated with drilling and production (Bartram, 2003). Table 6-5 presents the pollutant concentrations from basins that account for approximately 96 percent of the 2002 U.S. production.

There is very limited discharge monitoring information in PCS and TRI for this industrial sector. In the 2007 and 2008 annual reviews, EPA will collect more information on the pollutants of concern in CBM-produced waters across the different CBM basins and formations.

6.6.2 Adverse Impacts from CBM-Produced Water Discharges

CBM-produced water discharges can adversely impact the receiving surface water and soil. Saline discharges affect streams' aquatic and benthic life and can damage streams used to irrigate farmland or water livestock (Johnston, 2006). The large volume of water discharged can also cause stream bank erosion and salt deposition, creating hardpan soil. Long-term impacts include sodium buildup, reduction of plant diversity, mobilization of salts and other elements, and alteration of surface and subsurface hydrology (Ruckelshaus, 2005). In addition, removing large quantities of CBM-produced water can lower aquifers used for drinking water (Horsley & Witten, 2001).

Table 6-5. Concentration of Pollutants in CBM-Produced Water by Basin

Pollutant	Pollutant Concentration by Basin (mg/L)									
	San Juan Basin		Black Warrior Basin		Powder River Basin		Raton Basin		Uinta Basin	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Barium	0.7	63	ND	ND	0.06	2	ND	ND	ND	ND
Calcium	0	228	ND	ND	5	200	4	24	ND	ND
Chloride	0	2,350	40	36,000	3	119	15	719	2,300	14,000
Iron	0	228	0.1	400	0.03	11	0.1	23	ND	ND
Magnesium	0	90	ND	ND	1	52	1	8	ND	ND
Potassium	0.6	770	ND	ND	2	20	1	17	ND	ND
Sodium	19	7,130	60	21,500	89	800	210	991	ND	ND
Sulfate	0	2,300	1	1,350	0.01	1,170	1	204	ND	ND

Source: Analysis of Discharge Data for Six Industry Categories (Bartram, 2003).
Min – Minimum.
Max – Maximum.
ND – No data available.

Aquatic communities can be adversely impacted (e.g., decrease in species diversity and density) by the constituents in CBM-produced waters (e.g., TDS, bicarbonate, chloride, metals, organics) (Mount, 1997; Tietge, 1997; Mount, 1993a). CBM discharges may adversely impact water quality and aquatic organisms. For example, soil colloids suspended in runoff may sorb and mobilize metals, soil nutrients, pesticides and other organic contaminants (Sumner, 1998). Also, the ions that comprise TDS (e.g., chloride) can be toxic to freshwater organisms if present in sufficiently high concentrations (Mount, 1992; Mount, 1993b, Klarich, 1980; Boelter, Unknown; Horpestad, 2001). Some macroinvertebrates in freshwater systems appear to be quite sensitive to increasing TDS concentrations. Sensitivity will vary with the species of aquatic organism and the ionic composition of the TDS. As in-stream TDS concentrations increase, sensitive aquatic species are eliminated while more TDS-tolerant species increase in abundance. Thus, while the overall abundance of macroinvertebrates may not change, the diversity, or taxa richness, of the aquatic community may change.

In the 2007 and 2008 annual reviews, EPA will collect more information on the potential adverse environmental impacts from the discharge of CBM-produced waters across the different CBM basins.

6.7 CBM-Produced Water Treatment and Disposal

This subsection describes existing CBM-produced water management: surface water discharge, evaporation or storage ponds using impoundments, and subsurface injection. It also describes treatment technologies associated with produced water management and lists technologies that could allow beneficial use of CBM-produced water. Table 6-6 indicates the predominant disposal methods currently used in most of the major CBM basins.

Table 6-6. Produced Water Disposal Methods in Major CBM Basins

Basin	Predominant Disposal Method	Other Methods Noted
Black Warrior	Surface water discharge	Injection
Appalachian	Injection	
Powder River	Surface water discharge, impoundments	Injection, irrigation, aquifer storage
Uinta-Piceance	Injection	Evaporation impoundments
Raton	Injection	Impoundments, surface discharge
San Juan	Injection	
Arkoma-Cherokee	Injection	Hauling to commercial disposal

Source: *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives* (ALL, 2003); *Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin* (U.S. EPA, 2003); *Water Produced with Coal-Bed Methane* (USGS, 2000); *Regulatory Issues Affecting Management of Produced Water from Coal Bed Methane Wells* (Veil, 2002).

In the 2007 and 2008 annual reviews, EPA will collect more information on the produced water treatment and disposal methods across the different CBM basins and formations.

6.7.1 Surface Discharge of CBM-Produced Water

Of all U.S. CBM basins, surface water discharge is most prevalent in the Black Warrior, Powder River, and Raton Basins. Surface discharge occurs rarely, if at all, in the other major commercial basins.

In one case study presented in the *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives*, an operation in the Black Warrior Basin discharges to a treatment pond, where the pH is adjusted to precipitate metals (ALL, 2003). The water is then discharged at a controlled rate to the Black Warrior River. The facility's NPDES permit limits the rate of discharge and also limits the in-stream TDS concentration to less than 230 mg/L. The permit does not specify whether the treatment pond must be lined.

Operators typically transport CBM-produced water to the discharge location via buried pipelines. Prior to discharge, facilities often use aeration methods to precipitate iron from the water to reduce or eliminate staining in the stream beds and preserve the aesthetic quality of the receiving stream. Water typically flows over rip-rap before entering the stream bed to reduce erosion and further precipitate iron from the water. Operators may also use spray nozzles, agitators, and bubble diffusers to aerate the water before discharge.

6.7.2 Storage/Evaporation Ponds for CBM-Produced Water

Many CBM operators in the Powder River Basin use unlined earthen storage ponds for evaporation and infiltration in conjunction with or instead of surface discharge to minimize or eliminate the amount of water reaching outfalls to surface water. Ponds also can be used for livestock watering. They are typically an excavated rectangular pit with sloped sides and perimeter berms. Water is eliminated via infiltration, evaporation, or transport to irrigated cropland and pastureland without return flows to drainages (Oil & Gas Consulting, 2002). Evaporation rates depend on the size of the pong and its location. In semiarid regions such as Wyoming, hot dry air moving from land over a water body will cause faster evaporation for smaller water bodies (Pochop, 1985).

Two types of storage ponds are used: in-channel and off-channel. In-channel ponds are located within an existing drainage basin, including all perennial, intermittent, and ephemeral defined drainages, lakes, reservoirs, and wetlands. Off-channel ponds are located on upland areas, outside of natural drainages and alluvial deposits associated with these natural drainages (Pochop, 1985; U.S. EPA, 2003). Most of the storage ponds in the Powder River Basin are off-channel and are designed to contain all CBM-produced water without discharge (Oil & Gas Consulting, 2002; U.S. EPA, 2003).

6.7.3 Injection of CBM-Produced Water

CBM operators can eliminate all surface water discharge of produced water through underground injection. Prior to the major development of the Powder River Basin, injection of produced water into Underground Injection Control (UIC) Class II wells was the predominant (greater than 90 percent by volume) form of CBM-produced water management in the continental United States (Lawrence, 1993). UIC Class II wells are regulated under the federal Safe Drinking Water Act by EPA or EPA-approved state UIC programs and are used to inject fluids associated with the production of oil and natural gas. Operators can inject water with high TDS into UIC Class II wells without treatment, which cuts down on water management costs.

Operators install wells by either drilling a new hole or by converting an existing well such as marginal oil-producing wells, plugged and abandoned wells, and wells that were never completed (dry holes). Some operational difficulties of injecting CBM-produced water include formation plugging and scaling, formation swelling, corrosion, and incompatibility of injected produced waters with receiving formation fluids. In general, these issues can be avoided or remedied by using engineering and operational applications such as treatment chemicals (U.S. EPA, 1996).

An advantage of using UIC Class II injection wells to dispose of CBM-produced water is that the injected water is usually better quality, having lower TDS concentrations, than the water in the injection zone. If the well is properly designed, maintained, and operated, there is little risk of ground-water contamination from produced water. A potential disadvantage of using Class II injection wells is the possible need for pretreatment to prevent plugging of the injection well. It is also necessary to periodically clean crusted material from the injection well perforations. Well cleanings require temporary suspension of injection operations, and nearby temporary storage or alternative disposal techniques until injection resumes (Zimpher, 1988).

Pretreatment may include removing iron and manganese by precipitation. Iron and manganese form oxides upon exposure to air, which may clog the well. Settling tanks with splash plates are used to aerate the produced water, which will oxidize iron and manganese to insoluble forms that can precipitate in the tank. The water can then be injected. Biocides may also be added to the produced water prior to injection to control biological fouling.

6.7.4 Hauling with Commercial Disposal of CBM-Produced Water

For CBM operations where produced water generation is low, produced water may be stored in tanks, which are later hauled to a commercial disposal well. This option is noted in one case study (ALL, 2003) of an operation in the Arkoma basin where the wells are producing just a few gallons to not more than 400 gallons per day of water.

6.7.5 Technology Options for Beneficial Use and Disposal of CBM-Produced Water

Various treatment technologies reduce or eliminate pollutants of concern and allow for the beneficial use of CBM-produced water or for surface water disposal. Table 6-7 lists technologies that could be used to treat CBM-produced water for beneficial use.

Table 6-7. Potential Treatment Technologies for Beneficial Use and Disposal for CBM-Produced Water

Treatment Technology and Description	Potential CBM Application
Aeration/oxidation: use of spray nozzles, educators, bubble diffusers, or aerators to oxygenate water	Precipitates iron.
Reverse osmosis: pressure-driven membrane separation process	Removes sodium, chlorides, minerals, and other pollutants. Fouls if influent water contains particulates.
Ion exchange: cation or anion resin removal process	Removes ionic pollutants: sodium, chlorides, sulfate, metals.
Electrodialysis: electrical current with membrane separation process	Removes ionic pollutants: sodium, chlorides, sulfate, metals.
Chemical precipitation: addition of chemical to form metal hydroxides and subsequent precipitation of the insoluble hydroxides	Removes metals.
Downhole gas/water separation: separation of CBM from water without pumping water above ground.	Pollution prevention: decreases or eliminates CBM-produced water volume.
Freeze-thaw/evaporation: crystallization process	Reduces salinity.
Harmon SO_2 generator	Removes sulfur, increases acidity, reduces salt formation in soils receiving CBM-produced water.
Constructed wetlands	Removes metals.
Evaporation pond liners: barrier technology	Prevents infiltration of water and encourages evaporation.

Source: *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives* (ALL, 2003).

The CBM-produced waters can also be applied in agronomic rates to agricultural lands (U.S. EPA, 2006). This leads to no direct discharges of CBM-produced waters (i.e., zero discharge). Soil samples are periodically analyzed to ensure that the application of CBM-produced waters will not cause plugging or dispersal (and subsequent erosion) of the soil structure. Analytes include sodium adsorption ratio (SAR), electrical conductivity (EC), pH, and soil moisture, which help confirm the movement of water through the soil profile. Complete soil chemistry and hydraulic properties are also analyzed and review on a periodic basis. An overview of an agricultural use of CBM-produced waters is provided in Chapter 6 (Case Studies) of the *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives* (ALL, 2003).

6.8 Cost and Affordability of Treatment Technologies for CBM-Produced Water

EPA developed capital and operating costs associated with the CBM-produced water disposal and treatment methods. EPA estimated fixed costs and annual operating and maintenance costs based on equipment and land needs, for a range of produced water flows. Unit component costs were based on standard cost references, vendors, and industry contacts and are expressed in 2004 dollars. Table 6-8 shows the annualized costs estimated for treating CBM-produced water, considering capital and operating costs over lifetime water production.

Table 6-8. 2006 Estimates of Annualized Costs for Managing CBM-Produced Water in the Powder River Basin

Water Management Option	Estimated Annualized $/bbl
Surface discharge after reverse osmosis or ion exchange	$0.15 to $0.51
Zero discharge using injection or reinjection	$0.15 to $1.89
Zero discharge using impoundments	$0.06 to $0.07
Surface discharge (without treatment)	$0.03 to $0.05

Source: Computation of Lifetime per Barrel Costs of Disposal for Coal Bed Methane-Produced Water in the Powder River Basin (Jones, 2006).

After estimating treatment technology costs in 2003, EPA evaluated their affordability in an economic impact model of CBM production in the Powder River Basin. The economic analysis uses a financial model based on a discounted cash-flow approach that EPA has used for the economic analyses of several oil and gas industry-related effluent guidelines. The general approach uses a number of model projects that are specified on the basis of gas and water production volumes. Data and assumptions about costs of gas production, royalty and severance tax rates, price of gas, costs of project construction, number of wells per project, and other information are used to estimate costs. EPA used costs of CBM-produced water treatment and disposal in the model to prepare a number of scenarios, including a baseline (current practice) scenario against which all other scenarios are compared.

EPA’s 2003 study focused on the Powder River Basin, which has some of the highest water production rates of any basin in the United States. At the time of the study, wellhead gas prices were greater than $2.50 per mcf, and EPA’s analysis showed that many of the technology options were affordable, including injection (which is one of the more expensive options). DOE projects that future wellhead gas prices in the Powder River Basin will be significantly greater than $2.50-$3.00 per mcf, which indicates that the treatment technology options would continue to be affordable. Also, some of the beneficial use options might also be affordable in basins where water is currently injected, but where beneficial use opportunities are welcome.

Table 6-9 lists the types of treatment and disposal technologies evaluated in the Powder River Basin study and EPA's findings on their affordability. In the 2007 and 2008 annual reviews, EPA will collect more information on the treatment costs for the CBM-produced waters across the different CBM basins and formations.

6.9 CBM Industry Trends

This subsection discusses the trends seen in the U.S. energy market and the U.S. CBM business market.

In the 2007 and 2008 annual reviews, EPA will collect more information on the energy market trends with respect to the CBM industrial sector for the different CBM basins and formations.

6.9.1 Energy Market Trends

DOE projects that unconventional gas production, which includes CBM production, will become the largest source of domestic natural gas production over the next 25 years, as shown in Figure 6-3. The EIA projects CBM production to increase from 1.7 tcf per year (current) to 8.1 tcf per year (2015) and 9.1 tcf per year (2025) (EIA, 2006c). Currently, proved reserves of CBM are estimated to total 18.4 tcf, but technically recoverable reserves are higher. Recent estimates by DOE set this number at 75 tcf (McAllister, 2006). Most of these reserves are expected in the Rocky Mountain region, and much of this is associated with Powder River Basin.

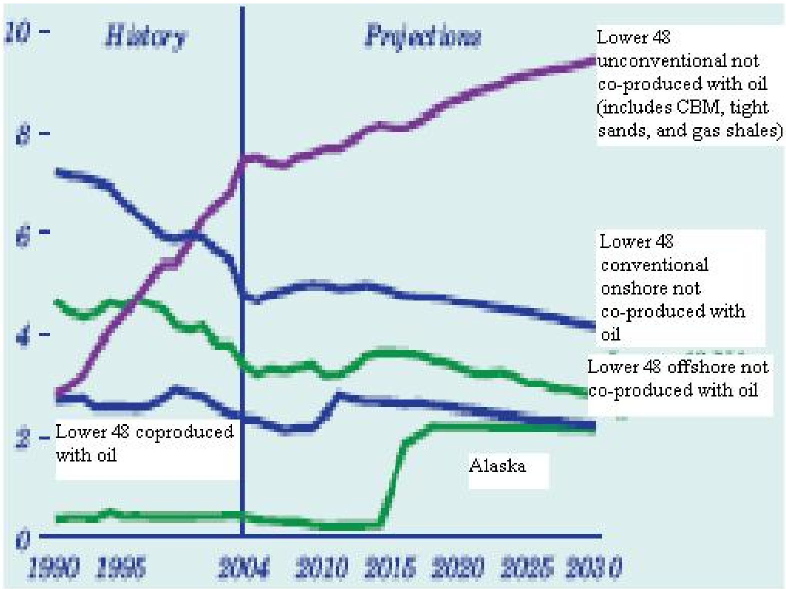

Figure 6-3. EIA Predicted Natural Gas Production by Source, 1990-2030 (tcf) (EIA, 2006c)

Table 6-9. 2003 Estimates of Cost and Affordability of Treatment and Disposal Technologies for CBM-Produced Water in the Powder River Basin

Technology Evaluated	Summary of Engineering Considerations	Estimated Cost: Capital Cost/Well Served ($000)	Estimated Cost: Operating Cost ($/bbl)	Conclusion Regarding Affordability
Surface Discharge	Piping, rip-rap, outfall structure	~$10	≤$0.01	Surface discharge costs (as the lowest cost technology) were considered the baseline against which other options are compared.
Zero Discharge via Storage Ponds	Piping, excavation and construction, surface runoff control, rip-rap, land	~$19	≤$0.01	Affordable over most gas prices modeled (i.e., production changes little from baseline).
Reverse Osmosis	Evaluation of cost to treat a portion of CBM-produced water with reverse osmosis unit	~$46 (one example case)	$0.03-$0.05	Likely to be affordable at current and projected wellhead gas prices.
Injection: Shallow Well[a]	Injection well construction, piping, tanks and chlorinator, storage tanks, injection pump, equipment building, and land	$21-$72	$0.08-$0.14	Likely to be affordable at current and projected wellhead gas prices.

Source: *Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin* (U.S. EPA, 2003).
[a]Medium depth and deep injection wells were also investigated, but shallow injection wells are considered the likeliest type of injection well needed in the Powder River Basin.

Drilling activity in the Powder River Basin has been expanding rapidly and is expected to continue to expand substantially over the next decades. According to ALL Consulting, as many as 87,000 wells might be drilled in Wyoming and Montana over the next 10 to 20 years (ALL, 2003). This averages to possibly 4,000 to 6,000 wells per year. In the last year, the Wyoming Oil and Gas Conservation Commission issued nearly 7,000 permits to drill for CBM (WOGCC, 2006).

The increased drilling activity results from increased gas prices, technology advancement, and piping infrastructure. DOE predicts that long-run wellhead gas prices (the price received by the operator of the well) will most likely range from $4 to $6/MMBtu,[11] which is more than twice the recent historic levels of about $2/MMBtu. DOE predicts even higher short-run prices, forecasting an annual average wellhead price of $7.15/Mcf for 2006, rising to $8.05/Mcf in 2007 (EIA, 2006b). Also, given that gas prices are twice the recent historic levels, CBM development will expand in basins just beginning the commercial development process.

The wellhead gas prices in the Powder River Basin tend to be slightly less than the average wellhead price due to the distance from the Midwest and Northeast gas demand areas and the relative lack of transmission infrastructure. However, a rapid expansion of infrastructure is expected in the Powder River Basin, which would increase wellhead gas prices for this area. For example, a 2 billion cubic foot per day pipeline is being built to carry gas from Wyoming to Ohio, and several similar projects are also underway (ENR, 2006).

Additionally, new technologies may reduce costs of production as well as increase the amount of reserves that are considered technically recoverable. For example, DOE predicts the possibility that multi-seam completions will allow one well to simultaneously extract methane from several narrow coal seams, lowering the cost of producing from marginally economic or uneconomic coal seams (U.S. DOE, 2005).

The increased drilling and production in the Powder River Basin and possibly other nearby basins increases produced water discharges and environmental impacts. On average, a Powder River Basin CBM well produces 97 bbl water, or over 4,000 gallons per day (WOGCC, 2006). For the Wyoming portion alone, this results in 67 MGD for all wells (WOGCC, 2006). If the expected 4,000 to 6,000 wells come on line annually, there will be an additional 16 to 24 MGD of produced water to be managed in the Powder River Basin. In Wyoming, a majority of the produced water is surface discharged, and the state may need to permit more than 2,000 well discharges each year.

6.9.2 Economic Structure of CBM Operations

CBM operators lease properties for exploration and development. The operator pays for the lease regardless of whether the lease is active. Once the lease produces, the operator also pays the mineral rights owner (who may or may not be the landowner) a royalty, which is typically a percentage of production. The mineral rights owner can be a private party, a state, the Federal Government, or a tribe and varies depending on whether state or federal laws apply (Phelps, Unknown). Western regions have more complex rights ownership on private lands,

[11] 1 MMBtu ~ 1 Mcf.

where the landowner, the water rights owner, and the mineral rights owner(s) (the owner of the coal can be different from the owner of the CBM) can all differ.

Facilities that are currently subject to the Oil and Gas Extraction ELGs – many of which also operate CBM extraction facilities – are conventionally divided into independents and "majors," which are the large, vertically integrated firms with familiar names (e.g., ExxonMobil). Independents are involved only in the "downstream" activities of drilling and producing oil and gas and are not associated with gas distribution, refining, or retail sales. Independents can be either large or small businesses (as defined by the Small Business Administration). Utilities, gas transmission firms, and mining firms might also operate CBM wells (U.S. EPA, 2003).

In the 2007 and 2008 annual reviews, EPA will collect more information on the energy market trends with respect to the CBM industrial sector for the different CBM basins and formations.

6.10 CBM Subcategory Conclusions for the 2006 Plan

In conducting this review, EPA found that it will need to gather more specific information as part of a detailed study of the CBM industry in order to determine whether it would be appropriate to conduct a rulemaking to potentially revise the Oil and Gas Extraction ELGs to include limits for CBM. In particular, EPA needs more detailed information on the characteristics of produced water, as well as the technology options available to address such discharges. To aid in a better industrial profile of the CBM sector, EPA intends to submit an ICR to OMB for their review and approval under the Paperwork Reduction Act, 33 U.S.C. 3501, et seq., in the 2007 and 2008 annual reviews. EPA will use this ICR to collect technical and economic information from a wide range of CBM operations (e.g., geographical differences in the characteristics of CBM-produced waters, current regulatory controls, availability and affordability of treatment technology options). In designing this industry survey EPA expects to work closely with CBM industry representatives and other affected stakeholders. EPA solicits comment on the potential scope of this ICR. EPA may also supplement the survey data collection with CBM site visits and produced water sampling.

Survey questionnaires solicit detailed information specific to individual facilities that is used to assess the statutory rulemaking factors, particularly technological and economic achievability of available controls, production processes, and wastewater treatment residuals disposal practices. To develop a useful survey questionnaire, EPA typically selects the methodology it would use for estimating the costs of installing or upgrading pollution control equipment and for financial and economic analyses, and defines the data it would need to conduct these studies. The necessary data for the CBM ICR will include, among other things:

- NPDES permit information and other regulatory controls;
- Information about CBM formations, CBM production levels and produced water characteristics, types of CBM drilling, CBM-produced water treatment and disposal options and practices (including beneficial use);

- The design, capacity, and operation of current CBM-produced water treatment technologies and practices;

- The types, amounts, composition, and destination of CBM-produced waters and wastes generated by the facility and associated costs of treatment, management, and disposal; and

- Detailed facility and well specific economic and financial data, such as statements of production, revenues and net income, assets and liabilities, operating costs and expenses (e.g., depreciation, royalty payments, severance tax payments), and internal rates of return.[12]

6.11 CBM Industry References

ALL. 2003. ALL Consulting, LLC. *Handbook on Coal Bed Methane Produced Water: Management and Beneficial Use Alternatives.* (July). Available online at: http://www.all-llc.com/CBM/pdf/CBMBU/CBM%20BU%20Screen.pdf. DCN 03451.

Apache Corporation. 2006. *Areas with the Largest Increase in Drilling*. (March). Available online at: http://www.apachecorp.com/Explore/Explore_Features/20060327/Topic_Report_Areas_with_the_Largest_Increase_in_Drilling/. DCN 03452.

Bartram, D., et al., 2003. Eastern Research Group, Inc. Memorandum to Carey Johnston, U.S. EPA. "Analysis of Discharge Data for Six Industry Categories." (September 5). DCN 00258.

Boetler, Ann M. et al. Unknown. Wyoming Water Research Center. Environmental Effects of Saline Oil-field Discharges on Surface Waters. RB93-104. DCN 03424.

De Bruin, R.H. R.M. Lyman, R.W. Jones, and L.W. Cook. 2001. *Coalbed Methane in Wyoming Information Pamphlet 7 (revised).* Wyoming State Geological Survey. DCN 03070.

EIA. 2004. Energy Information Administration. *CBM in the U.S. – Past, Present, and Future*. (February). Available online at: http://www.eia.doe.gov/oil_gas/rpd/cbmusa2.pdf. Date accessed: July 13, 2006. DCN 03876.

EIA. 2006a. Energy Information Administration. Natural Gas Gross Withdrawals and Production. Available online at:
http://tonto.eia.doe.gov/dnav/ng/ng_enr_cbm_a_EPG0_r51_Bcf_a.htm;
http://tonto.eia.doe.gov/dnav/ng/ng_enr_cbm_a_EPG0_r52_Bcf_a.htm;
http://tonto.eia.doe.gov/dnav/ng/ng_enr_sum_dcu_NUS_a.htm;
http://tonto.eia.doe.gov/dnav/ng/ng_prod_sum_dcu_NUS_a.htm. Date accessed: August 16, 2006. DCN 03468.

[12] EPA's ICR for the 1996 Oil and Gas Extraction Coastal Subcategory ELG rulemaking provides <u>some</u> examples of the economic information EPA will likely collect with the CBM ICR in the 2007 and 2008 annual reviews (U.S EPA, 2003b).

EIA. 2006b. Energy Information Administration. *EIA's Short-Term Energy Outlook* (June). Available online at: http://www.eia.doe.gov/emeu/steo/pub/jun06.pdf. DCN 03877.

EIA. 2006c. Energy Information Administration. *Annual Energy Outlook 2006 With Projections to 2030*. (February). DOE/EIA-0383(2006). Available online at: http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2006).pdf. DCN 03414.

ENR. 2006. Engineering News Record. "$3 Billion Project Planned to Move Rockies Gas East." (February 16). DCN 03582.

ERG. 2006a. Eastern Research Group, Inc. *Final Site Visit Report: Coalbed Methane Landowners and Environmental Impacts, Gillette, WY*. (September 29). DCN 03204.

ERG. 2006b. Eastern Research Group, Inc. *Final Site Visit Report: Coalbed Methane Operators, Gillette, WY*. (September 29). DCN 03205.

GTI. 2000. Gas Technology Institute. *U.S. Lower-48 Coal and Coalbed Resources*. Available online at: http:/www.eandpnet.com/mapscharts/cbm/ustable.html. Date accessed: July 13, 2006. DCN 03482.

Horpstad, Abe. 2001. Montana Department of Environmental Quality. Water Quality Analysis of the Effects of CBM Produced Water on Soils, Crop Yields and Aquatic Life. DCN 03555.

Horsley & Witten, Inc. 2001. "Draft Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs." Prepared for the U.S. EPA. 2001. DCN 03489.

Hulcher, Richard. 2006. Alabama Department of Environmental Management. Email to Carey Johnston, U.S. EPA. "Coal Bed Methane NPDES Permit Questions." (September 11). DCN 03680.

Johnston, Carey A. 2006a. U.S. EPA. Memorandum to Public Record for Effluent Guidelines Program Plan 2005/2006. "Review of Coal Bed Methane for the 2006 Effluent Guidelines Program Plan." (October 25). DCN 02492.

Johnston, Carey A. 2006b. U.S. EPA. Memorandum to Public Record for Effluent Guidelines Program Plan 2005/2006. "Incorporation by Reference: *Sodic Soils*" (November 30). DCN 04113.

Jones, Anne. 2006. Eastern Research Group, Inc. Memorandum to Public Record for Effluent Guidelines Program Plan 2005/2006. "Computation of Lifetime per Barrel Costs of Disposal for Coal Bed Methane-Produced Water in the Powder River Basin." (October 13, 2006). DCN 03881.

Klarich, Duane A. and Stephen M. Regele. 1980. Montana Department of Health and Environmental Sciences. Structure, General Characteristics, and Salinity Relationships of

Benthic Macroinvertebrate Associations in Streams Draining the Southern Fort Union Coalfield Region of Southeastern Montana. (November). DCN 03208.

Lawrence, A.W. 1993. Gas Research Institute. "Coalbed Methane Produced-Water Treatment and Disposal Options." *Quarterly Review of Methane from Coal Seams Technology* 11:2. (December). DCN 01146.

McAllister, Ted. 2006. Energy Information Administration. In: Proceedings from the 2006 EIA Energy Outlook and Modeling Conference. "Unconventional Natural Gas: Industry Savior or Bridge, Unconventional Gas Production Projections in the Annual Energy Outlook 2006: An Overview." (March 27). Available online at: http://www.eia.doe.gov/oiaf/aeo/conf/pdf/mccallister.pdf. DCN 03473.

MBMG. 2003. Montana Bureau of Mines and Geology. *Coal Bed Methane – Frequently Asked Questions*. Available online at: http://waterquality.montana.edu/docs/methane/cbmfaq.shtml. Date accessed: July 12, 2006. DCN 03455.

MDEQ. 2001. Montana Department of Environmental Quality. Authorization to Discharge Under the Montana Pollution Discharge Elimination System NPDES – MT0030457 – Fidelity Exploration and Production Company, Decker, MT. Helena, MT. (July 5). DCN 03878.

Mount, David R. et al. 1992. "Use of Laboratory Toxicity Data for Evaluating the Environmental Acceptability of Produced Water Discharge to Surface Waters." *Produced Water*. DCN 03135.

Mount, David R. et al. 1993a. "Discharge of Coalbed Produced Water to Surface Waters – Assessing, Predicting, and Preventing Ecological Effects." *Methane from Coal Seams Monthly*. 18-25. (December). DCN 03702.

Mount, David R. et al. 1993b. "Salinity/Toxicity Relationships to Predict the Acute Toxicity of Produced Waters to Freshwater Organisms." *Society of Petroleum Engineers, Inc.* SPE 26007. DCN 03136.

Mount, David R. et al. 1997. "Statistical Models to Predict the Toxicity of Major Ions to *Ceriodaphnia Dubia*, *Daphina Magna* and *Pimephales Promelas* (Fathead Minnows)." *Environ. Toxicology and Chemistry*. 16:2009-2019. DCN 03063.

NMOCD. 2004. New Mexico Oil Conservation Division. In: Proceedings from the Produced Water Forum in Farmington, NM. (April 1). Available online at: http://octane.nmt.edu/sw-pttc/proceedings/ProducedWater04Proc/ProceedingsPW.asp. DCN 03879.

NaturalGas.org. 2004. Well Completion. Available online at: http://www.naturalgas.org/naturalgas/well_completion.asp. Date accessed: August 18, 2006. DCN 03476.

Northern Alaska Environmental Center. 2006. *Coal Bed Methane in Alaska*. Available online at: http://www.northern.org/artman/publish/coalBed.shtml. DCN 03880.

OGB. 2006. Oil and Gas Board. Number of Wells in Black Warrior Basin. Available online at: http://www.ogb.state.al.us/. DCN 03981.

O'Farrell, Thomas P., EPA's Industrial Technology Division. Letter to Constance B. Harriman, Steptoe & Johnson. June 1, 1989. OW-2003-0074, DCN 01191.

Oil & Gas Consulting, Inc. 2002. *CBM Producers User Information Survey Results.* (January). DCN 01143. Englewood, CO.

Phelps, Shannon D., James. W. Bauder, Krista E. Pearson. Unknown. Department of Land Resources and Environmental Sciences, Montana State University-Bozeman. *Coal Bed Methane Ownership and Responsibility: A Summary of Surface, Mineral, and Split-Estate Rights.* Available online at: http://waterquality.montana.edu/docs/methane/splitestate.shtml. DCN 03004.

Pochop, L., K. Warnaka, J. Borrelli, and V. Hasfurther. 1985. Design Information for Evaporation Ponds in Wyoming. WWRC-85-21. Available online at: www.wrds.uwyo.edu/library/wrp/85-21/85-21.html. DCN 01140.

Ruckelshaus, William. 2005. *Water Production from Coalbed Methane Development in Wyoming: A Summary of Quantity, Quality, and Management Options*. The Ruckelshaus Institute of Environment and Natural Resources. (December). Available online at: http://www.uwyo.edu/enr/ienr/CBMWaterFinalReportDec2005.pdf. DCN 03486.

Tietge, Joseph E. et al. "Major Ion Toxicity of Six Produced Waters to Three Freshwater Species: Application of Ion Toxicity Models and Tie Procedures." *Environ. Toxicology and Chemistry*. 16:2002-2008. DCN 03071.

U.S. DOE. 2005. *Crude Oil and Natural Gas Development Wells, 1949-2005*. Available online at: http://www.eia.doe.gov/emeu/aer/txt/ptb0407.html. DCN 03459.

U.S. DOE. 2006. *Future Supply and Emerging Resources – Coalbed Natural Gas*. Available online at: http://www.netl.doe.gov/technologies/oil-gas/FutureSupply/CoalBedNG/CoalBed_NG.html. Date accessed: July 12, 2006. DCN 03480.

U.S. EPA. 1976. *Development Document for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Oil and Gas Extraction Point Source Category*. EPA-440/1-76-055-a. Washington, DC. (September).

U.S. EPA. 1996. *Development Document for Final Effluent Limitations Guidelines and Standards for the Coastal Subcategory of the Oil and Gas Extraction Point Source Category*. EPA-821-R-96-023. Washington, DC. (December).

U.S. EPA. 2003. *Guidance for Developing Technology-Based Limits for Coalbed Methane Operations: Economic Analysis of the Powder River Basin.* Washington, DC. February.

U.S. EPA. 1993. *Coastal Oil and Gas Questionnaire, Parts IV and V, OMB No. 2040-0160.* (July). DCN 04079.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2006. *Coalbed Methane Site Visit Report: July 2006, Powder River Basin, WY.* (November 30). DCN 04110.

USGS. 2000. U.S. Geological Survey. *Water Produced with Coal-Bed Methane*. U.S.G.S. Fact Sheet FS-156-00. (November). DCN 03487.

Veil, John. 2002. Argonne National Laboratory. *Regulatory Issues Affecting Management of Produced Water from Coal Bed Methane Wells*. Available online at: http://www.ead.anl.gov/pub/doc/cbm-prod-water-rev902.pdf. DCN 03450.

Wheaton, John, et al. 2006. Montana Bureau of Mines and Geology. *2005 Annual Coalbed Methane Regional Ground-water Monitoring Report: Northern Portion of the Powder River Basin*. Open-File Report 538. (Unknown). DCN 03474.

WDEQ. 2002. Wyoming Department of Environmental Quality. Off-channel, Unlined CBM-produced Water Pit Siting Guidelines for the Powder River Basin. (August 6). DCN 03883.

WDEQ. 2006. Wyoming Department of Environmental Quality. "Coal Bed Methane Permits." Available online at: http://deq.state.wy.us/wqd/npdes/QLstPermits.asp. DCN 03905.

WOGCC. 2005. Wyoming Oil and Gas Conservation Commission. Coalbed Methane Wells in the Powder River Basin. Available online at: http://wogcc.state.wy.us/coalbedchart.cfm. DCN 03882.

WOGCC. 2006. Wyoming Oil and Gas Conservation Commission web site. Available online at: http://wogcc.state.wy.us/. Date accessed: August 18, 2006. DCN 03904.

WYSGS. 2006. Wyoming State Geological Survey. *Coalbed Methane Information.* Available online at: http://www.wsgs.uwyo.edu/Coal/CBM_Info.aspx. DCN 03884.

Zimpfer, G.L., E.J. Harmon, and B.C. Boyce. 1988. *Disposal of Production Waters from Oil and Gas Wells in the Northern San Juan Basin, Colorado*. In: Fassett, J.E. Fassett, ed. Geology and Coal-Bed Methane Resources of the Northern San Juan Basin, New Mexico and Colorado, 1988 CBM Symposium. Denver, CO: Rocky Mountain Association of Geologists. pp. 183-198. DCN 01190.

7.0 COAL MINING (40 CFR PART 434)

EPA selected the Coal Mining Category for additional data collection and analysis because of comments received on the 2006 Preliminary Effluent Guidelines Plan. The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 2004). This section describes EPA's 2006 annual review of the discharges associated with the Coal Mining Category.

7.1 Coal Mining Category Background

This subsection provides background on the Coal Mining Category including a brief profile of the coal mining industry, background on 40 CFR Part 434, and a description of the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

7.1.1 Coal Mining Industry Profile

The Coal Mining Category includes facilities reporting under SIC industry groups 122: Bituminous Coal and Lignite Mining and 123: Anthracite Mining. Specifically, it includes the following SIC codes, described below (U.S. Census, 2002):

- 1221: Bituminous Coal and Lignite Surface Mining. Establishments primarily engaged in producing bituminous coal or lignite at surface mines or in developing bituminous coal or lignite surface mines. This industry includes auger mining, strip mining, culm bank mining, and other surface mining, by owners or lessees or by establishments which have complete responsibility for operating bituminous coal and lignite surface mines for others on a contract or fee basis. Bituminous coal and lignite preparation plants performing such activities as cleaning, crushing, screening or sizing are included if operated in conjunction with a mine site, or if operated independently of any type of mine.

- 1222: Bituminous Coal Underground Mining. Establishments primarily engaged in producing bituminous coal in underground mines or in developing bituminous coal underground mines. This industry includes underground mining by owners or lessees or by establishments which have complete responsibility for operating bituminous coal underground mines for others on a contract or fee basis. Bituminous coal preparation plants performing such activities as cleaning, crushing, screening or sizing are included if operated in conjunction with a mine. Independent bituminous coal preparation plants are classified in SIC code 1221.

- 1231: Anthracite Mining. Establishments primarily engaged in producing anthracite or in developing anthracite mines. All establishments in the United States that are classified in this industry are located in Pennsylvania. This industry includes mining by owners or lessees or by establishments which have complete responsibility for operating anthracite mines for others on a contract or fee basis. Also included are anthracite preparation plants, whether or not operated in conjunction with a mine.

Table 7-1 lists the three SIC codes with operations in the Coal Mining Category. The number of coal mining facilities in the PCS and TRI databases accounts for less than 10 percent of the mines recorded in the 2002 U.S. Economic Census. All coal mines discharge their wastewater directly to surface water, and none discharge to POTWs.

Table 7-1. Number of Facilities in Coal Mining SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
1221: Bituminous Coal and Lignite, Surface Mining	642	90	55	64
1222: Bituminous Coal and Lignite, Underground Mining	478	18	27	23
1231: Anthracite Mining	0	0	0	0
Total	**1120**	**108**	**82**	**87**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v4*; *TRIReleases2003_v2*; *TRIReleases2002_v4*.
[a]Major and minor dischargers.
[b]Releases to any media.

EPA also obtained information, shown in Table 7-2, on the number of coal mines and their production from the Office of Surface Mining and Regulatory Enforcement (OSMRE), a division of the Office of the Interior (OSMRE, 2004). OSMRE provides counts of mine permits obtained under the SMCRA. In some cases, one mining location may have multiple SMCRA permits, which is why the mine counts from the 2002 U.S. Economic Census (Table 7-1) are less than the number of permits tracked by OSMRE (Table 7-2).

Table 7-2. Number of Permitted U.S. Coal Mining Operations and Production in 2004

Mine Type	Number of Mine Permits	Production (Millions of Short Tons)
Surface	2048	726
Underground	1105	350
Total	**3,253**	**1,076**

Source: U.S. Coal Production Under the Surface Mining Law for 2004 (OSMRE, 2004).

EPA obtained information on production and production trends from the Energy Information Administration (EIA), which reports this information by mining region (EIA, 2005). Table 7-3 presents actual production for 2003 and predicted production for 2004, 2005, 2006, and 2030. Overall, the EIA predicts a steady increase in coal production by 2030 for the United States as a whole, with more growth in U.S. coal mining in the west than the east.

Table 7-3. U.S. Coal Production in 2003 and Predictions to 2030 (In Millions of Short Tons)

Region	Actual Production	Predicted Production			
	2003	2004	2005	2006	2030
Appalachia	388	403	397	402	412
Interior	146	146	155	153	281
West	549	575	593	611	1010
East of the Mississippi	481	497	499	503	633
West of the Mississippi	603	627	646	662	1070
Total	**1083**	**1125**	**1145**	**1166**	**1703**

Source: Coal Production and Number of Mines by State and Mine Type (EIA, 2005).

7.1.2 40 CFR Part 434

EPA first promulgated ELGs for the Coal Mining Category (40 CFR Part 434) on October 9, 1985 (50 FR 41305). Table 7-4 presents the eight subcategories for the Coal Mining ELGs.

Table 7-4. Coal Mining ELGs

Subpart	Subcategory Name	Type of Limitation Guideline
Subpart A	General Provisions	Definitions and applicability
Subpart B	Coal Preparation Plants and Coal Preparation Plant Associated Areas	BPT, BAT, NSPS
Subpart C	Acid or Ferruginous Mine Drainage	BPT, BAT, NSPS
Subpart D	Alkaline Mine Drainage	BPT, BAT, NSPS
Subpart E	Post-Mining Areas	BPT, BAT, NSPS
Subpart F	Miscellaneous Provisions	Provisions for commingling of waste streams, alternate effluent limitation for pH, effluent limitations for precipitation events, procedure and method detection limit for measurement of settleable solids, and modification of NPDES permits for new sources
Subpart G	Coal Remining	BPT, BAT, BCT, NSPS
Subpart H	Western Alkaline Coal Mining	BPT, BAT, NSPS

Source: *Coal Mining Point Source Category BPT, BAT, BCT Limitations and New Source Performance Standards – 40 CFR Part 434*.

The Coal Mining ELGs sets numerical limitations for Subparts A through F, listed in Table 7-5. The technology basis for these limitations and standards is neutralization, chemical precipitation, and settling. BAT limitations are the same as BPT limitations.

Table 7-5. BPT and BAT Effluent Guidelines for Coal Mining Part 434 Subparts A – F

Parameter	BPT/BAT 30-day Average (mg/L)	BPT/BAT Daily Maximum (mg/L)
TSS	35	70
Settleable Solids[a]	0.5 mL/L	
pH	within range of 6 to 9	within range of 6 to 9
Iron, Total	3.5	7.0
Manganese, Total[b]	2.0	4.0

Source: *Development Document for Effluent Limitations Guidelines and Standards for the Coal Mining Point Source Category* (U.S. EPA, 1982).
[a]Limits for settleable solids only apply to Subpart E - Post Mining Areas.
[b]Manganese limits do not apply for Subpart D - Alkaline Drainage Mines.

In addition to the ELGs presented in Table 7-5, Subpart F – Miscellaneous Provisions contains alternative limitations that apply during catastrophic precipitation events. These limitations, listed in Table 7-6, apply to discharges that result from a rainfall or snowmelt event less than the 10-year, 24-hour storm. For events greater than the 10-year, 24-hour precipitation event, the only limitation is that pH remain between 6 and 9.

Table 7-6. Catastrophic Precipitation Event Exemption of 40 CFR Part 434

Parameter	BPT - Daily Maximum
Settleable Solids[a]	0.5 mL/L
pH	within range of 6 to 9

Source: *Development Document for Effluent Limitations Guidelines and Standards for the Coal Mining Point Source Category* (U.S. EPA, 1982).
[a]No limits on settleable solids when precipitation exceeds the 10-year, 24-hour storm.

For Subpart G – Coal Remining, BPT sets numerical limitations for TSS (35 mg/L), and discharges from remining operations may not exceed pre-existing loading conditions (baseline loadings) for all other parameters. BAT for Subpart G requires implementation of a pollution abatement plan. Similarly, for Subpart H, operators must submit and implement a Sediment Control Plan to maintain sediment discharges at or below premining levels.

7.1.3 Surface Mining Control and Reclamation Act of 1977 (SMCRA)

The ELGs in 40 CFR Part 434 work in concert with SMCRA. The Coal Mining ELGs apply to discharges from mining areas and do not require reclamation activities such as regrading and revegetation. Those activities are covered by SMCRA, which is implemented by OSMRE. Under SMCRA, a permitting process requires mine operators to conduct research to determine reclamation requirements and obtain bonds to cover reclamation costs before coal mining can begin.

Mine operators must collect at least one year of baseline surface- and ground-water monitoring data before applying for a coal mining and reclamation permit under SMCRA. Permit applicants use these baseline data to generate erosion and sedimentation plans to minimize environmental impacts. Regulatory authorities use these data to perform Probable Hydrologic Consequences (PHC) evaluations, projecting the hydrologic impacts of the coal mining and reclamation. Regulators also require protection, mitigation, and rehabilitation plans as part of the permit application.

Before mining can begin, regulatory authorities must approve the PHC evaluation and accompanying plans. Under SMCRA, if authorities predict that acid mine drainage will result from the proposed mine, then a permit is not granted. Authorities also require coal mine operators to submit bonds that cover the estimated costs of reclaiming and restoring disturbed areas. Bonds are required in case the operator forfeits the mine before it has been reclaimed. Authorities review permits, require renewals, and inspect mine activities throughout the life of the mine, to ensure the use of proper erosion and sedimentation control, treatment of mine drainage, mitigation, and rehabilitation.

7.2 Coal Mining Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Coal Mining Category including the screening-level review and category-specific review.

7.2.1 Coal Mining Category 2005 Screening-Level Review

Table 7-7 presents the Coal Mining Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*. The PCS and TRI databases contain data from approximately only 10 percent of the mines; therefore, the 2005 screening-level analysis of these data does not reflect national discharges.

Table 7-7. Coal Mining Category 2005 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
Coal Mining	3,116	1,908	8,024

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

7.2.2 Coal Mining Category 2005 Pollutants of Concern

EPA did not identify any pollutants of concern, in terms of TWPE, in the 2005 annual review of the Coal Mining Category. Commenters have raised concerns over manganese, not because of its toxic-weighted load, but because of the associated expense for its treatment and removal, especially in discharges from mines that closed long ago.

7.3 Coal Mining Category Potential New Subcategories

EPA did not identify any potential new subcategories for the Coal Mining Category.

7.4 Coal Mining Category 2006 Annual Review

EPA received public comments from states, industry, and a public interest group on the 2006 Preliminary Plan. These comments urged EPA to consider revisiting the manganese limitations in 40 CFR Part 434. The state and industry commenters requested that EPA study whether additional flexibility is warranted with these manganese limitations (EPA-HQ-OW-2004-0032-1049, 1055, 1062, 1075, 1091, 1101). The public interest group commented that EPA should start a rulemaking and promulgate more stringent limitations for manganese, other metals, and other dissolved inorganic pollutants (e.g., chlorides, sulfates, TDS) (EPA-HQ-OW-2004-0032-1075).

The state and industry commenters cited the following factors in support of their comments: (1) new, more stringent coal mining reclamation bonding requirements on post-closure discharges; (2) relatively low toxicity of manganese to aquatic communities as compared to other toxic metals in the coal mining discharges; and (3) complications associated with chemical precipitation to treat manganese, especially after a mine is closed. The public interest group referenced a study by EPA Region 5 on potential adverse impacts of the discharge of sulfates on aquatic life (OW-2004-0032-DCN 03852, 03853, 03854, and 03855). Table 2-1 in Section 2.0 of this report summarizes all comments received on the 2006 Preliminary Plan, including those related to the Coal Mining Category.

7.5 Coal Mining Category Conclusions

At this time, EPA does not have sufficient information to evaluate the merits of the factors cited by commenters. However, because of the potential for revised ELGs to encourage proper wastewater treatment, EPA will conduct a detailed study of the Coal Mining ELGs in the 2007/2008 planning cycle. EPA will focus on issues related to manganese limits and pollutants not currently regulated by the existing regulations. EPA will reevaluate these effluent guidelines taking into account, among other things, treatment technologies, toxicity of discharges, cost impacts to the industry, and bonding requirements.

7.6 Coal Mining Category References

EIA. 2005. Energy Information Administration. Coal Production and Number of Mines by State and Mine Type. Available online at: www.eia.doe.gov/cneaf/coal/page/acr/table1.html. Date accessed: April 2006. DCN 03863.

OSMRE. 2004. U.S. Department of Interior, Office of Surface Mining and Regulatory Enforcement. U.S. Coal Production Under the Surface Mining Law for 2004. Available online at: http://www.osmre.gov/coal/2004coal.htm. Date accessed: April 2006. DCN 03982.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1982. *Development Document for Effluent Limitations Guidelines and Standards for the Coal Mining Point Source* Category. EPA-440/1-82/009. Washington, DC. (June).

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

8.0 FERTILIZER MANUFACTURING (40 CFR PART 418)

EPA selected the Fertilizer Manufacturing Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FC 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 2004). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Fertilizer Manufacturing Category. EPA's 2006 annual review builds on the 2005 annual review. EPA focused on discharges of fluoride from three facilities in the Phosphate Subcategory, because of their high TWPE relative to the rest of the Fertilizer Manufacturing Category.

8.1 Fertilizer Manufacturing Category Background

This subsection provides background on the Fertilizer Manufacturing Category including a brief profile of the fertilizer manufacturing industry and background on 40 CFR Part 418. Additional background on the Fertilizer Manufacturing Category can be found in the 2004 Technical Support Document (U.S. EPA, 2004).

8.1.1 Fertilizer Manufacturing Industry Profile

The fertilizer manufacturing industry includes facilities that produce phosphorus- and nitrogen-based fertilizers (U.S. EPA, 2005b). Facilities subject to this category typically report under SIC codes 2873: Nitrogenous Fertilizers, 2874: Phosphatic Fertilizers, and 2875: Fertilizers, Mixing Only (U.S. EPA, 2005b). Because there may be an overlap for facilities reporting SIC code 2874: Phosphatic Fertilizers between the Fertilizer Manufacturing Category and the Phosphate Manufacturing Category, during the 2004 screening-level review, EPA reviewed operations at the top dischargers reporting SIC code 2874 and determined which category was most appropriate for their operations (U.S. EPA, 2004). Table 8-1 presents the findings for facilities reporting SIC code 2874 that EPA identified as subject to the Fertilizer Manufacturing ELGs.

Table 8-2 lists the three SIC codes with operations in the Fertilizer Manufacturing Category. Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census data by equivalent SIC code. The facilities in SIC code 2874 that are possibly subject to the Fertilizer Manufacturing ELGs do not correlate directly to a NAICS code, and therefore EPA could not determine the number of facilities in the 2002 U.S. Economic Census for SIC code 2874.

Table 8-1. Top Facilities Reporting Under SIC Code 2874

Facility (Location)	Final Category Designation in 2004 Screening Level Review	Description
IMC Phosphates Uncle Sam (Uncle Sam, LA)[a]	Phosphate Category	Manufactures phosphoric acid and hydrofluoric acid (covered by 40 CFR Part 422 Subpart C – Phosphate Subcategory) and sulfuric acid by burning elemental sulfur (covered by 40 CFR Part 418 Subpart A – Phosphate Subcategory). Estimated that 99% of facility's discharges are from operations subject to Part 422.
IMC Phosphates Faustina (Faustina, LA)	Fertilizer Category	Manufactures ammonia, diammonium phosphate, and monoammonium phosphate from wet-process phosphoric acid produced at IMC Phosphates Uncle Sam (covered by 40 CFR Part 418 Subpart A). Previously manufactured wet-process phosphoric acid.
Mississippi Phosphates (Pascagoula, MS)	Fertilizer Category	Manufactures sulfuric acid, wet-process phosphoric acid, and diammonium phosphate (covered by 40 CFR Part 418 Subpart A).
Royster-Clark Inc. (Hartsville, SC)	Fertilizer Category	Purchases liquids, such as sulfuric acid and wet-process phosphoric acid, and other by-products and combines them in a rotary drum (covered by 40 CFR Part 418 Subpart G).

Source: Water Discharge Permit for NPDES LA0029769 – IMC Phosphates Company, Faustina Plant, St. James, LA (LDEQ, 2004a); *Technical Support Document for the 2004 Effluent Guidelines Program Plan* (U.S. EPA, 2004).
[a]During the 2006 annual review, EPA reviewed IMC Phosphates Uncle Sam facility's permit and determined the facility discharges are regulated by 40 CFR Part 418 Fertilizer Manufacturing, as discussed in Section 8.5.4.

Table 8-2. Number of Facilities in Fertilizer Manufacturing SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2873: Nitrogen Fertilizers	143	40	61	52
2874: Phosphatic Fertilizers[c]	NA[d]	1	2	3
2875: Fertilizers, Mixing Only	542	5	57	57
Total	**>685**	**46**	**120**	**112**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2*; *TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]Includes only facilities with known discharges subject to the Fertilizer Manufacturing ELGs. During the 2004 and 2005 annual reviews, EPA classified IMC Phosphates Uncle Sam as subject to the Phosphate Manufacturing Category, so this facility is not included in the 2002 TRI and PCS counts. However, after permit review, EPA determined the discharges should be included in the Fertilizer Manufacturing Category for the 2006 annual review, discussed in Section 8.5.4.
[d]Poor bridging between NAICS and SIC codes. Number of facilities could not be determined.
NA – Not applicable.

Fertilizer manufacturing facilities discharge directly to surface water as well as to POTWs. Table 8-3 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds. Of the fertilizer manufacturing facilities with wastewater discharges, most discharge directly to surface water.

Table 8-3. Fertilizer Manufacturing Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2873: Nitrogen Fertilizers	33	3	2	23
2874: Phosphatic Fertilizers[a]	2	0	1	0
2875: Fertilizers, Mixing Only	7	1	0	49

Source: *TRIReleases2002_v4*.
[a]Includes only facilities with known discharges subject to the Fertilizer Manufacturing ELGs. During the 2004 and 2005 annual reviews, EPA classified IMC Phosphates Uncle Sam as subject to the Phosphate Manufacturing Category, so this facility is not included in the 2002 TRI and PCS counts. However, after permit review, EPA determined the discharges should be included in the Fertilizer Manufacturing Category for the 2006 annual review, discussed in Section 8.5.4.

8.1.2 40 CFR Part 418

EPA first promulgated ELGs for the Fertilizer Manufacturing Category (40 CFR Part 418) on April 8, 1974 (39 FR 12836) for the Basic Fertilizer Chemicals Segment and on January 14, 1975 (40 FR 2652) for the Formulated Fertilizer Chemicals Segment. The Fertilizer Manufacturing ELGs are applicable to process wastewater and contaminated nonprocess wastewater discharged from the specific subcategories lists in Table 8-4. The seven subcategories are based on the type of fertilizer produced (U.S. EPA, 2005b). Discussion of the pollutants regulated for each subcategory can be found in Table 5-25 of the 2004 TSD (U.S. EPA, 2004).

Table 8-4. Subcategories in the Fertilizer Category

Subpart	Title	Related SIC Code(s)	Description
A	Phosphate Subcategory	2874: Phosphatic Fertilizers	Manufacture of sulfuric acid by sulfur burning, wet-process phosphoric acid, normal superphosphate, triple superphosphate, and ammonium phosphate.
B	Ammonia Subcategory	2873: Nitrogenous Fertilizers	Manufacture of ammonia.
C	Urea Subcategory	2873: Nitrogenous Fertilizers	Manufacture of urea.
D	Ammonium Nitrate Subcategory	2873: Nitrogenous Fertilizers	Manufacture of ammonium nitrate.
E	Nitric Acid Subcategory	2873: Nitrogenous Fertilizers	Production of nitric acid in concentrations up to 68 percent.
F	Ammonium Sulfate Production Subcategory	2873: Nitrogenous Fertilizers	Production of ammonium sulfate by the synthetic process and by coke oven by-product recovery.
G	Mixed Blend Fertilizer Production Subcategory	2875: Fertilizers, Mixing Only	Production of mixed[a] and blend[b] fertilizer.

Source: *Fertilizer Manufacturing Point Source Category - 40 CFR Part 418*; *Preliminary Review of Prioritized Categories of Industrial Dischargers* (U.S. EPA, 2005b).
[a]Mixed fertilizer means "a mixture of wet and/or dry straight fertilizer material, mixed fertilizer materials, fillers and additives prepared through chemical reaction to a given formulation."
[b]Blend fertilizer means "a mixture of dry, straight and mixed fertilizer materials."

8.2 Fertilizer Manufacturing Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Fertilizer Manufacturing Category including the screening-level review and category-specific review.

8.2.1 Fertilizer Manufacturing 2005 Screening-Level Review

Table 8-5 presents the NFMM Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 8-5. Fertilizer Manufacturing Category 2005 Screening-Level Review Results[a]

Rank	Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	Total TWPE
11	Fertilizer Manufacturing	143,795	6,403	150,198

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Excludes discharges from IMC Phosphates Uncle Sam. These discharges were excluded from the category because EPA determined the discharges were subject to the Phosphate Manufacturing Category (U.S. EPA, 2004). However, after permit review, EPA determined the discharges should be included in the Fertilizer Manufacturing Category for the 2006 annual review, discussed in Section 8.5.4.
[b]Discharges include only major dischargers.
[c]Discharges include transfers to POTWs and account for POTW removals.

8.2.2 Fertilizer Manufacturing Category 2005 Pollutants of Concern

Table 8-6 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. The top five pollutants account for approximately 99 percent of the TRI and PCS 2002 combined TWPE. Fluoride contributed 74 percent of the combined 2002 TRI and PCS TWPE.

Table 8-6. 2005 Annual Review: Fertilizer Manufacturing Category Pollutants of Concern

Pollutant	2002 PCS[a,b]			2002 TRI[a,c]		
	Number of Facilities Reporting Pollutants	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutants	Total Pounds Released	TWPE
Fluoride	3	3,157,912	110,527	Pollutants are not in the top five TRI 2002 reported pollutants.		
Aluminum	1	168,191	10,880			
Nitrate	13	1,631,915	9,139			
Ammonia	21	4,189,153	6,306			
Cadmium	1	267	6,172			
Dioxin and Dioxin-Like Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			2	0.008	2,288
Chlorine				9	2,880	1,467
Copper and Copper Compounds				11	1,383	878
Ammonia				42	396,220	596
Atrazine				1	186	429
Fertilizer Category Total	**24**	**540,486,797**	**143,795**	**48**	**4,980,379**	**6,403**

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.
[a]Excludes discharges from IMC Phosphates Uncle Sam. These discharges were excluded from the category because EPA determined the discharges were subject to the Phosphate Manufacturing Category (U.S. EPA, 2004). However, after permit review, EPA determined the discharges should be included in the Fertilizer Manufacturing Category for the 2006 annual review, discussed in Section 8.5.4.
[b]Discharges include only major dischargers.
[c]Discharges include transfers to POTWs and account for POTW removals.

8.3 Potential New Subcategories for the Fertilizer Manufacturing Category

EPA did not identify any potential new subcategories for the Fertilizer Manufacturing Category.

8.4 Fertilizer Manufacturing Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Fertilizer Manufacturing Category. EPA obtained additional data and identified:

- Facility classified in the wrong category; and
- Changes in estimates of TWPE for nitrite compounds, nitrate, and chlorine.

8.4.1 Fertilizer Manufacturing Category Facility Classification Revisions

During the 2004 annual review, EPA contacted the IMC Phosphates Uncle Sam facility to determine the applicable point source category. IMC Phosphates Uncle Sam produces sulfuric acid by burning sulfur, and then uses the sulfuric acid to produce phosphoric acid, defluorinated phosphoric acid, and hydrofluoric acid. The facility confirmed their operations were included in SIC code 2874 (Oliver, 2003). Based on this information, EPA determined that the IMC Phosphates Uncle Sam facility discharges were not subject to the Fertilizer Manufacturing ELGs, but rather were subject to the Phosphate Manufacturing ELGs because the manufacture of defluorinated phosphoric acid is covered by the Phosphate Manufacturing ELGs. For the 2005 annual review, EPA continued classifying the IMC Phosphates Uncle Sam facility as subject to the Phosphate Manufacturing Category. As part of the 2006 annual review, however, EPA obtained the permit for IMC Phosphates Uncle Sam facility. The permit identifies IMC Phosphates Uncle Sam facility as a phosphatic fertilizer manufacturing facility subject to the Fertilizer Manufacturing Category (LDEQ, 2003). As a result, EPA revised its category designation for this facility and has now included its discharges in the Fertilizer Manufacturing Category.

8.4.2 Fertilizer Manufacturing Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF used for nitrate and nitrate compounds in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EAD now applies for nitrate and nitrate compounds are 0.0032 and 0.000062, respectively (formerly 0.0056 and 0.000747, respectively). EAD also revised the POTW percent removal value for chlorine to 100 percent (formerly 1.87 percent). Table 8-7 presents the loads before and after corrections to the TWF for nitrate compounds and nitrate as N and the POTW percent removal for chlorine for the Fertilizer Manufacturing Category.

Table 8-7. Impact of Changes to TWF and POTW Percent Removal for the Fertilizer Manufacturing Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Nitrate Compounds	32	276	3,323
PCS 2002	Nitrate as N	13	9,139	5,222
TRI 2002	Chlorine	9	1,467	1,373

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*; *PCSLoads2002_v2*; *PCSLoads2002_v4*.

8.4.3 Fertilizer Manufacturing Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings described in Section 4.2, based on methodology changes described in Section 4.2 and changes made based on permit review. For the Fertilizer Manufacturing Category, the most significant changes are also described in Section 8.4.1 and 8.4.2. Table 8-8 shows the 2006 screening-level TWPE estimated for the Fertilizer Manufacturing Category from the 2002 and 2003 TRI and 2002 PCS databases. The TRI TWPE from the 2005 and 2006 screening-level reviews are similar, but the PCS TWPE from the 2006 screening-level review greatly exceeds that estimated at the time of the 2005 screening-level review. This is largely due to the change in category designation for the IMC Phosphates Uncle Sam facility.

Table 8-8. Fertilizer Manufacturing Category 2006 Screening-Level Review Results[a]

Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	2003 TRI TWPE[c]
Fertilizer Manufacturing	1,369,762	9,062	10,268

Source: *TRIReleases2003_v4*; *TRIReleases2002_v4*; *PCSLoads2002_v4*.

[a]Includes discharges from IMC Phosphates Uncle Sam. These discharges were excluded from the 2005 annual category review because EPA determined the discharges were applicable to the Phosphate Manufacturing Category (U.S. EPA, 2004). However, after permit review in 2006, EPA determined the discharges should be included in the Fertilizer Manufacturing Category for the 2006 annual review, discussed in Section 8.5.4.

[b]Discharges include only major dischargers.

[c]Discharges include transfers to POTWs and account for POTW removals.

8.4.4 Fertilizer Manufacturing Category 2006 Pollutants of Concern

Table 8-9 presents the pollutants of concern for the Fertilizer Manufacturing Category based on the 2006 annual review. Because fluoride discharges contribute approximately 98 percent of the combined TWPE from PCS and TRI, EPA focused its remaining study of this industry on fluoride discharges.

Table 8-9. 2006 Annual Review: Fertilizer Manufacturing Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Fluoride	4	38,348,483	1,342,197	Pollutants are not in the top five TRI 2002 reported pollutants.			Pollutants are not in the top five TRI 2003 reported pollutants.		
Aluminum	1	168,191	10,880						
Cadmium	1	267	6,172						
Nitrate Total (as N)	13	1,631,915	5,222						
Ammonia	21	4,189,153	4,650						
Nitrate Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			32	4,450,361	3,323	33	4,402,180	3,287
Dioxin and Dioxin-like Compounds				2	0.0080	2,288	2	0.0093	2,658
Chlorine				9	2,697	1,373	10	2,846	1,449
Copper and Copper Compounds				11	1,382	878	10	1,138	722
Ammonia				42	396,219	440	40	727,893	808
Fertilizer Manufacturing Category Total	**24**	**624,125,300**	**1,369,762**	**49**	**4,980,784**	**9,062**	**49**	**5,276,210**	**10,268**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

8.5 Fertilizer Manufacturing Category 2006 Top Discharging Facilities

The PCS discharges account for approximately 99 percent of the combined TRI and PCS TWPE for 2002. The additional review of the Fertilizer Manufacturing Category focuses on discharges reported to PCS in 2002. Table 8-10 lists the facilities that contribute over 99 percent of the overall Fertilizer Manufacturing Category TWPE. The vast majority of the TWPE contributed by these facilities is a result of fluoride discharges. Fluoride is generated in the manufacture of wet-process phosphoric acid that is used in phosphatic fertilizer manufacturing (U.S. EPA, 1974). This subsection provides a process description for wet-process phosphoric acid manufacturing, discusses the wastewater sources of fluoride, wastewater treatment of fluoride, and presents additional information about the top discharging facilities.

Table 8-10. 2006 Annual Review: Fertilizer Manufacturing Category Top Discharging Facilities in PCS

Facility Name	Facility Location	Products	Top Pollutant Discharged	Total Pounds Discharged	Total TWPE	Percentage of Fertilizer Manufacturing Category PCS 2002 TWPE
IMC Phosphates Uncle Sam	Uncle Sam, LA	Wet-process Phosphoric Acid	Fluoride	83,638,502	1,231,795	89.9%
IMC Phosphates Faustina	Donaldsonville, LA	Ammonia, DAP and MAP using Phosphoric Acid from Uncle Sam	Fluoride	6,791,067	81,571	6.0%
Mississippi Phosphates Corporation	Pascagoula, LA	Sulfuric Acid, Phosphoric Acid, DAP	Fluoride	14,720,096	47,286	3.5%

Source: *PCSLoads2002_v4*.
MAP – Monoammonium phosphate ($NH_4H_2PO_4$).
DAP – Diammonium phosphate ($(NH_4)_2HPO_4$).

8.5.1 Wet-Process Phosphoric Acid Process Description

In the wet process, phosphate rock is reacted with sulfuric acid and water to produce phosphoric acid and gypsum. The reaction is as follows:

$$3\,Ca_3(PO_4)_2\,(s) + 9\,H_2SO_4\,(l) + 18\,H_2O\,(l) \rightarrow 6\,H_3PO_4\,(l) + 9\,CaSO_4 \bullet 2\,H_2O\,(s)$$

Phosphate rock + sulfuric acid + water → phosphoric acid + gypsum

The product phosphoric acid and gypsum solution are mechanically filtered to remove particulate gypsum. Each pound of phosphoric acid produced generates five pounds of gypsum by-product (U.S. EPA, 1974).

The phosphoric acid contains between 26 and 30 percent phosphorous oxide (P_2O_5) and must be concentrated for sale as phosphoric acid or processed for a final fertilizer product. The phosphoric acid is concentrated using water evaporation units, which also volatilize impurities, such as fluoride, and small fractions of the phosphoric acid. The volatilized water, impurities, and phosphoric acid are condensed and sent to wastewater treatment (U.S. EPA, 1974).

The concentrated phosphoric acid is clarified to remove any solid impurities before sale or further processing for fertilizer. The fertilizer products manufactured using phosphoric acid are:

- Manufacture of triple superphosphates ($Ca(H_2PO_4)_2 \cdot H_2O$) by reacting the phosphoric acid with additional phosphate rock and water;
- Manufacture of granular triple superphosphate ($Ca(H_2PO_4)_2 \cdot H_2O$) by reacting lower concentration phosphoric acid with phosphate rock and evaporating the water to form granules; and
- Manufacture of ammonium phosphates ($NH_4H_2PO_4$ or $(NH_4)_2HPO_4$) by reacting phosphoric acid with ammonia and evaporating the water to form granules (U.S. EPA, 1974).

8.5.2 Wastewater Sources of Fluoride

The phosphate rock is not a pure compound, but a fluorapitite mineral containing impurities of fluoride, iron, aluminum, silica, and uranium. The fluoride impurities evolve into gaseous silicon tetrafluoride (SiF_4) or gaseous hydrofluoric acid (HF) throughout the manufacture of phosphoric acid and the processing of phosphoric acid into triple superphosphates. The gaseous fluoride compounds are collected in a wet scrubber unit, generating fluoride-contaminated wastewater. Additional fluoride remains in the gypsum by-product as a variety of fluoride compounds. The gypsum is combined with contaminated wastewater and pumped to a storage and disposal area. Wastewater is also generated from stormwater drainage from the storage and disposal area (U.S. EPA, 1974).

8.5.3 Wastewater Treatment of Fluoride

The basis for the existing BAT ELGs is a two-stage chemical precipitation process using lime to address pH, fluoride, and phosphorous. This treatment emerged in the industry in the early 1960s and is commonly used at facilities that manufacture phosphorous-based fertilizers. It increases the pH of contaminated water to between 3.5 and 4.0 in the first stage. The following reaction occurs in the first stage of the liming process to remove the majority of the fluoride:

$$H_2SiF_6 + 3\ CaO + H_2O \rightarrow 3\ CaF_2\ (s) + 2\ H_2O + SiO_2$$

fluosilicic acid + lime + water → calcium fluoride + water + silicia

After adequate settling time, the wastewater contains 30-60 mg/L fluoride and up to 5,500 mg/L phosphorous. The second stage of the liming process raises the pH to between 6.0 and 9.0 to primarily remove the phosphorous compounds. The reaction that occurs in the second stage of the liming process is:

$$H_3PO_4 + CaO \rightarrow CaHPO_4\ (s) + H_2O$$
phosphoric acid + lime → dicalcium phosphate + water

The second stage also removes some additional fluoride. Precipitation of calcium fluoride and dicalcium phosphate reduces the concentration of fluoride to 15 mg/L or less and phosphorous to 10 to 40 mg/L (U.S. EPA, 1974). Current technologies are achieving fluoride concentrations at least as effective, sometimes achieving 2 mg/L effluent fluoride. The chemical precipitation has improved by using calcium chloride ($CaCl_2$) rather than lime, while solids separation has improved by using polymers and membrane filters (WC&E, 2006; Ionics, Unknown; GCIP, 2002).

8.5.4 Top Facility Permit Compliance

All of the top facilities in the Fertilizer Manufacturing Category are phosphate fertilizer manufacturers and are potentially subject to 40 CFR Part 418 Subpart A – Phosphate Subcategory. Subpart A BAT includes limits on flow-based surge capacity and pollutant discharge concentrations. The flow-based requirements are:

- Zero discharge of wastewater except from the gypsum storage and disposal area;
- Maintenance of a surge capacity for a 10-year, 24-hour storm event (BPT) or a 25-year, 24-hour storm event (BAT) in the gypsum storage and disposal area;
- If stored wastewater reaches 50 percent of the required surge capacity, the facility is *allowed* to discharge treated wastewater;
- If stored wastewater exceeds 50 percent of the required surge capacity, the facility is *required* to discharge treated wastewater; and
- During discharge events, facilities are required to meet limitations for phosphorous, fluoride (25 mg/L monthly average and 75 mg/L daily maximum), total suspended solids, and pH (U.S. EPA, 1974).

Facilities minimize the volume of wastewater discharged by impounding and recirculating all direct contact process wastewater, including stormwater runoff from active gypsum storage and disposal areas. This recirculation leads to an accumulation of fluoride, phosphorous, and radium in the wastewater with concentrations in excess of 8,500 mg/L fluoride, 5,000 mg/L phosphorous, and 60 pCi/L radium 226. Additionally, the wastewater is typically very acidic, between a pH of one to two. Several facilities report that they have not treated or discharged wastewater for several years. For the 1974 rulemaking, EPA determined that most facilities would discharge continuously between two and four months of the year (U.S. EPA, 1974).

The applicability of Subpart A excludes certain wet-process phosphoric acid processes from BPT, BAT, and BCT limitations that were under construction either on or before April 8, 1974, at plants located in the state of Louisiana. As a result, the IMC Phosphates Uncle Sam and Faustina facilities are excluded from Subpart A. Permit writers limit discharges from these facilities using best professional judgment (BPJ) (see 52 FR 28428, July 29, 1987). For some portion of the discharges from the IMC Phosphates Uncle Sam and Faustina facilities, BPJ permits incorporate Subpart A requirements (see Table 8-12). All discharges from Mississippi Phosphates Corporation are permitted based on Subpart A (MDEQ, 2002a; MDEQ, 2002b).

Table 8-11 presents the fluoride discharges reported to PCS in 2002 by outfall and the corresponding fluoride permit limit for the top three fertilizer manufacturing facilities and the calculated fluoride discharge based on the permit limits. Table 8-12 presents the discharge flow restrictions included in each facility's permit.

Table 8-11. Fertilizer Manufacturing Category, Top Fluoride Outfalls

Name	Outfall with Fluoride Discharges	Pounds of Fluoride Discharged	TWPE of Fluoride Discharges	Permit Limits	Calculated Maximum Pounds of Fluoride Using Permit Limits
IMC Phosphates Uncle Sam[a]	001: Once-through cooling water, scrubber water, non-process wastewater, fertilizer area stormwater, inactive gypsum storage area, and active gypsum storage area	35,190,572	1,231,670	Limits for outfall 001 excluding inactive and active gypsum storage area discharges: 165.0 lb/day monthly average 222.8 lb/day daily maximum	81,322[b]
IMC Phosphates Faustina	001: Active gypsum storage area, process wastewater, stormwater, nonprocess wastewater, and noncontact cooling water	105,272	3,685	25 mg/L monthly average 75 mg/L daily maximum	131,636[c]
	002: Inactive gypsum storage area	1,737,420	60,810	Monitor and report fluoride discharges	NA
Mississippi Phosphates Corporation	001: Noncontact cooling water and stormwater	1,304,595	45,661	292 lb/day monthly average 876 lb/day daily maximum; based on: 25 mg/L monthly average 75 mg/L daily maximum	319,740[b]

Source: Facility Permits (LDEQ, 2003; LDEQ, 2004a; LDEQ, 2004b; MDEQ, 2002a; MDEQ, 2002b); *PCSLoads2002_v4*.
[a]Pounds of fluoride using permit limits cannot be calculated because fluoride is not limited for outfall 002.
[b]Pounds of fluoride calculated using the daily maximum fluoride lb/day permit limit and 365-day per year discharge.
[c]Pounds of fluoride calculated using the daily maximum fluoride mg/L permit limit, 365-day per year discharge, and the 30-day maximum flow 7.01 MGD flow (LDEQ, 2004b).
NA – Not applicable. The pounds of fluoride cannot be calculated using the permit limits since flow data are not available.

Table 8-12. Fertilizer Manufacturing Category, Permit Flow Requirements

Name	Permit Findings
IMC Phosphates Uncle Sam[a]	Acknowledges exemption of flow requirements; portion of gypsum storage and disposal are designated inactive; stormwater from inactive storage and disposal area discharged without treatment; FDF granted to exempt facility from recycling process wastewater by installing fluoride scrubber; gypsum storage area must meet BAT requirements; optional discharge of treated wastewater below 50% surge capacity; required discharge of treated wastewater above 50% storage capacity.
IMC Phosphates Faustina	No acknowledgement of exemption of flow requirements; no discharge of process wastewater; gypsum storage area must meet BAT requirements; optional discharge of treated wastewater below 50% surge capacity; required discharge of treated wastewater above 50% storage capacity.
Mississippi Phosphates Corporation[b]	Gypsum storage area must meet BAT requirements; optional discharge of treated wastewater below 50% surge capacity; required discharge of treated wastewater when above 50% surge capacity.

Source: Facility Permits (LDEQ, 2003; LDEQ, 2004a; LDEQ, 2004b; MDEQ, 2002a; MDEQ, 2002b); *PCSLoads2002_v4*.
[a]Facility permit includes mass-based fluoride limitations (165.0 lb/day monthly average, 222.8 lb/day daily maximum) for one outfall based on fluoride removal efficiency of the scrubber.
[b]Facility permit includes mass-based fluoride limitations that were calculated using the ELGs concentrations and the facility flow rates, as provided in the Permit Rationale (MDEQ, 2002a).
FDF – Fundamentally different factors variance.

IMC Phosphates Uncle Sam reported over 35 million pounds of fluoride to PCS in 2002; however, using their daily maximum fluoride permit limit and 365 days of discharge, the facility should only discharge 81,322 pounds of fluoride per year. Mississippi Phosphates Corporation reported over 1.3 million pounds of fluoride to PCS in 2002; however, using their daily maximum fluoride permit limit and 365 days of discharge, the facility should only discharge 319,740 pounds of fluoride per year. Both facilities appear to be exceeding their mass-based permit limits for fluoride.

IMC Phosphates Faustina reported over 105,000 pounds of fluoride to PCS in 2002; the estimated fluoride discharge using the daily maximum fluoride permit limit and maximum flow of 7.01 MGD for outfall 001 is 131,636 pounds of fluoride per year (LDEQ, 2004b). The fluoride concentrations that IMC Phosphates Faustina reported from 2002 through 2005 for outfall 001 are within the permitted limits. The estimated fluoride discharge for outfall 002 cannot be calculated since the discharge is not limited. The fact sheet for this facility listed an estimated discharge of 2.464 MGD intermittently from outfall 002, which is potentially contaminated stormwater runoff from the inactive calcium sulfate storage pile and is not treated prior to discharge. The fluoride concentrations from this outfall range from 233 mg/L to 1,116 mg/L, far greater than the treatable concentrations reported in the 1974 Development Document (U.S. EPA, 1974).

8.6 Fertilizer Manufacturing Conclusions

- Previously, EPA identified IMC Phosphates Uncle Sam as subject to the Phosphate Manufacturing ELGs. After reviewing the facility's permit, EPA determined that this facility is subject to the Fertilizer Manufacturing ELGs.

- For the 2006 screening-level review, the high TWPE ranking for the Fertilizer Manufacturing Category is from fluoride dischargers from three facilities manufacturing phosphate-based fertilizer from wet-process phosphoric acid. One facility, IMC Phosphates Uncle Sam, contributes over 92 percent of the Fertilizer Manufacturing Category fluoride TWPE reported to PCS in 2002.

- 40 CFR Part 418 regulates fluoride discharges from operations in the Phosphate-Based Fertilizer Subcategory, requiring zero discharge except during certain storm events, and treatment of fluoride discharges to 25 mg/L (monthly average) and 75 mg/L (daily maximum).

- High fluoride discharges are from three facilities: IMC Phosphates Uncle Sam, Mississippi Phosphates Corporation, and IMC Phosphates Faustina. All three are report continuous, 12-month discharges.

- IMC Phosphates Uncle Sam is exempt from Subpart A, so the permit is based on BPJ but includes fluoride limits. The facility appears to be exceeding their fluoride limits.

- Mississippi Phosphates Corporation's permit is based on Subpart A. The facility appears to be exceeding their fluoride limits.

- IMC Phosphates Faustina is exempt from Subpart A, so the permit is based on BPJ but includes fluoride limits, monitoring, and reporting requirements. Fluoride discharges from outfall 001 are within the permitted limits. Fluoride discharges from outfall 002 are not limited, but monitored and reported at concentrations greater than the treatable concentrations reported in the 1974 Development Document (U.S. EPA, 1974).

8.7 Fertilizer Manufacturing References

GCIP. 2002. General Chemical Industrial Products. Chapter 14 – Wastewater and Water Treatment. Available online at: http://www.genchem.com/calcium/NCh14.html. Date accessed: July 27, 2006. DCN 03761.

Ionics. Unknown. "The EnChem® Process for Fluoride Removal." *Wastewater Treatment for the Microelectronics Industry*. Available online at: http://www.iconics.com/pdf/TS4752EUS.pdf. Date accessed: July 27, 2006. DCN 03760.

LDEQ. 2003. Louisiana Department of Environmental Quality. Office of Environmental Services Water Discharge Permit and Fact Sheet NPDES LA0004847 – IMC Phosphates Company Uncle Sam Plant, Uncle Sam, LA. Baton Rouge, LA. (June 16). DCN 02764.

LDEQ. 2004a. Louisiana Department of Environmental Quality. Water Discharge Permit for NPDES LA0029769 – IMC Phosphates Company, Faustina Plant, St. James, LA. Baton Rouge, LA. DCN 02424.

LDEQ. 2004b. Louisiana Department of Environmental Quality. Water Discharge Permit Fact Sheet for NPDES LA0029769 – IMC Phosphates Company, Faustina Plant, St. James, LA. Baton Rouge, LA. DCN 02424.

MDEQ. 2002a. Mississippi Department of Environmental Quality. State of Mississippi Water Pollution Control Permit to Discharge Wastewater in Accordance with the National Pollution Discharge Elimination System Fact Sheet NPDES MS0003115 – Mississippi Phosphates Corporation, Pascagoula, Mississippi. Jackson, MS. (July 8). DCN 02414.

MDEQ. 2002b. Mississippi Department of Environmental Quality. State of Mississippi Water Pollution Control Permit to Discharge Wastewater in Accordance with the National Pollution Discharge Elimination System NPDES MS0003115 – Mississippi Phosphates Corporation, Pascagoula, MS. Jackson, MS. (August 26). DCN 02414.

Oliver, Russell G. 2003. Telephone conversation with Russell G. Oliver of IMC Phosphates, Uncle Sam, LA, and Bob Southworth of Eastern Research Group. "SIC Code for Uncle Sam and Faustina Facilities." (November 18). DCN 00560.

Pirkle, Billy. 2004. Telephone conversation with Billy Pirkle of Royster-Clark, Hartsville, SC, and Arash Hooshangi of Eastern Research Group. "Clarification of Manufacturing Process and Pollutant Discharges." (January 16). DCN 00735.

Smith, Jim. 2004. Telephone conversation with Jim Smith of Mississippi Phosphates Corporation, Pascagoula, MS, and Arash Hooshangi of Eastern Research Group, Inc. "Clarification of Manufacturing Processes and Pollutant Discharges." (January 16). DCN 00734.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1974. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Basic Fertilizer Chemicals Segment of the Fertilizer Manufacturing Point Source Category*. EPA-440/1-75/042-a. Washington, DC. (March).

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

WC&E. 2006. Wastech Controls & Engineering, Inc. Fluoride Wastewater Treatment (FWT) (HF Neutralization or Fluoride Reduction. Available online at: http://www.wastechengineering.com/papers/hf.htm. Date accessed: July 27. DCN 03759.

9.0 INORGANIC CHEMICALS MANUFACTURING (40 CFR PART 415)

EPA selected the Inorganic Chemicals Manufacturing (Inorganic Chemicals) Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 1982). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Inorganic Chemicals Category. EPA's 2006 annual review builds on the 2005 annual review.

EPA focused this review on discharges of dioxin and dioxin-like compounds from the Titanium Dioxide Production Subcategory, because of their high TWPE relative to the rest of the Inorganic Chemicals Category. EPA is currently reviewing discharges from the Chlor-Alkali Subcategory as part of the Chlorine and Chlorinated Hydrocarbons (CCH) ELGs rulemaking and excluded the discharges from that subcategory from this review (see Table V-1, 70 FR 51050, August 29, 2005).

9.1 Inorganic Chemicals Category Background

This subsection provides background on the Inorganic Chemicals Category including a brief profile of the inorganic chemicals manufacturing industry and background on 40 CFR Part 415.

9.1.1 Inorganic Chemicals Industry Profile

The inorganic chemicals manufacturing industry includes facilities that manufacture chemicals that do not include organic carbon and its derivatives as their principal elements. The industry includes facilities within the following four SIC codes:

- 2812: Alkalies and Chlorine;
- 2813: Industrial Gases;
- 2816: Inorganic Pigments; and
- 2819: Inorganic Chemicals, Not Elsewhere Classified (NEC).

Table 9-1 lists the four SIC codes with operations in the Inorganic Chemicals Category.

Table 9-1. Number of Facilities in Inorganic Chemicals Manufacturing SIC Codes

SIC Code	Final Regulation (1982 and 1984)	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2812 Alkalies and Chlorine	77	40	6	7	8
2813 Industrial Gases	223	568	42	82	73
2816 Inorganic Pigments	36	105	24	50	48
2819 Inorganic Chemicals, NEC[c]	434	2,396	123	348	336
Total	**770**	**3,109**	**195**	**487**	**465**

Sources: *Development Document for Effluent Limitations Guidelines and Standards for the Inorganic Chemicals Manufacturing Point Source Category* (U.S. EPA, 1982); U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2*; *TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]EPA identified certain facilities reporting under SIC code 2819 as subject to the Nonferrous Metals Manufacturing ELGs (see Section 5.0).
NEC - Not elsewhere classified.

Inorganic chemicals manufacturing facilities discharge directly to surface water as well as to POTWs. Table 9-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds.

Table 9-2. Inorganic Chemicals Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2812: Alkalies and Chlorine	0	0	0	7
2813: Industrial Gases	5	1	1	75
2816: Inorganic Pigments	12	9	7	22
2819: Inorganic Chemicals, NEC	52	78	30	185

Source: *TRIReleases2002_v4.*
NEC – Not elsewhere classified.

9.1.2 40 CFR Part 415

EPA first promulgated ELGs for the Inorganic Chemicals Category (40 CFR Part 415) in 1974 and revised then in 1975, 1976, 1982, and 1986. The Inorganic Chemicals ELGs include 67 subcategories defined by the type of inorganic chemical product manufactured. The ELGs provide limitations guidelines for BPT, BAT, BCT, and NSPS for all subcategories, and include pretreatment standards for at least one subcategory. Table 5-6 in the 2004 Plan contains details on the pollutants regulated by subpart.

9.2 Inorganic Chemicals 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Inorganic Chemicals Category including the screening-level review and category-specific review.

9.2.1 Inorganic Chemicals 2005 Screening-Level Review

Table 9-3 compares the Inorganic Chemicals Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*. The table excludes the amount of TWPE contributed specifically by the Chlor-Alkali Subcategory.

Table 9-3. Inorganic Chemicals Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	Total TWPE
8	Inorganic Chemicals, Excluding the Chlor-Alkali Subcategory[c]	139,682	280,977	420,659

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]The Chlor-Alkali Subcategory of the Inorganic Chemicals Category includes facilities that conduct chlor-alkali manufacturing and reported a primary SIC code associated with inorganic chemicals.

EPA is currently considering revisions to ELGs for discharges from facilities that produce chlorine by the chlor-alkali process. Because a rulemaking for the chlor-alkali sector of the Inorganic Chemicals Category is underway, discharges from these facilities were excluded from further consideration for the Inorganic Chemicals Category review under the current planning cycle.

9.2.2 Inorganic Chemicals Category 2005 Pollutants of Concern

Table 9-4 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. Dioxin and dioxin-like compounds contributed 27 percent of the category TWPE in *TRIReleases2002_v2*. Five of the seven facilities that reported dioxin discharges to TRI in 2002 manufacture titanium dioxide (U.S. EPA, 2001). As a result, most of this section focuses on discharges of dioxin and dioxin-like compounds.

Table 9-4. 2005 Annual Review: Inorganic Chemicals Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Dioxin and Dioxin-Like Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			7	0.07	74,702
Sodium Nitrite				7	186,320	69,560
Chlorine	16	16,915	8,612	13	77,654	39,539
Lead and Lead Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			54	13,148	29,451
Mercury and Mercury Compounds				14	206	24,164
Iron	11	11,540,889	64,629	Pollutants are not in the top five TRI 2002 reported pollutants.		
Nitrogen, Nitrite Total (as N)	3	87,896	32,815			
Sulfide	2	2,640	7,396			
Fluoride	10	205,338	7,187			
Inorganic Chemicals Category Total	**68[c]**	**1,258,006,644**	**139,682**	**198[c]**	**9,315,202**	**280,977**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

9.3 Potential New Subcategories for the Inorganic Chemicals Category

EPA did not identify any potential new subcategories for the Inorganic Chemicals Category.

9.4 Inorganic Chemicals Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Inorganic Chemicals Category. EPA obtained additional data and identified:

- Facilities classified in the wrong category;
- Changes in estimates of TWPE for dioxin and dioxin-like compounds discharges for three facilities; and
- Changes in estimates of TWPE for sodium nitrite, chlorine, nitrogen compounds.

9.4.1 Inorganic Chemicals Category Facility Classification Revisions

EPA contacted facilities that reported discharges of dioxin and dioxin-like compounds to TRI in 2002 and determined that one facility, GB Biosciences in Houston, TX, manufactures agricultural chemicals and pesticides. The discharges from this facility are subject to 40 CFR Part 455: Pesticide Chemicals rather than 40 CFR Part 415: Inorganic Chemicals (Wood, 2006). EPA changed the category classification of this facility in the revised databases, *TRIReleases2002_v4* and *PCSLoads2002_v4*, as described in Section 4.5 of this TSD.

9.4.2 Inorganic Chemicals Category Dioxin and Dioxin-Like Compounds Discharge Revisions

As described in Section 4.1, dioxin and dioxin-like compounds include 2,3,7,8-tetrachlordibenzo-p-dioxin (TCDD) and 16 other dioxin-like congeners. TRI requires facilities to report the total mass of the 17 congeners and allows facilities to report a single congener distribution across all media, representing the relevant percentages of each of the 17 congeners. The reported congener distribution may not represent the distribution of the congeners in wastewater. EPA contacted the facilities that reported discharges of dioxin and dioxin-like compounds to TRI in 2002 to determine how they estimated the discharges. Table 9-5 lists the facilities that EPA contacted, EPA's findings, and the resulting changes to the TRI databases.

9.4.3 Inorganic Chemicals Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF and POTW percent removal values used for sodium nitrite in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373) and the POTW percent removal is now 90 percent (formerly 1.85 percent). EAD also revised the TWF used for nitrite in the TRI and PCS databases. The TWF that EAD applies for nitrite is now 0.0032 (formerly 0.373). EAD also revised the POTW percent removal values used for chlorine in the TRI databases. The POTW percent removal that EAD applies for chlorine is now 100 percent (formerly 1.87 percent). Table 9-6 presents the loads before and after corrections to the TWF and POTW percent removal for sodium nitrite, the TWF for nitrite, and the POTW percent removal for chlorine for the Inorganic Chemicals Category.

Table 9-5. Inorganic Chemicals Category Facilities with Discharge Revisions

TRI ID	Facility	Dioxin and Dioxin-Like Compounds Findings	Resulting Database Change in *TRIReleases2002_v4*
21226-SCMCH-3901G	Millennium Inorganic Chemicals Inc.	Facility found dioxin and dioxin-like compounds at concentrations below sample detection limits in 2004. Facility estimated discharges based on ½ the detection limit (Schildt, 2006).	EPA revised the discharges of dioxin and dioxin-like compounds to zero pounds.
31404-KMRNC-EAST	Kerr McGee Pigments	Facility never measured dioxin and dioxin-like compounds and estimates discharges based on ½ the detection limit (Dolan, 2006).	EPA revised the discharges of dioxin and dioxin-like compounds to zero pounds.
38127-DPNTM-2571F	Du Pont Memphis Plant	Facility analyzed wastewater for dioxin and dioxin-like compounds once in 2001 and detected one congener, 1,2,3,4,7,8,9-heptachlorodibenzo-p-dioxin at 4.7 pg/L. This measurement is below the Method 1613B minimum level. Facility assumed that undetected congeners were present at the detection limit (Zweig, 2006).	EPA revised the discharges of dioxin and dioxin-like compounds to 0.0235 pounds to reflect only the detection of 1,2,3,4,7,8,9-heptachlorodibenzo-p-dioxin.

Source: *TRIReleases2002_v2*; *TRIReleases2002_v4*;.

Table 9-6. Impact of Changes to TWF and POTW Percent Removal for the Inorganic Chemicals Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	6[a]	69,560	63.5
PCS 2002	Nitrogen, Nitrite Total (as N)	3	32,815	281
TRI 2002	Chlorine	13	39,539	2,440

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*; *PCSLoads2002_v4*.
[a]Number of facilities reporting discharges of sodium nitrite to TRI in 2002 for the revised database, *TRIReleases2002_v4*, increased due to moving U.S. DOE Portsmouth Gaseous Diffusion Plant from the Inorganic Chemicals Category to the Nonferrous Metals Manufacturing Category.

9.4.4 Inorganic Chemicals Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings based on methodology changes as described in Section 4.2. For the Inorganic Chemicals Category, the most significant changes are also described in Section 9.4.1 through 9.4.3. Table 9-7 shows the 2006 screening-level TWPE estimated for the Inorganic Chemicals Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 9-7. Inorganic Chemicals Category 2006 Screening-Level Review

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Inorganic Chemicals, Excluding the Chlor-Alkali Subcategory[c]	107,159	186,185	182,427

Sources: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Values exclude TWPE from the Chlor-Alkali subcategory, because EPA is investigating chlor-alkali discharges as part of the CCH rulemaking.

9.4.5 Inorganic Chemicals Category 2006 Pollutants of Concern

Table 9-8 presents the pollutants of concern for the Inorganic Chemicals Category based on the 2006 annual review.

Manganese and Manganese Compounds Discharges

Of the Inorganic Chemicals Category's 2002 manganese and manganese compounds discharges in TRI, 91 percent were from Kerr McGee Pigments in Savannah, GA. The facility's permit does not require monitoring for manganese, and the manganese results from titanium dioxide manufacture using the sulfate process. The facility shut down its sulfate process in 2004, and its manganese releases should be significantly reduced (Dolan, 2006). The category's 2002 manganese discharges in TRI without the Kerr McGee Pigments facility account for only 6,745 TWPE.

Iron Discharges

Of the Inorganic Chemicals Category's 2002 iron discharges in PCS, 99 percent were from Kerr McGee Pigments in Savannah, GA. The facility's permit requires wastewater monitoring for iron but does not have limits for iron. EPA contacted the facility and determined that the iron loads result from titanium dioxide manufacture using the sulfate process. The facility shut down its sulfate process in 2004, and its iron discharges are significantly reduced (U.S. Census, 2002). The Inorganic Chemicals Category's 2002 iron discharges in PCS without the Kerr McGee Pigments facility account for only 801 TWPE.

Table 9-8. 2006 Annual Review: Inorganic Chemicals Category Pollutants of Concern[a]

Pollutant	2002 PCS[b]			2002 TRI[c]			2003 TRI[c]		
	Number of Facilities Reporting Pollutant	**Total Pounds Released**	**TWPE**	**Number of Facilities Reporting Pollutant**	**Total Pounds Released**	**TWPE**	**Number of Facilities Reporting Pollutant**	**Total Pounds Released**	**TWPE**
Manganese and Manganese Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			30	1,105,758	77,882	31	1,186,329	83,557
Lead and Lead Compounds				54	13,148	29,451	57	3,128	7,007
Mercury and Mercury Compounds				14	206	24,164	15	164	19,174
Dioxin and Dioxin-Like Compounds				4	0.066	21,197	5	0.039	22,404
PCBs				1	0.300	10,210	2	0.314	10,687
Iron	10	11,540,889	64,629	Pollutants are not in the top five TRI 2002 reported pollutants.					
Chlorine	13	16,915	8,612						
Sulfide	2	2,640	7,396						
Fluoride	10	205,338	7,187						
Cadmium	7	91	2,109						
Inorganic Chemicals Category Total	**66**[d]	**1,242,687,564**	**107,159**	**195**[d]	**9,072,771**	**186,185**	**201**[d]	**8,831,964**	**182,427**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Values exclude TWPE from the Chlor-Alkali Subcategory, because EPA is investigating chlor-alkali discharges as part of the CCH rulemaking.
[b]Discharges include only major dischargers.
[c]Discharges include transfers to POTWs and account for POTW removals.
[d]Number of facilities reporting TWPE greater than zero.

Lead and Lead Compounds Discharges

Of the Inorganic Chemicals Category's 2002 lead and lead compounds discharges in TRI, 83 percent were from PCS Nitrogen Fertilizers in Geismar, LA. In 2002, this facility reported 10,862 pounds (24,331 TWPE) and in 2003 reported 140 pounds (314 TWPE). The difference in TWPE for lead and lead compounds from 2002 to 2003 in the TRI databases, as shown in Table 9-7, is due to the decrease in reported discharges of lead and lead compounds from this facility.

Mercury and Mercury Compounds Discharges

Of the Inorganic Chemicals Category's 2002 mercury and mercury compounds discharges in TRI, 84 percent of the discharges are from Kerr McGee Pigments in Hamilton, MS. This facility also accounted for 75 percent of the 2003 mercury and mercury compounds discharges in TRI. EPA contacted the facility and determined that the mercury and mercury compounds discharges were from the titanium dioxide process. The facility has never analyzed for mercury in the wastewater (Dolan, 2006), and based its mercury and mercury compounds discharge estimates on the approximate amount of mercury in the rutile ore and fate and transport estimates.

Dioxin and Dioxin-Like Compounds Discharges

EPA identified facilities reporting discharges of dioxin and dioxin-like compounds to TRI in 2002 and 2003 for additional review because of the TWPE associated with the discharges. Of the four facilities reporting discharges of dioxin and dioxin-like compounds to TRI in 2002, three facilities manufacture titanium dioxide.

9.5 Inorganic Chemicals Category Dioxin and Dioxin-Like Compounds Discharges

As described in Section 4.1, dioxin and dioxin-like compounds include 2,3,7,8-tetrachlordibenzo-p-dioxin (TCDD) and 16 other dioxin-like congeners. Section 9.4.2 describes the changes made to the TRI 2002 databases based on EPA contact with facilities reporting discharges of dioxin and dioxin-like compounds. EPA zeroed the dioxin and dioxin-like compounds discharges for two facilities, Millennium Inorganic Chemicals Inc. and Kerr McGee Pigments, and corrected the discharge of dioxin and dioxin-like compounds for one facility, Du Pont Memphis Plant. Table 9-9 lists the facilities reporting discharges of dioxin and dioxin-like compounds to TRI in 2002 and 2003 with the products the facilities manufacture.

Table 9-9. Inorganic Chemicals Category Facilities Reporting Discharges of Dioxin and Dioxin-like Compounds to TRI

Facility (Location)	Applicable Subcategory	2002 TRI[a]		2003 TRI[a]	
		Pounds Dioxin and Dioxin-Like Compounds Released	Dioxin and Dioxin-Like Compounds TWPE	Pounds Dioxin and Dioxin-Like Compounds Released	Dioxin and Dioxin-Like Compounds TWPE
Du Pont Memphis Plant (Memphis, TN)	Hydrogen Cyanide	0.000001	0.41	0.000001	0.38
Du Pont De Lisle Plant (Pass Christian, MS)	Titanium Dioxide	NR	NR	0.00002	1.70
Du Pont Edgemoor Plant (Edgemoor, DE)	Titanium Dioxide	0.03	60.5	0.002	208
Du Pont New Johnsonville Plant (New Johnsonville, TN)	Titanium Dioxide	0.04	6,849	0.03	4,953
Kerr-McGee Chemical, LLC (Tronox) (Savannah, GA)	Titanium Dioxide	0.00	0.00	0.00	0.00
Louisiana Pigment Company LLC (Lake Charles, LA)	Titanium Dioxide	0.0004	14,288	0.0007	17,241
Millennium Inorganic Chemicals Inc. (Baltimore, MD)	Titanium Dioxide	0.00	0.00	0.00	0.00

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.
NR – Not reported.

Only one facility that reported discharges of dioxin and dioxin-like compounds to TRI in 2002 and 2003 does not manufacture titanium dioxide. This facility, Du Pont Memphis Plant in Memphis, TN, was unable to determine the source of the dioxin and dioxin-like compounds discharges. Chlorine is required to produce dioxin and dioxin-like compounds and this facility only uses sodium hypochlorite for breakpoint chlorination of its wastewater treatment system to remove cyanide from the wastewater.

For comparison purposes, Table 9-10 compares the dioxin and dioxin-like compounds discharges for the Titanium Dioxide Subcategory of the Inorganic Chemicals Category, the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) Category, and the facilities reviewed as part of the CCH rulemaking. Compared with the 2002 TWPE from discharges from OCPSF and CCH dischargers, the total 2002 TWPE for titanium dioxide dischargers is significantly less.

Table 9-10. Comparison of TRI TWPE from Dioxin and Dioxin-Like Compounds for 2002 and 2003 for the Titanium Dioxide Subcategory, OCPSF Category, and CCH Rulemaking

Point Source Category/Subcategory	Dioxin and Dioxin-Like Compounds TRI TWPE	
	2002	2003
Titanium Dioxide Subcategory of the Inorganic Chemicals Category	21,197	22,404
Organic Chemicals, Plastics, and Synthetic Fibers Category[a]	115,132	703,572
Chlorine and Chlorinated Hydrocarbons Rulemaking	8,667,223	6,733,923

Sources: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Excludes facilities included in the CCH rulemaking.

9.6 Titanium Dioxide Manufacturing Subcategory

The majority of the TWPE associated with dioxin and dioxin-like compounds discharges in the TRI databases for the Inorganic Chemicals Category results from titanium dioxide manufacturers. This subsection discusses titanium dioxide manufacturing and provides more detail on available dioxin and dioxin-like compounds data.

9.6.1 Titanium Dioxide Manufacturing Industry Profile

Nine plants in the United States currently manufacture titanium dioxide. Because discharges reported by six of these facilities accounted for most of the TWPE from dioxin and dioxin-like compounds in EPA's 2005 annual review for the Inorganic Chemicals Category, EPA identified this subcategory for additional review. All nine facilities discharge their wastewater directly, and none have permit limits for dioxin and dioxin-like compounds. Table 9-11 lists the nine titanium dioxide manufacturing facilities, type of manufacturing process, and capacities.

Table 9-11. United States Titanium Dioxide Manufacturers

Facility Name	Location	Capacity (tonnes)	Process Type[a]
Du Pont De Lisle Plant	De Lisle, MS	280	C/I
Du Pont Edge Moor Plant	Edge Moor, DE	155	C/I
Du Pont New Johnsonville Plant	Johnsonville, TN	380	C/I
Kerr-McGee Chemical, LLC	Hamilton, MS	200	C
Kerr-McGee Chemical, LLC (Tronox)[b]	Savannah, GA	85	C
Louisiana Pigment Company LLC	Lake Charles, LA	120	C
Millennium Inorganic Chemicals	Baltimore, MD	104	C
Lyondell/Millennium Inorganic Chemicals (Plant I)	Ashtabula, OH	98	C
Lyondell/Millennium Inorganic Chemicals (Plant II)	Ashtabula, OH	51	C

Source: *Final Titanium Dioxide Listing Background Document for the Inorganic Chemical Listing Determination* (U.S. EPA, 2001); *Final Technical Background Document Identification Description of Mineral Processing Sectors and Waste Streams* (U.S. EPA, 1998); Telephone and e-mail correspondence with Kenneth Wood of Du Pont and Eleanor Ku Codding of Eastern Research Group, Inc. (Wood, 2006).
[a]C indicates chloride and C/I indicates chloride-ilmenite process.
[b]Kerr-McGee's Savannah plant operated both a chloride and sulfate process until 2004, when they shut down the sulfate process.

9.6.2 40 CFR Part 415 Subpart V

ELGs for the Titanium Dioxide Subcategory of the Inorganic Chemicals Category (40 CFR Part 415 Subpart V) includes facilities that manufacture titanium dioxide by the sulfate process, the chloride process, and the simultaneous beneficiation-chlorination (chloride-ilmenite) process. Currently, no titanium dioxide manufacturers discharge to POTWs. The technology basis for both BPT and NSPS was physical/chemical treatment. Table 9-12 summarizes the BPT and NSPS limitations for the Titanium Dioxide Subcategory.

Table 9-12. Titanium Dioxide Subcategory BPT and NSPS Monthly Average Limitations

Regulated Pollutant	BPT kg/kkg (or lb per 1,000 lb)			NSPS kg/kkg (or lb per 1,000 lb)		
	Sulfate Process	Chloride Process	Chloride-Ilmenite Process	Sulfate Process	Chloride Process	Chloride-Ilmenite Process
TSS	38	6.4	9.6	30	4	2.4
Chromium	0.21	0.03	0.053	0.14	0.012	0.002
Nickel	0.14	NA	0.035	0.095	NA	0.01
Iron	NR	NR	NR	1.2	0.16	0.096

NR – Not regulated.
NA – Not applicable. Nickel is not regulated for discharges from the chloride process.

9.6.3 Titanium Dioxide Manufacturing Process Description

Titanium dioxide is used as a pigment in paints, varnishes, lacquer, paper and paperboard, plastics, and personal care products (U.S. EPA, 2001). It provides whiteness and opacity in products ranging from polyvinyl chloride piping to cosmetics and sunscreen. The United States accounts for most of the world production (USGS, 2006).

Table 9-13 lists the three types of titanium dioxide manufacturing processes that reflect data reported to TRI and the type of titanium ore used. Manufacturing with lower purity ore increases the volume of impurities formed during chlorination, such as iron chlorides.

Table 9-13. Titanium Dioxide Manufacturing Processes

Process Type	Type of Ore Used	Typical Ore Purity
Chloride	Rutile or high-grade ilmenite	95%
Chloride-Ilmenite	Ilmenite (low grade acceptable)	50 - 65%
Sulfate[a]	Rutile or high-grade ilmenite	95%

Source: (U.S. EPA, 2001).
[a]Only one facility in the United States reportedly uses this process. It reported discharges to TRI in 2002 and 2003, but shut down its operation in 2004. As a result, EPA is not aware of any facilities in the United States that currently use this process.

Currently, U.S. facilities manufacture titanium dioxide using the chloride or chloride-ilmenite process. The last U.S. facility using the sulfate process, Kerr-McGee Chemical, LLC (Tronox) in Savannah, GA, shut that process down in 2004. This subsection discusses all three processes, because the sulfate process discharges are reflected in the 2002 and 2003 TRI and 2002 PCS databases.

In 2001, EPA's Office of Solid Waste (OSW) completed a study of titanium dioxide manufacturers. The information gathered during the OSW study is summarized in the document entitled *Final Titanium Dioxide Listing Background Document for the Inorganic Chemical Listing Determination* (U.S. EPA, 2001). The process descriptions that follow are based on the descriptions in the OSW listing document, as well as information from additional OSW reports and the United States Geological Survey Minerals Division.

Titanium Dioxide Chloride Process

Figure 9-1 shows the basics of the chloride process, which are the same as the chloride-ilmenite process. In the chloride process, facilities convert rutile or high-grade ilmenite ore into titanium tetrachloride ($TiCl_4$) in a chlorinator. Although a fixed-bed chlorinator may be used, all U.S. facilities use a fluidized bed (U.S. EPA, 1998). Feedstocks include titanium ore, chlorine, supplied as a gas at approximately 900^o C, and petroleum coke (as a reductant) (U.S. EPA, 2001).

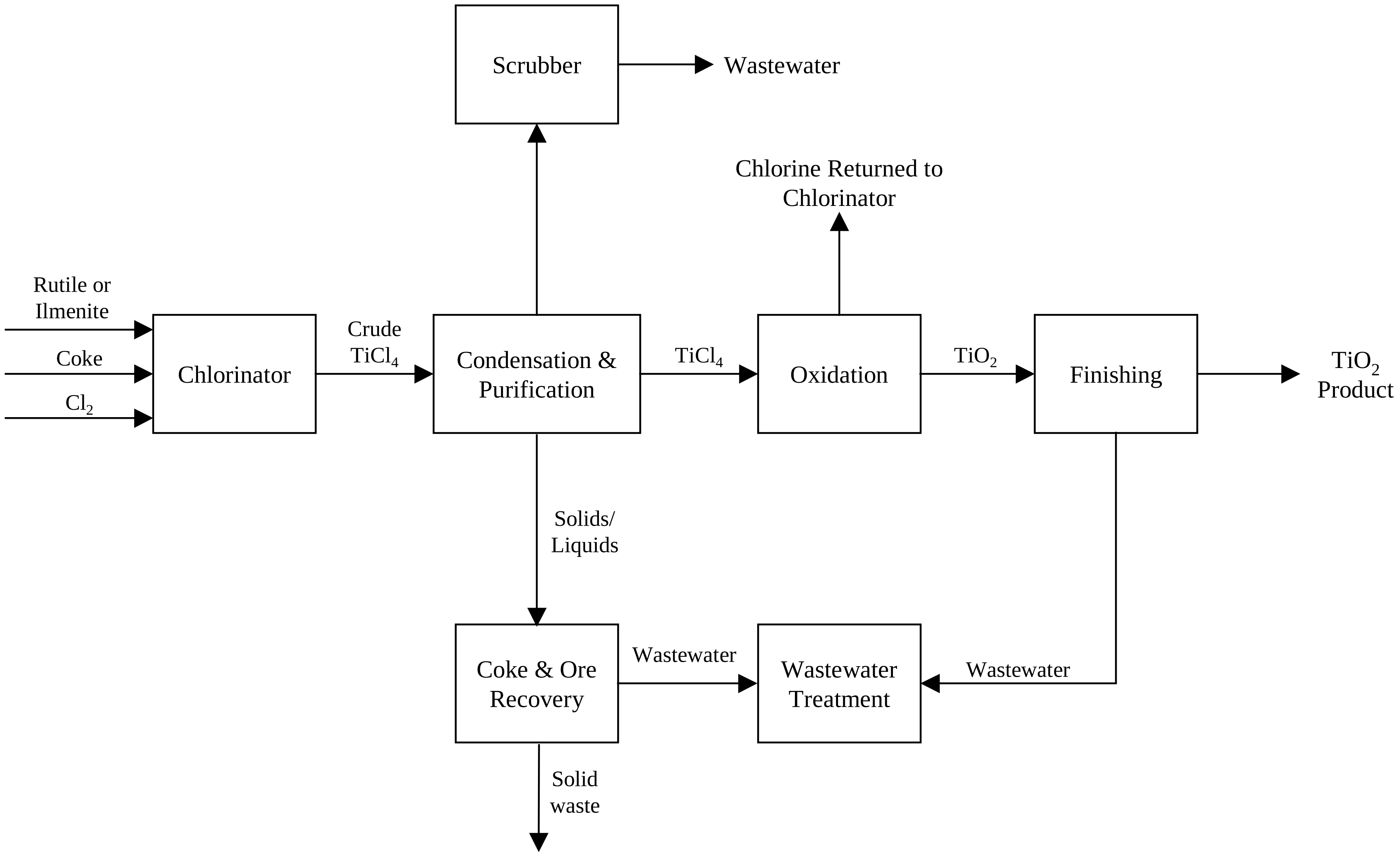

Figure 9-1. Basic Diagram of the Chloride and Chloride-Ilmenite Processes for Titanium Dioxide Manufacture (U.S. EPA, 2001)

The resulting $TiCl_4$ is volatile and is piped to an oxidizer as a vapor. Impurities of metal chlorides, unreacted coke, and ore solids are removed with condensers and chemical treatment. The acidic metal chlorides, including ferric chloride ($FeCl_3$), are removed as a liquid stream. Coke and ore are recovered from this stream, and the remaining solution is sent to wastewater treatment. Air emissions from the condenser are purified using water and caustic scrubbers, generating acidic wastewater. Facilities may recover hydrochloric acid from the acidic scrubber blowdown, either for use on site or for sale (U.S. EPA, 1998).

In the oxidizer, purified $TiCl_4$ vapor is converted to TiO_2, or titanium dioxide. Facilities recycle the liberated chlorine gas from the oxidizer back to the chlorinator. The TiO_2 product is conveyed in slurry form to the finisher. At the finisher, facilities grind the TiO_2 and add surface treatments. Some plants generate wastewater at the finisher, most likely from air pollution control of particulate matter. Facilities sell the finished TiO_2 as both a dry solid and water-based slurry (U.S. EPA, 2001).

Titanium Dioxide Chloride-Ilmenite Process

Figure 9-1 shows the basics of the chloride-ilmenite process, which are the same as the chloride process. Du Pont holds a patent on the chloride-ilmenite process. This process allows the use of lower-quality ore and easier oxidation (U.S. EPA, 2001). As in the chloride process, the titanium ore is chlorinated in a fluidized-bed chlorinator, with coke used as a reducing agent. The gaseous product stream is condensed to separate the $TiCl_4$ from other metal chloride impurities, including ferric chloride ($FeCl_3$). $FeCl_3$ is present in higher concentrations than in the chloride process because of the high iron content in the ore (U.S. EPA, 2001). Impurities are separated via condensation and chemical treatment. The process for converting $TiCl_4$ to TiO_2 is similar to that used in the chloride process as are the sources of wastewater: condenser air pollution control, metal chloride liquid waste, and, potentially, the finisher.

The principal difference between the chloride-ilmenite and chloride processes is that the Du Pont process can use lower-grade ore. Ilmenite typically contains approximately 65 percent titanium and has more iron than rutile (U.S. EPA, 2001). Du Pont's chloride-ilmenite process beneficiates the ore (U.S. EPA, 1998). There are four steps in ore beneficiation and the subsequent processing of $TiCl_4$ (U.S. EPA, 1998):

- Step 1: In the chlorinator, ilmenite ore is mixed with chlorine gas and coke. Initially, the chlorine reacts with the iron oxide in the ilmenite ore, producing gaseous iron chlorides and enriched ilmenite ore containing more than 95 percent titanium. The beneficiated ilmenite changes color from the iron removal, but is otherwise unaltered.

- Step 2: After the chlorine and iron react, the resulting beneficiated ore converts to gaseous $TiCl_4$ in the chlorinator.

- Step 3: A spray condenser collects iron chloride waste acids, which are sold as a by product or disposed as nonhazardous waste. As with the chloride process, the liquid metal chloride stream contains hydrochloric acid, which may be recovered (U.S. EPA, 1998).

- Step 4: $TiCl_4$ is condensed, purified, and prepared for sale in a finisher, using the same techniques as the chloride process.

Titanium Dioxide Sulfate Process

Figure 9-2 shows the basics of the sulfate process. In the sulfate process, a digester dissolves rutile slag in sulfuric acid and water, producing a titanyl sulfate liquor. In the next step, undissolved ore and solids settle out in a clarification tank. The undissolved ore and solids are disposed of as Bevill-exempt, nonhazardous waste**.** The clarified titanium liquor is concentrated and undergoes hydrolysis, forming titanium dioxide hydrate in solution with ferrous sulfate and sulfuric acid. The titanium dioxide hydrate is then precipitated and filtered from the ferrous sulfate and sulfuric acid (H_2SO_4). The waste acid filtrate from this step is used in gypsum production. A calciner then heats the hydrated titanium dioxide, forming crystalline TiO_2 and driving off residual water and H_2SO_4. The dried titanium dioxide is then finished, using the same techniques as the chloride process.

Wet air pollution control cleans emissions from both the digester and calciner, generating wastewater. The finishing process also generates wastewater. The digester scrubber generates sulfuric acid at a rate up to twice the product weight, and neutralization of this wastewater is costly. The last U.S. facility using the chloride process, Kerr McGee in Savannah, Georgia, shut its sulfate process down in 2004.

9.6.4 Titanium Dioxide Wastewater Sources of Dioxin and Dioxin-Like Compounds

Dioxin and dioxin-like compounds are a by-product of incomplete combustion and form when chlorine reacts with organic carbon in the presence of a metal at high temperatures (approximately 400° C) (U.S. EPA, 1994). In titanium dioxide manufacturing, based on the information obtained to date, EPA concluded that dioxin and dioxin-like compounds may form in the chloride and chloride-ilmenite processes. In the chlorinator, titanium ore (containing iron impurities), chlorine gas, and petroleum coke (source of carbon) react at temperatures around 900° F (U.S. EPA, 2001).

Facility-reported discharges of dioxin and dioxin-like compounds from titanium dioxide manufacturers are available in TRI. EPA contacted all nine facilities to verify their TRI-reported values. Table 9-14 presents the TRI data and EPA's findings from the facility contacts.

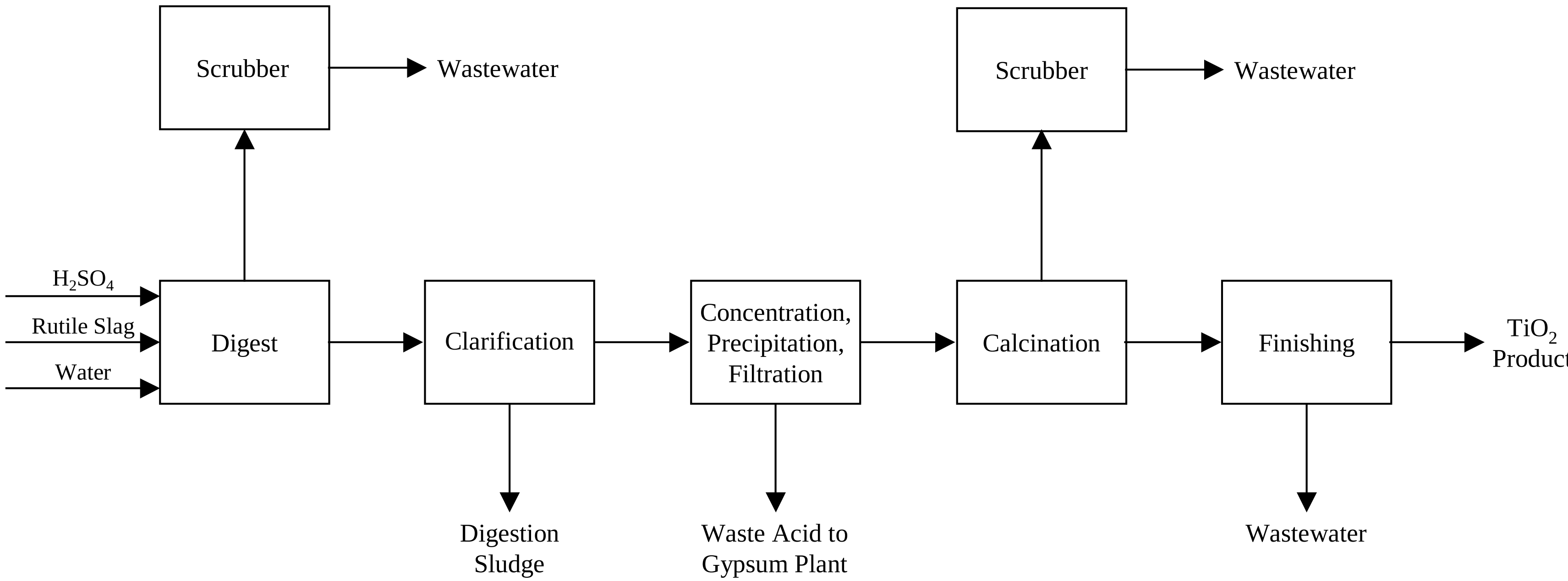

Figure 9-2. Basic Diagram of the Sulfate Process for Titanium Dioxide Manufacture (U.S. EPA, 2001)

Table 9-14. Titanium Dioxide Facility List and Inventory of Data Available for Dioxin and Dioxin-Like Compounds

Facility Name	Location	2002 TRI[a]		2003 TRI[a]		Did Facility Detect Dioxin and Dioxin-Like Compounds at Any Level?	Additional Comments
		g TM-17	TWPE	g TM-17	TWPE		
Du Pont De Lisle Plant	De Lisle, MS	NR	NR	0.0091	1.70	N	Facility analyzed wastewater twice in 2003. All congeners were below laboratory detection limits for both samples. Du Pont measured 7.3 pg/L of 1,2,3,4,6,7,8-HpCDF, but the blank for that sample had a similar result. Du Pont used 1/2 the detection limit to estimate discharges. The detected values are below the 1613B ML and are questionable because of the sample blank result.
Du Pont Edgemoor Plant	Edgemoor, DE	13.6	60.5	0.708	208	Y	Facility analyzed wastewater once in 1999 and twice in 2003. Facility measured four congeners measured overall (OCDD, OCDF, HpCDF, HxCDF). Facility used 1/2 the detection limit for the other congeners.
Du Pont New Johnsonville Plant	Johnsonville, TN	16.4	6,850	16.4	4,953	Y	Facility analyzed wastewater once in 2000 and once in 2003. Facility measured six congeners overall.
Kerr-McGee Chemical, LLC	Hamilton, MS	Facility did not report any dioxin discharges to water in TRI.				N	Facility analyzed wastewater for dioxin and dioxin-like compounds in their treated wastewater. All congeners were below laboratory detection limits.
Kerr-McGee Chemical, LLC (Tronox)	Savannah, GA	0 (Facility reported 0.854)[a]	0[a]	0 (Facility reported 2.00)[a]	0[a]	N	Facility provided analytical data, which showed that all congeners of dioxin and dioxin-like compounds were below laboratory detection limits in the water. The facility filtered the water sample and analyzed those solids. Three congeners were detected in the separated solids; however, they are all at levels below the minimum level for EPA Method 1613B.[a]

Table 9-14 (Continued)

Facility Name	Location	2002 TRI[a]		2003 TRI[a]		Did Facility Detect Dioxin and Dioxin-Like Compounds at Any Level?	Additional Comments
		g TM-17	TWPE	g TM-17	TWPE		
Louisiana Pigment Company LLC	Lake Charles, LA	0.166	14,288	0.330	17,241	Y	Facility measured dioxin and dioxin-like compounds congeners in treated process wastewater.
Millennium Inorganic Chemicals	Baltimore, MD	0 (Facility reported 0.47 g)[a]	0[a]	0 (Facility reported 0.32 g)[a]	0[a]	N	Facility analyzed wastewater for dioxin and dioxin-like compounds in 2004 and found all congeners were below laboratory detection limits.
Lyondell/Millennium Inorganic Chemicals (Plant I)	Ashtabula, OH	These facilities did not report any water discharges of dioxin or dioxin-like compounds to TRI in 2002 or 2003.				N	Facility reported 0.12 g TM-17 released to water in 2000 using engineering assumptions based on dioxin and dioxin-like compounds in their solid waste. Facility measured wastewater in 2001 and found all congeners below laboratory detection limits.
Lyondell/Millennium Inorganic Chemicals (Plant II)	Ashtabula, OH					N	

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]These facilities analyzed wastewater for dioxin and dioxin-like compounds, and all measurements were below sample detection limits. The facilities estimated their water discharges of dioxin and dioxin-like compounds based on one-half the detection limit. For this analysis, EPA set those discharges to zero.
NR – Not reported. Facility did not detect dioxin or dioxin-like compounds in these years.

All nine facilities analyzed their wastewater for dioxin and dioxin-like compounds; three of these facilities found measurable concentrations:

- Louisiana Pigments in Lake Charles, LA;
- Du Pont in Edgemoor, DE; and
- Du Pont in New Johnsonville, TN.

Table 9-15 lists the analytical data obtained from the Louisiana Pigment facility, compares them to the EPA Method 1613B ML, and calculates the annual discharge for concentrations greater than the 1613B ML. Table 9-16 provides the same information for the two Du Pont facilities.

Table 9-15 shows that Louisiana Pigments measured concentrations of dioxin and dioxin-like compounds once above the 1613B minimum level in one sample from one of the outfalls tested: 109 pg/L of OCDD at Outfall 004. Based solely on this one measurement above the 1613B minimum level, EPA estimated that Louisiana Pigments discharged 1.9×10^{-10} g-TEQ/yr and 8.3×10^{-6} TWPE/yr.

Table 9-16 shows that Du Pont measured concentrations of dioxin above the 1613B minimum level once at the Edgemoor facility and twice at the New Johnsonville facility. For Edgemoor, Du Pont detected 101 pg/L OCDF. Based solely on this one measurement above the 1613B ML, EPA estimated that the Edgemoor facility discharged 0.000667 g-TEQ/yr and 29.7 TWPE/yr. For New Johnsonville, Du Pont detected approximately 100 pg/L of OCDF and 108 pg/L of OCDD. Based solely on these two measurements above the 1613B ML, EPA estimated that the New Johnsonville facility discharged 0.0182 g-TEQ/yr and 1,781 TWPE/yr.

Table 9-17 compares the TWPE estimated using all congeners detected versus only those detected above the 1613B ML, for the three facilities. This table shows that the majority of the TWPE in the TRI database from dioxin and dioxin-like compounds is estimated from measurements below the 1613B ML.

Table 9-15. Concentrations of Dioxin and Dioxin-Like Compounds in Effluent Samples (pg/L) for Louisiana Pigments

Congener	1613B ML	Outfall 001[a]				Outfall 002[b]				Outfall 004[c]				Outfall 004 Summary[d]
		11/18/01	12/25/01	01/22/01	02/06/02	11/18/01	12/25/01	02/06/02	10/26/04[a]	11/28/01	01/06/02	02/01/02	10/18/04	
Polychlorinated dibenzo-p-furans (CDFs)														
2,3,7,8-TCDF	10	ND	ND	4.1	ND	4.8	ND	ND	NA	ND	ND	ND	NA	
1,2,3,7,8-PeCDF	50	ND	ND	6.2	ND	4.1	ND	ND	NA	ND	ND	6.8	NA	
2,3,4,7,8-PeCDF	50	ND	ND	4.5	ND	5.1	ND	ND	NA	ND	ND	ND	NA	
1,2,3,4,7,8-HxCDF	50	1.4	ND	4.7	ND	5.6	ND	16.4	NA	ND	ND	1.9	NA	
1,2,3,6,7,8-HxCDF	50	ND	ND	4	ND	ND	ND	15.3	NA	ND	ND	2.8	NA	
2,3,4,6,7,8-HxCDF	50	ND	ND	1.9	ND	4.3	ND	13.2	NA	ND	ND	2.8	NA	
1,2,3,7,8,9-HxCDF	50	ND	ND	1.6	ND	5.4	ND	24	NA	ND	ND	ND	NA	
1,2,3,4,6,7,8-HpCDF	50	ND	ND	ND	ND	5.4	ND	16.7	NA	ND	ND	ND	NA	
1,2,3,4,7,8,9-HpCDF	50	ND	ND	ND	ND	ND	ND	19.8	NA	ND	ND	ND	NA	
1,2,3,4,6,7,8,9-OCDF	100	7.7	ND	7.6	ND	17.1	ND	ND	NA	ND	ND	5.9	NA	
Polychlorinated dibenzo-p-dioxins (CDDs)														
2,3,7,8-TCDD	10	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2,3,7,8-PeCDD	50	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	NA	
1,2,3,4,7,8-HxCDD	50	ND	ND	1.9	ND	4.9	ND	ND	NA	ND	ND	ND	NA	
1,2,3,6,7,8-HxCDD	50	ND	ND	3.7	ND	5.9	ND	ND	NA	ND	ND	ND	NA	
1,2,3,7,8,9-HxCDD	50	ND	ND	3.4	ND	6.0	ND	20.8	NA	ND	ND	ND	NA	
1,2,3,4,6,7,8-HpCDD	50	ND	ND	4.8	ND	8.0	ND	15.6	NA	ND	ND	3.4	NA	
1,2,3,4,6,7,8,9-OCDD	100	13.9	21.9	30.5	ND	42.2	ND	ND	NA	109[e]	8.5	18.5	NA	
Grams/year														**1.9E-06**
Grams TEQ/year														**1.9E-10**
TWPE/year														**8.3E-06**

Analytical Data Sources: Data provided by Louisiana Pigments (Frees, 2006).
[a]Outfall 001 is combined process wastewater from the chlorinator and oxidizer, as well as stormwater, equipment washdown water, hydrostatic testing water, and other wastewater sources.
[b]Outfall 002 is process wastewater from the finishing plant.
[c]Outfall 004 is discharge of stormwater from the landfill area, where the facility disposes of process wastes.
[d]Flow value was estimated based on a monthly stormwater flow of 0.4 million gallons, or 4.8 million gallons per year.
[e]Concentrations greater than Method 1613B minimum level.
ND – Not detected.
ND – No data.
NA – Not applicable. Congener was not analyzed.

9-21

Table 9-16. Concentrations of Dioxin and Dioxin-Like Compounds in Effluent Samples (pg/L) from Two Du Pont Facilities

Congener	1613B ML	Du Pont New Johnsonville	Du Pont Edgemoor
		2003[a]	2003[a]
Estimated Flow (MGY) [b]		235,000	17,400
Polychlorinated dibenzo-p-furans (CDFs)			
2,3,7,8-TCDF	10	ND	ND
1,2,3,7,8-PeCDF	50	ND	ND
2,3,4,7,8-PeCDF	50	ND	ND
1,2,3,4,7,8-HxCDF	50	3.32	2.675
1,2,3,6,7,8-HxCDF	50	ND	ND
2,3,4,6,7,8-HxCDF	50	ND	ND
1,2,3,7,8,9-HxCDF	50	ND	ND
1,2,3,4,6,7,8-HpCDF	50	4.52	18.27
1,2,3,4,7,8,9-HpCDF	50	2.44	ND
1,2,3,4,6,7,8,9-OCDF	100	96.9[c]	101.24[c]
Polychlorinated dibenzo-p-dioxins (CDDs)			
2,3,7,8-TCDD	10	ND	ND
1,2,3,7,8-PeCDD	50	ND	ND
1,2,3,4,7,8-HxCDD	50	ND	ND
1,2,3,6,7,8-HxCDD	50	ND	ND
1,2,3,7,8,9-HxCDD	50	ND	ND
1,2,3,4,6,7,8-HpCDD	50	5.99	ND
1,2,3,4,6,7,8,9-OCDD	100	108.33	7.335
Grams/year		**182**	**6.67**
Grams TEQ/year		**0.0182**	**0.000667**
TWPE/year		**1781**	**29.7**

Source: Telephone conservations with Tammy Burke of Louisiana Pigments and Eleanor Ku Codding of Eastern Research Group, Inc. (Burke, 2006a; Burke, 2006b).
[a]Facilities provided the average of two data points for the year 2003. In the case of 1,2,3,4,6,7,8,9-OCDF for the New Johnsonville facility, EPA assumes at least one value was greater than 100 pg/L; therefore, this value is greater than the 1613B ML
[b]Flow values are estimated using 2003 flows reported to PCS.
[c]Concentrations greater than Method 1613B ML.
ML – Minimum level established for EPA Method 1613B (TIG, 2005).
ND – No data.

Table 9-17. TWPE Comparison for Three Titanium Dioxide Manufacturers

Facility	TRI 2002 TWPE (All Congeners Detected)	TWPE For Congeners Detected Above 1613B ML Only
Louisiana Pigments Lake Charles, LA	14,288	0.0000083
Du Pont Edgemoor, DE	60.5	29.7
Du Pont New Johnsonville, TN	6,850	1,781

Source: *TRIReleases2002_v4*; Telephone and e-mail correspondence with Kenneth Wood of Du Pont and Eleanor Ku Codding of Eastern Research Group, Inc. (Wood, 2006); Telephone conversations with Tammy Burke of Louisiana Pigments and Eleanor Ku Codding of Eastern Research Group, Inc. (Burke, 2006a; Burke, 2006b).
ML – Minimum level established for Method 1613B.

9.6.5 Dioxide and Dioxide-Like Compounds Wastewater Treatment and Pollution Prevention

When contacting titanium dioxide manufacturing facilities, EPA requested information on wastewater treatment and pollution prevention. Two facilities indicated they had implemented changes to reduce dioxin discharges. Although both indicated that the changes were too facility-specific to be used at other facilities, Du Pont’s Edgemoor facility reported it had installed a “PBT Unit” for additional solids removal.

Table 9-18 lists the information available on wastewater treatment in place and pollution prevention used by the nine U.S. titanium dioxide manufacturers. No data were available for one facility.

9.7 Inorganic Chemicals Category Conclusions

- During the 2005 annual review, EPA identified sodium nitrite, chlorine, and nitrite as pollutants of concern. After changes to database methodology and facility-specific corrections, these pollutants are no longer the top pollutants in the TRI and PCS databases, based on TWPE.

- The existing ELGs for the Inorganic Chemicals Category were selected for additional review because of the high TWPE in the 2002 and 2003 TRI and 2002 PCS databases. While EPA evaluated the other pollutants of concern identified in the 2006 annual review, EPA focused its additional review on the discharge of dioxin and dioxin-like compounds from titanium dioxide manufacturing because they contributed more TWPE than any other pollutant in the 2005 annual review.

Table 9-18. Titanium Dioxide Facilities Wastewater Treatment In Place and Pollution Prevention

Facility	Location	Wastewater Treatment in Place
Du Pont De Lisle Plant	De Lisle, MS	Neutralization, solids removal, clarification.
Du Pont Edgemoor Plant	Edgemoor, DE	Neutralization, solids removal, clarification. Facility added "PBT Unit" in 2001 to reduce discharge of chemicals including dioxin and dioxin-like compounds, polychlorinated biphenyls, pentachlorophenol, and hexachlorobenzene.
Du Pont New Johnsonville Plant	Johnsonville, TN	Neutralization, solids removal, clarification.
Kerr-McGee Chemical, LLC	Hamilton, MS	Neutralization, solids removal, clarification.
Kerr-McGee Chemical, LLC (Tronox)	Savannah, GA	No data available.
Louisiana Pigment Company LLC	Lake Charles, LA	Neutralization, solids removal, clarification.
Millennium Inorganic Chemicals	Baltimore, MD	Neutralization, solids removal, clarification. Facility incorporated process changes to reduce generation of dioxin and dioxin-like compounds in all media and adjustments to wastewater treatment system to improve solids removal in 2001.
Lyondell/Millennium Inorganic Chemicals (Plant I)	Ashtabula, OH	Neutralization, solids removal, clarification.
Lyondell/Millennium Inorganic Chemicals (Plant II)	Ashtabula, OH	Neutralization, solids removal, clarification.

Source: Facility Permits (LDEQ, 2002; MDE, 2003; MDEQ, 2005; MDEQ, 2003; OEPA, 2003a; OEPA, 2003b; TDEC, 2004); Telephone conversations with Tammy Burke of Louisiana Pigments and Eleanor Ku Codding of Eastern Research Group, Inc. (Burke, 2006a; Burke 2006b); Telephone conversations with Thomas Dolan of Kerr McGee, Savannah, GA, and Eleanor Ku Codding of Eastern Research Group, Inc. (Dolan, 2006); Telephone conversation with Terry Frees of Kerr McGee, Hamilton, MS, and Eleanor Ku Codding of Eastern Research Group, Inc. (Frees, 2006); Telephone and e-mail correspondence with Kenneth Wood of Du Pont and Eleanor Ku Codding of Eastern Research Group, Inc. (Wood, 2006).

- Dioxin and dioxin-like compounds may form during the chloride and chloride-ilmenite titanium dioxide manufacturing processes; however, most of the process wastes that contain dioxin and dioxin-like compounds are disposed of as solid waste. In some cases, dioxin and dioxin-like compounds remain in wastewater. Three titanium dioxide manufacturers reported measurable concentrations of dioxin and dioxin-like compounds in their treated effluent.

- Tables 9-15 and 9-16 compare EPA Method 1613B ML with the analytical data available for dioxin and dioxin-like compounds from the three facilities with measurable congeners of dioxin and dioxin-like compounds in their effluent. The tables show that only OCDD and OCDF were measured at levels above the 1613B ML at the three facilities. When values below the ML are set to zero, the resulting combined TWPE from dioxin and dioxin-like compounds is less than 1,900 TWPE.

- The Du Pont Edgemoor Plant in Edgemoor, DE installed additional solids removal in 2003, which has reduced discharges of dioxin and dioxin-like compounds since 2004. One other facility incorporated process changes that reduced the generation of dioxin and dioxin-like compounds and their releases across all media. When this facility measured dioxin and dioxin-like compounds in its wastewater, all congeners were below laboratory detection limits. However, titanium dioxide manufacturing facilities in the United States do not use identical processes, and according to both facilities, changes made at these two plants would not likely be appropriate for other facilities.

- Because the TWPE associated with dioxin compounds measured above the Method 1613B ML is small (1900 TWPE) EPA concludes additional study and analysis of dioxin discharges from titanium dioxide manufacturers is not warranted at this time.

9.8 Inorganic Chemicals Category References

Burke, Tammy. 2006a. Telephone conversations with Tammy Burke of Louisiana Pigments and Eleanor Ku Codding of Eastern Research Group, Inc. “2002 and 2003 TRI Reporting from Louisiana Pigment’s Titanium Dioxide Plant in Lake Charles, LA.” (February 16). DCN 03984.

Burke, Tammy. 2006b. Telephone conversations with Tammy Burke of Louisiana Pigments and Eleanor Ku Codding of Eastern Research Group, Inc. “2002 and 2003 TRI Reporting from Louisiana Pigment’s Titanium Dioxide Plant in Lake Charles, LA.” (February 23, March 20, and April 24). DCN 03983.

Dolan, Thomas. 2006. Telephone conversation with Thomas Dolan of Kerr McGee, Savannah, GA, and Eleanor Ku Codding of Eastern Research Group, Inc. (February 10). DCN 03985.

Frees, Terry. 2006. Telephone conversation with Terry Frees of Kerr McGee, Hamilton, MS, and Eleanor Ku Codding of Eastern Research Group, Inc. (April 19). DCN 03976.

LDEQ. 2002. Louisiana Department of Environmental Quality. Water Discharge Permit for NPDES LA0080829 – Louisiana Pigment Company, LP, Westlake, LA. Baton Rouge, LA. (June 10). DCN 02406.

MDE. 2003. Maryland Department of the Environment. Water Discharge Permit for NPDES MD0001261 – Millennium Inorganic Chemicals, Baltimore, MD. Baltimore, MD. (February 1). DCN 02404.

MDEQ. 2005. Mississippi Department of Environmental Quality. State of Mississippi Water Pollution Control Permit to Discharge Wastewater NPDES MS0002232 – Kerr-McGee Chemical Corporation, Hamilton, MS. Jackson, MS. (September 22). DCN 02401.

MDEQ. 2003. Mississippi Department of Environmental Quality. State of Mississippi Water Pollution Control Permit to Discharge Wastewater NPDES MS0027294 – Du Pont De Lisle Plant, De Lisle, MS. Jackson, MS. (July 9). DCN 02410.

OEPA. 2003a. Ohio Environmental Protection Agency. Authorization to Discharge Under the National Pollution Discharge Elimination System NPDES OH0000523 – Millennium Inorganic Chemicals Ashtabula Plant I, Ashtabula, OH. Columbus, OH. (March 20). DCN 02398.

OEPA. 2003b. Ohio Environmental Protection Agency. Authorization to Discharge Under the National Pollution Discharge Elimination System NPDES OH0000523 – Millennium Inorganic Chemicals Ashtabula Plant II, Ashtabula, OH. Columbus, OH. (March 20). DCN 02399.

Schildt, Bill. 2006. Millennium Inorganic Chemicals Inc. Letter to Ellie Codding of Eastern Research Group, Inc. "Re: February 23, 2006 Letter from Jan Matuszko of EPA Regarding 2002 and 2003 TRI Dioxin Reported Discharges." (March 1). DCN 03307.

TDEC. 2004. Tennessee Department of Environment and Conservation. State of Tennessee National Pollution Discharge Elimination System Permit NPDES TN0001465 – Du Pont New Johnsonville Plant, New Johnsonville, TN. Nashville, TN. (August 1). DCN 02402.

TIG. 2005. The Innovation Group. Chemical profile for titanium dioxide. Available online at: http://www.the-innovation-group.com/chemprofile.htm. Date accessed: September 2005. DCN 02541.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1982. *Development Document for Effluent Limitations Guidelines and Standards for the Inorganic Chemicals Manufacturing Point Source* Category. EPA-440/1-82/007. Washington, DC. (June).

U.S. EPA. 1994. Method 1613B Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS. Washington, DC. (October). DCN 03977.

U.S. EPA. 1998. *Final Technical Background Document Identification and Description of Mineral Processing Sectors and Waste Streams.* Washington, DC. (April). DCN 03330.

U.S. EPA. 2001. *Final Titanium Dioxide Listing Background Document for the Inorganic Chemical Listing Determination.* Washington, DC. (October). DCN 03331.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan.* EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary 2005 Review of Prioritized Categories of Industrial Dischargers*. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

U.S. EPA. 2005c. *The Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the U.S.: the Year 2000 Update*. EPA/600/P-03/002A. Washington, DC. (March). Available online at: http://www.epa.gov/ncea/pdfs/dioxin/2k-update.

USGS. 2006. U.S. Geological Survey. *USGS Minerals Yearbook*. "Titanium and Titanium Dioxide." Available online at: http://minerals.usgs.gov/minerals/pubs/commodity/titanium/tidiomcs06.pdf. Date accessed: April 2006. DCN 03978.

Wood, Kenneth. 2006. E-mail correspondence with Kenneth Wood of Du Pont and Eleanor Ku Codding of Eastern Research Group, Inc. (January and February). DCN 03326.

Zweig, Greg. 2000. Letter to Mr. Akil Al-Chokhachi, City of Memphis, from Greg Zweig, Site Environmental Coordinator, DuPont Memphis Plant. (March 13). DCN 02675.

10.0 NONFERROUS METALS MANUFACTURING (40 CFR PART 421)

EPA selected the Nonferrous Metals Manufacturing (NFMM) Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review. (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 2005a). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the NFMM Category. EPA's 2006 annual review builds on the 2005 annual review. EPA identified facilities contributing the most TWPE and reviewed discharges of fluoride and cyanide from the primary aluminum industry as part of the 2006 review.

10.1 NFMM Category Background

This section provides background on the NFMM Category including a brief profile of the NFMM industry and background on 40 CFR Part 421.

10.1.1 NFMM Industry Profile

The nonferrous metals manufacturing industry includes facilities that smelt and refine metals other than steel, such as aluminum, copper, and nickel (U.S. EPA, 2005b). Although facilities with many SIC codes could perform operations covered by Part 421, the main SIC codes that are covered by the NFMM ELGs are:

- 3331: Primary Smelting and Refining of Copper;
- 3334: Primary Production of Aluminum;
- 3339: Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum;
- 3341: Secondary Smelting and Refining of Nonferrous Metals; and
- A portion of 2819: Inorganic Chemicals, Not Elsewhere Classified (NEC).

SIC code 2819 also includes facilities subject to 40 CFR Part 415: Inorganic Chemicals Manufacturing Point Source Category. In 2004, EPA reviewed the facilities reporting under SIC code 2819 and identified six facilities that are known to perform NFMM operations, including the production of refined bauxite, alumina, slug uranium (radioactive), liquid metals, and several inorganic metals (U.S. EPA, 2004). Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census data by equivalent SIC code. The facilities in SIC code 2819 that are possibly subject to the NFMM ELGs do not correlate directly to a NAICS code, and therefore EPA could not determine the number of facilities in the 2002 U.S. Economic Census for SIC code 2819.

Table 10-1 lists the five SIC codes with operations in the NFMM Category. SIC code 3334: Primary Production of Aluminum has the largest number of facilities with data in PCS.

Table 10-1. Number of Facilities in NFMM SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2819: Inorganic Chemicals, NEC[c]	NA[d]	3	3	4
3331: Primary Smelting and Refining of Copper	15	3	6	5
3334: Primary Production of Aluminum	41	23	21	21
3339: Primary Smelting of Nonferrous Metals, Except Copper and Aluminum	170	11	30	29
3341: Secondary Smelting and Refining of Nonferrous Metals	417	13	182	163
Total	**>643[d]**	**53**	**242**	**221**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2*; *TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]EPA identified facilities known to perform NFMM operations.
[d]Poor bridging between NAICS and SIC codes. Number of facilities could not be determined.
NA – Not applicable.
NEC – Not elsewhere classified.

NFMM facilities discharge directly to surface water as well as to POTWs. Table 10-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds.

Table 10-2. NFMM Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2819: Inorganic Chemicals, NEC[a]	3	0	0	0
3331: Primary Smelting and Refining of Copper	1	2	0	2
3334: Primary Production of Aluminum	11	0	2	8
3339: Primary Smelting of Nonferrous Metals, Except Copper and Aluminum	7	5	3	14
3341: Secondary Smelting and Refining of Nonferrous Metals	44	23	14	101

Source: *TRIReleases2002_v4*.
[a]EPA identified facilities known to perform NFMM operations.
NEC – Not elsewhere classified.

10.1.2 40 CFR Part 421

EPA first promulgated ELGs for the NFMM Category (40 CFR Part 421) on March 8, 1984 (49 FR 8790). Below is a brief summary of the category's ELGs. All 31 subcategories have NSPS and PSNS standards. Fourteen subcategories do not have PSES standards; the Bauxite Refining and Primary Copper Smelting Subcategories are limited to zero discharge of process wastewater under BPT, BAT, and NSPS; and EPA reserved BPT and BAT limitations for four subcategories (Secondary Indium, Secondary Mercury, Secondary Nickel, and Primary Rare Earth Metals). Most NFMM subcategories include limitations guidelines for lead, chromium, copper, arsenic, and zinc.

Section 5.3.2 of the 2004 TSD lists the regulated priority and nonconventional pollutants in the NFMM Category (U.S. EPA, 2005b).

10.2 <u>NFMM Category 2005 Annual Review</u>

This subsection discusses EPA's 2005 annual review of the NFMM Category including the screening-level review and category-specific review.

10.2.1 NFMM Category 2005 Screening-Level Review

Table 10-3 presents the NFMM Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 10-3. NFMM Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	Total TWPE
6	Nonferrous Metals Manufacturing	450,525	63,694	514,219

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

10.2.2 NFMM Category 2005 Pollutants of Concern

Table 10-4 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. The estimated TWPE from the PCS database is much greater than the TWPE from the TRI database. Cadmium contributed 28 percent of the category TRI TWPE for 2002 and approximately 22 percent of the PCS TWPE for 2002.

Table 10-4. 2005 Annual Review: NFMM Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Cadmium and Cadmium Compounds	20	4,282	98,997	7	789	18,245
Chlorine	25	178,125	90,694	Pollutants are not in the top five TRI 2002 reported pollutants.		
Silver	9	3,028	49,871			
PCBs	6	1.4	48,550			
Molybdenum	5	237,108	47,763			
Sodium Nitrite	Pollutants are not in the top five PCS 2002 reported pollutants.			1	21,708	8,104
Phosphorous				2	298	6,266
Arsenic and Arsenic Compounds				15	1,492	6,031
PACs				3	48	4,831
NFMM Category Total	**53[c]**	**206,294,722**	**450,525**	**114[c]**	**2,342,514**	**63,694**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

10.3 Potential New Subcategories for the NFMM Category

EPA did not identify any potential new subcategories for the NFMM Category.

10.4 NFMM Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the NFMM Category. EPA obtained additional data and identified:

- Facilities classified in the wrong category;
- Errors in how PCS loads were estimated for four facilities; and
- Changes in estimates of TWPE for sodium nitrite.

10.4.1 NFMM Category Facility Classification Revisions

EPA reviewed permits for facilities in the SIC codes covered by the NFMM Category and determined that discharges from five facilities are not subject to the NFMM ELGs. EPA changed the category classifications of these facilities in the revised databases, *TRIReleases2002_v4* and *PCSLoads2002_v4*, as described in Section 4.5 of the TSD. Table 10-5 lists EPA's findings and corrections for these five facilities.

Table 10-5. NFMM Category Facilities Classified in Wrong Category

TRI ID (NPDES ID)	Facility	Findings	Resulting Database Change
72011-LCRKN-USHIG (AR0000582)	ALCOA Bauxite	Discharges result from the reclaimed mine drainage and maintenance of the closed ALCOA and Reynolds Metals Bauxite Residue Disposal Areas. Discharges are regulated by 40 CFR Part 440: Ore Mining and Dressing (ADEQ, 2005a; ADEM, 2005b).	Incorporated change into PCS and TRI databases. In *PCSLoads2002_v4* and *TRIReleases2002_v4*, facility loads are now included under 40 CFR Part 440.
47903-LCLFY-EASTM (IN0001210)	ALCOA Lafayette Works	Facility manufactures fabricated aluminum products. Discharges are regulated by 40 CFR Part 467: Aluminum Forming (IDEM, 2002; IDEM, 2001).	Incorporated change into PCS database. In *PCSLoads2002_v4*, facility loads are now included in 40 CFR Part 467 review. No changes were made in *TRIReleases2002_v4* because the facility loads were already included under 40 CFR Part 467.
42351-CMMNW-KYHWY (KY0002666)	Commonwealth Aluminum	Discharges are regulated by 40 CFR Part 465: Coil Coating (KDEP, 2002).	Incorporated change into PCS database. In *PCSLoads2002_v4*, facility loads are now included under 40 CFR Part 465. Facility reported no water discharges to TRI in 2002, so no changes were made to *TRIReleases2002_v4*.
84006-KNNCT-8362W (UT0000051)	Kennecott Utah	Facility is an integrated copper mine, smelter, and refiner producing copper anodes and cathodes, by-product sulfuric acid, and co-product gold, silver, selenium, platinum, lead carbonate, and palladium. Discharges are regulated by 40 CFR Part 440: Ore Mining and Dressing and by Part 421: Nonferrous Metals Manufacturing. The majority of the facility's TWPE are from outfalls regulated by 40 CFR Part 440 (UDEQ, Unknown).	Incorporated change into TRI database. In *TRIReleases2002_v4*, facility loads are now included under 40 CFR Part 440. No changes were made in *PCSLoads2002_v4* because the facility loads were already under 40 CFR Part 440.
37040-SVGZN-1800Z (TN0029157)	Pasminco Zinc	Facility manufactures zinc metal, co-product cadmium metal, sulfuric acid, and metallurigically valuable by-products. Permit limits are based on 40 CFR Part 421 Subpart H – Primary Zinc and Subpart I – Metallurgical Acid Plants (TDEC, 2005).	Incorporated change into PCS database. In *TRIReleases2002_v4*, facility loads are now included under 40 CFR Part 421 instead of 40 CFR Part 440. No changes were made in *PCSLoads2002_v4* because the facility loads were already under 40 CFR Part 421.

Source: *TRIReleases2002_v4*; *PCSLoads2002_v4*; Facility Permits and Fact Sheets (IDEM, 2002; IDEM, 2001; ADEQ, 2005a; ADEM, 2005b; KDEP, 2002; UDEQ, Unknown; TDEC, 2005).

10.4.2 NFMM Category Facility Discharge Revisions

EPA reviewed permits and discharge monitoring reports for four facilities with discharges contributing a majority of the 2002 PCS TWPE in the SIC codes covered by the NFMM Category. EPA determined that, because of assigned outfall names, *PCSLoads2002_v2* was double counting loads from four facilities. EPA corrected the double counting in the revised database, *PCSLoads2002_v4*, as described in Section 4.5 of this TSD. Table 10-6 lists EPA's findings and corrections for these four facilities.

Table 10-6. NFMM Category Facilities with Discharge Revisions

TRI ID (NPDES ID)	Facility	Double Counting Identified	Resulting Database Change
13662-LMNMC-PARKA (NY0001732)	ALCOA Massena West	Outfalls 01B, 01D, 01E, 01F, 01H, 03A, and SUM were included in other outfalls (NYSDEC, 2003; NYSDEC, 2001).	EPA excluded the discharges from these outfalls in *PCSLoads2002_v4*.
NA[a] (TN0065081)	ALCOA South Plant	Outfall 006A was included in outfall 006 (TDEC, 2004b; TDEC, 2004a).	In *PCSLoads2002_v4*, EPA revised the discharges from outfall 006, reducing the TWPE by approximately 25 percent.
65440-BCKMN-HWYKK (MO0000337)	Doe Run Resources Recycling	Outfall 004 is an in-stream monitoring location (MDNR, 2004).	In *PCSLoads2002_v4*, EPA set the discharges from outfall 004 to zero.
62024-LNCRP-LEWIS (NA[b])	Olin Corporation	Facility manufactures brass for the automotive, housing, electronics, coinage, and ammunition industries (Olin, 2000). Discharges of total phosphorous were incorrectly reported to TRI as discharges of phosphorous (yellow or white) (Reddington, 2005). Facility reports to TRI under two IDs.	In *TRIReleases2002_v4*, EPA set phosphorous (yellow or white) discharges to zero.

Source: *PCSLoads2002_v2*; *PCSLoads2002_v4*; *TRIReleases2002_v2*; *TRIReleases2002_v4*; Facility Permits and Fact Sheets (MDNR, 2004; NYSDEC, 2003; NYSDEC, 2001; TDEC, 2004b; TDEC, 2004a).
[a]Facility does not report to TRI.
[b]Facility does not report to PCS.
NA – Not available.

10.4.3 NFMM Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF and POTW percent removal values used for sodium nitrite in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373), and the POTW percent removal is now 90 percent (formerly 1.85 percent). Table 10-7 presents the loads before and after corrections to sodium nitrite TWF and POTW percent removal for the NFMM Category.

Table 10-7. Impact of Changes to TWF and POTW Percent Removal for the NFMM Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	2[a]	8,104	14

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*.
[a]Number of facilities reporting discharges of sodium nitrite to TRI in 2002 for the revised database, *TRIReleases2002_v4*, increased due to moving U.S. DOE Portsmouth Gaseous Diffusion Plant from the Inorganic Chemicals Category to the NFMM Category.

10.4.4 NFMM Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings based on methodology changes as described in Section 4.2 and changes made based on permit review. For the NFMM Category, the most significant changes are also described in Sections 10.5.1 through 10.5.3. Table 10-8 shows the 2006 screening-level TWPE estimated for the NFMM Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 10-8. NFMM Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Nonferrous Metals Manufacturing	394,881	57,093	78,400

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

10.4.5 NFMM Category 2006 Pollutants of Concern

Table 10-9 presents the pollutants of concern for the NFMM Category based on the 2006 annual review.

Table 10-9. 2006 Annual Review: NFMM Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Cadmium and Cadmium Compounds	12	4,246	98,153	7	987	22,822	11	1,311	30,296
Chlorine	17	165,958	84,500	Pollutants are not in the top five TRI 2002 reported pollutants.			Pollutants are not in the top five TRI 2003 reported pollutants.		
Silver	4	3,028	49,871						
Molybdenum	5	237,108	47,763						
Aluminum	21	448,672	29,025						
Manganese and Manganese Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			20	83,684	5,894	19	90,809	6,396
PACs				3	48	4,832	5	168	16,921
Lead and Lead Compounds				73	2,001	4,483	70	3,055	6,844
Copper and Copper Compounds				64	5,494	3,488	58	6,471	4,108
NFMM Category Total	**46[c]**	**118,048,210**	**396,740**	**112[c]**	**2,397,391**	**51,819**	**104[c]**	**2,755,833**	**78,400**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

10.4.6 NFMM Category 2006 Top Discharging Facilities

The PCS discharges account for approximately 88 percent of the combined TRI and PCS TWPE for 2002. The remainder of this section focuses on discharges reported to PCS in 2002. Table 10-10 lists the eight facilities in the NFMM Category with the largest discharges in PCS for 2002.

EPA obtained permits and detailed PCS data, researched facility operations, and analyzed the available pollutant discharge data for these top discharging facilities. Table 10-11 presents EPA's findings.

10.5 Primary Aluminum Subcategory

During the 2006 screening-level review, EPA determined that the Primary Aluminum Subcategory accounted for approximately 34 percent of the NFMM Category TWPE in *PCSLoads2002_v4*. EPA noted that two facilities contributing the top pollutant loads in terms of TWPE for the NFMM Category were primary aluminum manufacturers, leading EPA to review discharges from all facilities with operations subject to the Primary Aluminum Subcategory. For this reason, Section 10.5 focuses on the Primary Aluminum Subcategory.

10.5.1 Primary Aluminum Industry Profile

Primary aluminum facilities produce aluminum by the electrolytic reduction of alumina via the Hall-Heroult Process. In addition to producing aluminum metal and various aluminum alloys, some primary aluminum facilities carry out an additional refining step to produce higher purity aluminum.

According to the U. S. Geological Survey's Minerals Industry Surveys of Primary Aluminum Plants Worldwide (USGS, 2006), conducted in 1998, 23 facilities in the United States have primary aluminum operations. Table 10-12 lists these facilities along with their current owners and operating status. All of the facilities are direct dischargers. Two are minor dischargers: Columbia Falls Aluminum (MT0030066) and ALCOA Mt. Holly (SC0036153). Primary aluminum manufacturing in the United States has decreased slightly over the past two years due to increases in energy and alumina costs (Plunkert, 2006).

Table 10-10. 2006 Annual Review: NFMM Category Top Discharging Facilities in PCS

NPDES ID	Facility Name	Facility Location	Applicable 40 CFR Part 421 Subpart	Total Pounds Discharged	Total TWPE	Percentage of NFMM Category PCS 2002 TWPE
TN0029157	Pasminco Zinc	Clarksville, TN	Subpart H – Primary Zinc; Subpart I – Metallurgical Acid Plants	1,403,459	73,745	18.6%
IN0001155	ALCOA Warrick	Newburgh, TN	Subpart B – Primary Aluminum	751,753	71,361	18.0%
MO0000337	Doe Run Resources Recycling	Boss, MO	Subpart M – Secondary Lead	5,704,134	51,375	12.9%
LA0110931	CS Metals of LA Inc.	Convent, LA	Subpart T – Secondary Molybdenum and Vanadium	543,086	47,309	11.9%
TN0065081	ALCOA South Plant	Alcoa, TN	Subpart B – Primary Aluminum	4,500,150	26,295	6.6%
PA0002208	Horsehead Corporation	Monaca, PA	Subpart G – Primary Lead	316,657	23,274	5.9%
MO0001121	Doe Run Glover Smelter	Annapolis, MO	Subpart G – Primary Lead	2,253,820	21,885	5.5%
PA0012751	Zinc Corporation of America	Palmerton, PA	Subpart H – Primary Zinc; Subpart F – Primary Copper	88,499	13,399	3.4%

Source: *PCSLoads2002_v4*.

Table 10-11. Top Discharging NFMM Category Facilities

Facility	TWPE from Discharge of Top Pollutant (Top Pollutant)	Manufacturing and Product Information	ELG Used for Permit	Findings
Pasminco Zinc	62,362 (cadmium)	Manufactures zinc metal, co-product cadmium metal, sulfuric acid, metallurgically valuable by-products	40 CFR Part 421 Subpart H – Primary Zinc; Subpart I – Metallurgical Acid Plants	Process water outfall has a daily maximum cadmium limit of 3.59 lb/day and a monthly average of 1.44 lb/day. Facility is required to report discharge of cadmium from four stormwater outfalls. All of the measured cadmium concentrations for the stormwater outfalls are above Tennessee's target storm water cadmium concentration of 0.0159 mg/L (TDEC, 2005).
ALCOA Warrick	70,011 (chlorine)	Produces aluminum sheet using primary aluminum smelting (ALCOA, 2006d)	40 CFR Part 423: Steam Electric Power Generating Point Source Category and 40 CFR Part 421 Subpart B – Primary Aluminum (IDEM, 2004)	EPA determined the chlorine discharges, although permitted under Part 423, should be included in the NFMM Category since Part 423 does not apply to integrated power generating plants. However, because the chlorine discharges do not derive from NFMM operations, EPA will exclude the chlorine load from further review.
Doe Run Resources Recycling	49,556 (silver)	Recycles and recovers lead from lead-acid batters and other lead-bearing wastes with trace metal recovery, sulfuric acid manufacturing, and polyethylene plastic recycling (Doe Run Co, 2004b)	40 CFR Part 421 Subpart M – Secondary Lead	Silver discharges are limited to 0.013 mg/L daily maximum for all the outfalls (MDNR, 2003b; MDNR, 2003a). Discharges of silver decreased by 99 percent from 2002 to 2005.
CS Metals of LA Inc.	42,576 (molybdenum)	Recovers molybdenum oxide, vanadium oxide, and alumina from petrochemical catalysts	40 CFR Part 421 Subpart T – Secondary Molybdenum and Vanadium	Permit does not include molybdenum limits, but the facility is required to report discharges (LDEQ, 2002). U. S. GS Mineral Industry Survey for Vanadium reported the facility closed in December 2004 (U. S. GS, 2005). Discharges of molybdenum have decreased tenfold from 2002 to 2005. EPA will exclude this facility's discharges from future reviews.

Table 10-11 (Continued)

Facility	TWPE from Discharge of Top Pollutant (Top Pollutant)	Manufacturing and Product Information	ELG Used for Permit	Findings
ALCOA South Plant	25,441 (aluminum)	Produces aluminum sheet using primary aluminum smelting (ALCOA, 2006c)	40 CFR Part 421 Subpart B – Primary Aluminum Smelting (q) Direct Chill Casting Contact Cooling	Permit includes aluminum limits for all outfalls and facility is required to monitor aluminum in stormwater (TDEC, 2004a), (TDEC, 2004b). Approximately 98 percent of the aluminum discharges reported to PCS in 2002 are from stormwater outfalls and are above Tennessee's target storm water aluminum concentration of 0.75 mg/L (U.S. EPA, 1989; Janjic, 2006).
Horsehead Corporation	13,016 (chlorine)	Manufactures zinc metal and zinc oxides (PDEP, 2001a)	40 CFR Part 423: Steam Electric Power Generating Point Source Category and 40 CFR Part 421	EPA determined the chlorine discharges, although permitted under Part 423, should be included in the NFMM Category since Part 423 does not apply to integrated power generating plants. However, because the chlorine discharges do not derive from NFMM operations, EPA will exclude the chlorine load from further review.
Doe Run Glover Smelter	20,229 (cadmium)	Produces lead	40 CFR Part 421 Subpart G – Primary Lead	Operations at the Doe Run Glover Smelter were suspended in December 2003 due to decreased U.S. lead demand. The facility is in "care and maintenance" status to ensure it can be quickly restarted if the demand for lead increases (Doe Run Co, 2004a). The facility has a current NPDES permit but EPA believes the facility is not currently discharging (MDNR, 2005). EPA will exclude discharges from this facility from future review because the facility is not operating.
Zinc Corporation of America	11,285 (cadmium)	Produces powder zinc and copper-based alloys and concentrated zinc material for smelting at other facilities	40 CFR Part 421 Subpart H – Primary Zinc and Subpart F – Primary Copper	Cadmium permit limits are 0.20 mg/L daily maximum and 0.10 mg/L monthly average (PDEP, 2001b). The facility consistently discharges cadmium below the permitted levels for the outfalls with cadmium limits and the monitor-only outfalls.

Source: *PCSLoads2002_v2*; Facility Permits and Fact Sheets (MDNR, 2003b; MDNR, 2003a; TDEC, 2004b; TDEC, 2004a; TDEC, 2005; IDEM, 2004; LDEQ, 2002; PDEP, 2001a; MDNR, 2005; PDEP, 2001b); "ALCOA Warrick Operations" (ALCOA, 2006d); "Boss, MO" (Doe Run Co, 2005b); "Vanadium in January 2005" (U.S. GS, 2005); "ALCOA Tennessee Operations" (ALCOA, 2006c); *Development Document for Effluent Limitations Guidelines and Standards for the Nonferrous Metals Manufacturing Point Source Category Vol. II* (U.S. EPA, 1989); "Glover, MO" (Doe Run Co, 2004a).

Table 10-12. U.S. Primary Aluminum Facilities Owners and Operating Status

NPDES ID	Facility Name	Location	Company	Operating Status[a]
IN0001155	ALCOA Warrick	Evansville, IN	ALCOA	Reduced capacity
KY0001821	Alcan Sebree	Sebree, KY	Alcan	Operating
KY0004278	National Southwire Aluminum Hawesville	Hawesville, KY	Southwire	Operating
MD0002429	Eastalco Aluminum	Frederick, MD	ALCOA	Operating
MO0105732	Noranda Aluminum	New Madrid, MO	Noranda Incorporated	Operating
MT0030066	Columbia Falls Aluminum	Columbia Falls, MO	Glencore Group	Reduced capacity
NC0004308	ALCOA Badin Works	Badin, NC	ALCOA	Reduced capacity
NY0000132	ALCOA Massena East	Massena, NY	ALCOA	Operating
NY0001732	ALCOA Massena West	Massena, NY	ALCOA	Operating
OH0011550	Ormet Hannibal	Hannibal, OH	Ormet Corp.	Operating
OR0000060	ALCOA Troutdale	Troutdale, OR	ALCOA	Closed
OR0001708	Northwest Aluminum Specialties	The Dalles, OR	Northwest Aluminum Specialties	Operating
SC0036153	ALCOA Mt. Holly	Mt. Holly, SC	ALCOA and Century Aluminum	Operating
TN0065081	ALCOA South Plant	Alcoa, TN	ALCOA	Operating
TX0004715	ALCOA Point Comfort	Rockdale, TX	ALCOA	Operating
WA0000299	Evergreen Aluminum	Vancouver, WA	Glencore Group	Closed
WA0000680	ALCOA Wenatchee Works	Wenatchee, WA	ALCOA	Operating
WA0000086	Longview Aluminum	Longview, WA	Longview Aluminum	Closed
WA0000876	CVB Northwest	Mead, WA	Commercial Development Company	Reduced capacity
WA0000931	Port of Washington	Tacoma, WA	Port of Washington	Closed
WA0000540	Goldendale Aluminum	Goldendale, WA	Goldendale Aluminum Company	Closed
WA0002950	Intalco Works	Ferndale, WA	ALCOA	Reduced capacity
WV0000779	Century Aluminum	Ravenswood, WA	Century Aluminum Company	Operating

Source: "ALCOA Warrick Operations – Evansville" (ALCOA, 2006d); *ALCOA Takes Full Ownership of Intalco and Eastalco Smelters in Washington and Maryland; Signs Agreement for NW Power*" (ALCOA, 2006b); "Aluminum, Alumina, and Bauxite" (Glencore, 2006); *ALCOA Badin Works* (ALCOA, 2006a); "ALCOA Begins Troutdale Site Restoration" (ALCOA, 2003); "Smelters Final Hopes Melt" (Forgey, 2004); "Port Prepares to Demolish Kaiser Smokestack" (Port of Tacoma, 2000).
[a]Closed means facilities that were idle and facilities that were dismantled. Reduced capacity means facilities that were not operating at full production capacity.

10.5.2 40 CFR Part 421 Subpart B

Subpart B of 40 CFR Part 421 regulates direct and indirect discharges from primary aluminum manufacturers. This subcategory is divided into 17 subparts defined by production process. Each subpart includes production-normalized BPT and BAT limitations guidelines. For example, the BAT effluent limitation for aluminum for Subpart (r) – Continuous Rod Casting Contact Cooling is 0.282 mg/kg of aluminum product from rod casting. Table 10-13 summarizes the BAT treatment effectiveness concentrations used to develop the limitations in Part 421 Subpart B. Subparts (a) through (m) also include NSPS and PSNS.

Table 10-13. Primary Aluminum Subcategory BAT Treatment Effectiveness Concentrations

Pollutant	One-Day Maximum (mg	30-Day Average (mg/
Aluminum	7.8	3.5
Antimony	12.0	5.4
Benzo(a)pyrene	0.0337	0.0156
Cyanide	4.5	2.0
Fluoride	59.5	26.4
Nickel	2.3	1.0
TSS	61.5	27.3

Source: *Development Document for Effluent Limitations Guidelines and Standards for the Nonferrous Metals Manufacturing Point Source Category Vol II* (U.S. EPA, 1989).

The basis for the existing BAT ELGs for the Primary Aluminum Subcategory is:

- In-process recycling of air pollution wastewater and contact cooling water;
- Lime precipitation and sedimentation;
- Multimedia filtration; and
- Cyanide precipitation (U.S. EPA, 1989).

10.5.3 Primary Aluminum 2006 Pollutants of Concern

Table 10-14 presents the top five pollutants reported to PCS in 2002 by primary aluminum facilities and the number of facilities for which the 2002 discharge load is greater than zero. The top five pollutants account for approximately 96 percent of the Primary Aluminum Subcategory's discharges in PCS for 2002.

Chlorine Discharges

Of the Primary Aluminum Subcategory's 2002 chlorine discharges in PCS, approximately 98 percent were from the ALCOA Warrick facility. Because these chlorine discharges do not derive from NFMM operations, as described in Table 10-11, the chlorine load is excluded from further review.

Table 10-14. 2006 Annual Review: Primary Aluminum Subcategory Pollutants of Concern

Pollutant	Number of Facilities with Discharge Greater than Zero	Total Pounds Discharged	TWPE	Percentage of Subcategory TWPE	Percentage of Category TWPE
Chlorine	14	139,942	71,253	53.4%	18.0%
Aluminum	18	446,539	28,887	21.7%	7.3%
Fluoride	19	462,328	16,182	12.1%	4.1%
Cyanide	13	7,614	8,504	6.4%	2.1%
PCB-1248	1	0.4	3,527	2.6%	0.9%
Primary Aluminum Subcategory Total		**1,603,333**	**133,426**		**32.4%**

Source: *PCSLoads2002_v4*.

Aluminum Discharges

Of the Primary Aluminum Subcategory's 2002 aluminum discharges in PCS, 88 percent were from the ALCOA South Plant. As described in Table 10-11, 98 percent of the aluminum discharges that the ALCOA South Plant reported to PCS in 2002 are from stormwater outfalls. EPA determined discharges applicable to the Primary Aluminum Subcategory would not include stormwater: "…stormwater is or can be segregated from the process wastewater" (U.S. EPA, 1989). EPA determined stormwater discharges from primary aluminum manufacturing facilities should be "addressed on a case-by-case basis by the permit writer" (U.S. EPA, 1989). The ALCOA South Plant facility is required to monitor aluminum in their stormwater. The reported concentrations of aluminum in the stormwater (1.08 mg/L to 47.3 mg/L for all the stormwater outfalls) are discharged above the Tennessee target stormwater aluminum concentration of 0.75 mg/L (TDEC, 2004a; TDEC, 2004b). For two of the facility's stormwater outfalls, the aluminum concentrations are above the Primary Aluminum Subcategory BAT treatment effectiveness concentration of 7.8 mg/L daily maximum (U.S. EPA, 1989).

Fluoride and Cyanide Discharges

EPA identified the Primary Aluminum Subcategory for additional review, in part, because of the large number of facilities reporting discharges of fluoride and cyanide. Of the 23 primary aluminum facilities, 21 report discharges of fluoride and 19 report discharges of cyanide. Section 10.5.4 and 10.5.5 present the results of additional reviews of the fluoride and cyanide discharges. No one facility discharges a majority of the fluoride or cyanide.

PCB-1248 Discharges

The ALCOA Massena West facility is the only facility in the Primary Aluminum Subcategory for which PCS includes data for 2002 discharges of PCB-1248. Because the facility has not reported discharges of PCB-1248 since January 2004, EPA did not collect any additional information about this pollutant.

10.5.4 Primary Aluminum Wastewater Sources of Fluoride

This subsection describes the primary aluminum manufacturing process and the generation of fluoride-containing wastewater. Primary aluminum smelting takes place in electrolytic cells, in which alumina, the principle ore of aluminum, is dissolved in molten cryolite (Na_3AlF_6). The cells are heated to approximately 950^{o}F and an electrical current is passed through the molten cryolite to force the aluminum ions to migrate to the cathode, where they are reduced to aluminum metal. Because the reduced molten aluminum is heavier than the molten cryolite, the molten aluminum forms a layer at the bottom of the cell. The electrolytic cells emit gases containing fluoride compounds that are collected in hoods above the cells. The collected gases are treated using dry air scrubbing or wet scrubbing processes, which generate wastewater. The molten aluminum, collected in the bottoms of the cells, is sent for further refining and alloying. Refining consists of fluxing to remove impurities and degassing to remove trapped hydrogen gas from the molten aluminum. The refined aluminum is typically cast into ingots or billets (U.S. EPA, 1989).

In the electrolytic cells, called the pot liner, the anode is made of coal tar pitch and coke, while the cathode is the carbon lining of the cell. The anodes are consumed when the negative charge (electrons) is transferred to the aluminum ions to reduce the aluminum. Therefore, the anodes must be replaced and recycled periodically when they become too small to be effective. In the recycling process, the anodes are crushed and made into paste, which is formed into briquettes and baked to create new anodes. The recycled anodes contain impurities that collect on them in the cells. Fluoride, one of the impurities, is released as gas when the recycled anodes are baked. The emissions are treated using dry or wet scrubbing processes. The pot liners can also be reprocessed to reduce the amount of hazardous waste generated. The pot liners are ground and leached with caustic to solubilize the fluoride deposits. The solids are removed from the leaching solution using sedimentation. Sodium aluminate ($NaAlO_2$) is added to the solution to precipitate cryolite (Na_3AlF_6). The resulting cryolite precipitate is recovered for use in the electrolytic cells. Lime is added to the remaining solution to precipitate calcium fluoride (CaF_2). The remaining solution is then used as the leachate at the beginning of the pot liner reprocessing (U.S. EPA, 1989).

The air pollutants emitted during primary aluminum smelting are particulates, sulfur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2), tars, oils, and fluoride compounds. The dry air scrubbing process uses sandy alumina, prior to its use in the electrolytic cells. The scrubber process removes pollutants from exhaust gases and recovers them for reuse in the process. Dry air scrubbing cannot be used for the manufacture of high purity alloys because using the alumina in the scrubber concentrates the impurities, reducing the quality of the metal produced. The wet air scrubbing process generates large wastewater discharges containing fluoride and TSS. The wastewater generation can be reduced by adding lithium carbonate to electrolytic cells. The lithium carbonate reduces the fluoride compound emissions and power consumption, and it increases aluminum production by controlling the physical properties such as melting point, electrical conductivity, and density (U.S. EPA, 1989).

Table 10-15 lists the primary aluminum facilities that reported discharges of fluoride to PCS in 2002.

EPA obtained additional, detailed PCS concentration data for 14 of the 21 primary aluminum facilities that reported discharges of fluoride to PCS in 2002. The remaining facilities reported quantities (e.g., pounds per day) of fluoride to PCS in 2002. Table 10-16 presents the reported average concentrations of fluoride discharged by these facilities for outfalls that were included in *PCSLoads2002_v4*.

The median fluoride concentrations reported by primary aluminum facilities, as shown in Table 10-16, are all less than the fluoride BAT treatment effectiveness concentrations of 26.5 mg/L monthly average (U.S. EPA, 1989). The current treatment technologies perform better than the “best” treatment (BAT) at the time the existing ELGs were developed.

10.5.5 Primary Aluminum Wastewater Sources of Cyanide

The high temperatures and reducing environment found in aluminum electrolytic cells induce the formation of cyanide. Cyanide gas is emitted from the cells and treated with other off gases using dry air scrubbing or wet scrubbing processes. Pot liner reprocessing also generates cyanide-bearing wastewater (U.S. EPA, 1989).

Table 10-17 lists the primary aluminum facilities with cyanide discharges in PCS for 2002.

EPA obtained additional, detailed PCS concentration data for 8 of the 19 primary aluminum facilities with cyanide discharges in PCS for 2002. The remaining facilities reported discharges of cyanide as quantities (e.g., pounds per day) to PCS in 2002. Table 10-18 presents the reported average concentrations of cyanide discharged by these facilities.

The median cyanide concentrations reported by primary aluminum facilities, as shown in Table 10-18, are all well below the cyanide BAT treatment effectiveness concentrations, 2.0 mg/L monthly average and 4.5 mg/L daily maximum (U.S. EPA, 1989).

Table 10-15. Primary Aluminum Facilities with Fluoride Discharges in PCS for 2002

NPDES ID	Facility	Location	Pounds Discharged	TWPE	Percentage of Total Fluoride TWPE
MD0002429	Eastalco Aluminum	Frederick	89,362	3,128	19.3%
TX0004715	ALCOA Point Comfort	Point Comfort	73,776	2,582	16.0%
MO0105732	Noranda Aluminum	New Madrid	65,280	2,285	14.1%
WV0000779	Century Aluminum	Ravenswood	52,840	1,849	11.4%
WA0002950	Intalco Works	Ferndale	29,401	1,029	6.4%
NY0000132	ALCOA Massena East	Massena	25,869	905	5.6%
NY0001732	ALCOA Massena West	Massena	20,131	705	4.4%
IN0001155	ALCOA Warrick	Newburgh	16,727	585	3.6%
TN0065081	ALCOA South Plant	Alcoa	16,715	585	3.6%
WA0000540	Goldendale Aluminum	Goldendale	15,741	551	3.4%
NC0004308	ALCOA Badin Works	Badin	14,681	514	3.2%
OH0011550	Ormet Hannibal	Hannibal	12,716	445	2.8%
KY0004278	National Southwire Aluminum Hawesville	Robards	12,627	442	2.7%
OR0000060	ALCOA Troutdale	Troutdale	7,110	249	1.5%
WA0000931	Port of Washington	Tacoma	3,621	127	0.8%
WA0000299	Evergreen Aluminum	Vancouver	3,072	108	0.7%
OR0001708	Northwest Aluminum Specialties	The Dalles	1,770	62	0.4%
WA0000680	ALCOA Wenatchee Works	Malaga	720	25	0.2%
WA0000876	CVB Northwest	Mead	170	6	0.04%
KY0001821	Alcan Sebree[a]	Hawesville	0	0	0.0%
WA0000086	Longview Aluminum[b]	Longview	0	0	0.0%
Total Fluoride Discharges			**462,328**	**16,181**	

Source: *PCSLoads2002_v4*.
[a]Permit limits fluoride discharges for one outfall that had no discharge in 2002.
[b]Facility reports concentration of fluoride but does not report outfall flow, so a fluoride load was not calculated in *PCSLoads2002_v4*.

Table 10-16. Primary Aluminum Facilities, Fluoride Concentrations Reported to PCS in 2002

NPDES ID	Facility Name	Minimum Average Concentration[a] (mg/L)	Maximum Average Concentration[a] (mg/L)	Median Average Concentration[a] (mg/L)	Date Range
MO0105732	Noranda Aluminum	8.90	21.05	15.00	1/2002 – 3/2006
WA0002950	Intalco Works	5.00	26.00	14.00	1/2002 – 2/2003
OH0011550	Ormet Hannibal	9.84	15.20	13.33	1/2002 – 3/2004
WA0000876	CVB Northwest	10.45	14.50	12.48	1/2002 – 1/2003
MD0002429	Eastalco Aluminum	4.64	18.60	12.40	1/2002 – 2/2006
WA0000299	Evergreen Aluminum[b]	3.80	5.50	4.55	1/2002 – 2/2003
WA0000086	Longview Aluminum[b, c]	0.40	4.00	1.40	1/2002 – 2/2003
NC0004308	ALCOA Badin Works	0.24	33.00	1.25	8/2004 – 2/2006
NY0000132	ALCOA Massena East	0.20	35.00	0.45	8/2004 – 3/2006
IN0001155	ALCOA Warrick	2.02	3.97	2.90	1/2002 – 8/2004
TN0065081	ALCOA South Plant[b, d]	0.25	20.40	1.90	2/2002 – 4/2006
WA0000931	Port of Washington	1.03	27.40	2.81	1/2002 – 2/2003
WV0000779	Century Aluminum	0.05	12.60	0.91	2/2002 – 9/2002
OR0000060	ALCOA Troutdale	0.20	2.20	0.90	1/2002 – 4/2003

Source: Envirofacts.
[a]Concentrations are total fluoride, unless otherwise specified. EPA determined discharges reported as “0” and with “<” signs in Envirofacts were nondetects and excluded them from the facility’s concentrations. EPA included fluoride concentrations from all reported outfalls in this analysis.
[b]Concentrations are reported maximums. Facilities did not report average concentrations.
[c]Facility reports concentration of fluoride but does not report outfall flow, so a fluoride load was not calculated in *PCSLoads2002_v4*.
[d]Concentrations are dissolved fluoride.

Table 10-17. Primary Aluminum Facilities with Cyanide Discharges in PCS for 2002

NPDES ID	Facility	Location	Pounds Discharged	TWPE	Percentage of Total Cyanide TWPE
NC0004308	ALCOA Badin Works	Badin	3,380	3,775	44.4%
WV0000779	Century Aluminum	Ravenswood	2,460	2,748	32.3%
OH0011550	Ormet Hannibal	Hannibal	1,181	1,319	15.5%
KY0001821	Alcan Sebree	Hawesville	222	248	2.9%
NY0000132	ALCOA Massena East	Massena	120	134	1.6%
TN0065081	ALCOA South Plant	Alcoa	85	95	1.1%
NY0001732	ALCOA Massena West	Massena	83	93	1.1%
OR0000060	ALCOA Troutdale	Troutdale	29	33	0.4%
IN0001155	ALCOA Warrick	Newburgh	28	31	0.4%
WA0002950	Intalco Works	Ferndale	20	22	0.3%
WA0000299	Evergreen Aluminum	Vancouver	4	5	0.1%
MD0002429	Eastalco Aluminum	Frederick	2	3	0.03%
TX0004715	ALCOA Point Comfort[a]	Point Comfort	0	0	0.0%
MO0105732	Noranda Aluminum[a]	New Madrid	0	0	0.0%
OR0001708	Northwest Aluminum Specialties[a]	The Dalles	0	0	0.0%
WA0000086	Longview Aluminum[a]	Longview	0	0	0.0%
WA0000680	ALCOA Wenatchee Works[a]	Malaga	0	0	0.0%
WA0000876	CVB Northwest[a]	Mead	0	0	0.0%
WA0000931	Port of Washington[a]	Tacoma	0	0	0.0%
Total Cyanide Discharges			**7,614**	**8,504**	

Source: *PCSLoads2002_v4*; Envirofacts; Facility permits (TNRCC, 1996; MDNR, 2004; ODEQ, 2005; WDE, 2002; WDE, 1997; WDE, 2001b; WDE, 2000; WDE, 2001c; WDE, 2002; WDE, Unknown).
[a]Permits include cyanide limits or monitoring requirements. Discharges of cyanide were reported below the detection limit or were not provided on Envirofacts for 2002.

Table 10-18. Primary Aluminum Facilities, Cyanide Concentrations Reported to PCS in 2002

NPDES ID	Facility Name	Minimum Average Concentration[a] (mg/L)	Maximum Average Concentration[a] (mg/L)	Median Average Concentration[a] (mg/L)	Date Range
NC0004308	ALCOA Badin Works	0.003	258.4	0.152	8/2004 – 2/2006
WV0000779	Century Aluminum	0.010	1.06	0.150	1/2002 – 9/2002
NY0000132	ALCOA Massena East	0.012	6.19	0.025	1/2002 – 3/2006
TN0065081	ALCOA South Plant[b]	0.005	0.033	0.011	3/2002 – 4/2005
WA0000299	Evergreen Aluminum	0.010	0.010	0.010	4/2003 – 1/2006
MD0002429	Eastalco Aluminum[c]	0.001	0.020	0.003	1/2002 – 2/2006
WA0002950	Intalco Works[c]	0.001	0.002	0.002	2/2002 – 4/2002
OH0011550	Ormet Hannibal[d]	0.001	0.027	0.001	1/2002 – 3/2006

Source: Envirofacts.
[a]Concentrations are total cyanide, unless otherwise specified. EPA determined discharges reported as “0” and with “<” signs in Envirofacts were nondetects and excluded them from the facility’s concentrations. EPA included cyanide concentrations from all reported outfalls in this analysis.
[b]Concentrations are maximum. Facilities did not report average concentrations.
[c]Concentrations are cyanide, free (amenable to chlorination).
[d]Concentrations are cyanide, weak acid dissociable.

10.6 NFMM Category Conclusions

- The NFMM Category ranks high in TWPE because of the number of facilities with discharges.

- Some facilities discharges were misrepresented in PCS.

- Facilities in the Primary Aluminum Subcategory consistently report discharges of regulated pollutants, including fluoride and cyanide. EPA obtained additional data that shows current facility discharge concentrations are below treatment effectiveness concentrations identified as BAT in 1984.

- Pasminco Zinc Inc. reported discharges accounting for almost 19 percent of the NFMM Category's 2002 PCS TWPE. The majority of the facility's discharges are cadmium discharged from stormwater outfalls that exceed Tennessee's target stormwater cadmium concentration of 0.0159 mg/L (TDEC, 2005).

- Two of the top discharging facilities, ALCOA Warrick and Horsehead Corporation, reported discharges of chlorine accounting for approximately 21 percent of the NFMM Category's 2002 PCS TWPE. The chlorine discharges are associated with the on-site power generation at the facilities that are permitted with limits from 40 CFR Part 423: Steam Electric Power Generating Point Source Category. EPA determined the discharges of chlorine from the NFMM facilities are not applicable to 40 CFR Part 423 since 40 CFR Part 423 does not apply to integrated power generating plants. However, the chlorine loads are not from NFMM operations and were excluded from further review.

- EPA is not identifying the NFMM Category as a hazard priority based on data available at this time.

10.7 NFMM Category References

ADEQ. 2005a. Arkansas Department of Environmental Quality. Authorization to Discharge Under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act NPDES AR0000582 – ALCOA Bauxite Works, Bauxite, AR. Little Rock, AR. (May 31). DCN 03313.

ADEQ. 2005b. Arkansas Department of Environmental Quality. Authorization to Discharge Under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act Fact Sheet for NPDES AR0000582 – ALCOA Bauxite Works, Bauxite, AR. Little Rock, AR. (May 23). DCN 03313.

Alcan Inc. 2006. "Find Alcan Around the World – Sebree." *About Alcan*. Available online at: http://www.alcan.com/web/publishing.nsf/content/FF0C85E1F0D760B185256E860051BC1F?OpenDocument. Date accessed: September 28, 2006. DCN 03728.

ALCOA. 2003. *ALCOA Begins Troutdale Site Restoration*. (July 16). Available online at: http://www.alcoa.com/global/en/news/news_details.asp?pageID=231974841&newsYear=2003. Date accessed: July 5, 2006. DCN 03733.

ALCOA. 2006a. *ALCOA Badin Works*. Available online at: http://www.alcoa.com/locations/alcoa_location/en/home.asp?code=406. Date accessed: September 28, 2006. DCN 03729.

ALCOA. 2006b. *ALCOA Takes Full Ownership of Intalco and Eastalco Smelters in Washington and Maryland; Signs Agreement for NW Power*. (June 29). Available online at: http://www.alcoa.com/global/en/news/news_details.asp?pageID=20060629005669en&newsYear=2006. Date accessed: July 5, 2006. DCN 03730.

ALCOA. 2006c. "ALCOA Tennessee Operations." Available Online at: http://www.alcoa.com/tn_operations/en/home.asp. Date accessed: July 5, 2006. DCN 03731.

ALCOA. 2006d. "ALCOA Warrick Operations – Evansville." Available online at: http://www.alcoa.com/locations/usa_warrick/en/home.asp. Date accessed: July 5, 2006. DCN 03732.

Doe Run Co. 2004a. The Doe Run Company. "Glover, MO." *Smelting and Refining*. Available online at: http://www.doerun.com/whatwedo/glover.asp. Date accessed: April 12, 2006. DCN 03734.

Doe Run Co. 2004b. The Doe Run Company. "Boss, MO." *Recycling*. Available online at: http://www.doerun.com/whatwedo/boss.asp. Date accessed: April 14, 2006. DCN 03735.

Forgey, Pat. 2004. "Smelter's Final Hope Melts." *The Daily News*. Longview, Washington. (January 20). Available online at: http://www.tdn.com/articles/2004/01/20/area_news/news01.txt. Date accessed: July 5, 2006. DCN 03736.

Glencore. 2006. Glencore International AG. "Aluminum, Alumina, and Bauxite." *Commodity Departments*. Available online at: http://www.glencore.com/pages/aluminum.htm. Date accessed: July 17, 2006. DCN 03737.

IDEM. 2001. Indiana Department of Environmental Management. Fact Sheet for NPDES Permit IN0001210 – ALCOA Lafayette Works, Lafayette, IN. Indianapolis, IN. (August). DCN 02400.

IDEM. 2002. Indiana Department of Environmental Management. NPDES Permit IN0001210 – ALCOA Lafayette Works, Lafayette, IN. Indianapolis, IN. (October 10). DCN 03314.

IDEM. 2004. State of Indiana Department of Environmental Management. Authorization to Discharge under the National Pollutant Discharge Elimination System Permit NPDES IN0001155 – ALCOA Warrick, Newburgh, IN. Indianapolis, IN. (August 3). DCN 03314.

Janjic, Vojin. Unknown. Tennessee Department of Environment and Conservation, Division of Water Pollution Control. *Permit Rationale for the Tennessee Storm Water Multi-Sector General Permit for Industrial Activities*. DCN 03752.

KDEP. 2002. Commonwealth of Kentucky Department for Environmental Protection. Kentucky Pollution Discharge Elimination System Permit and Fact Sheet for NPDES KY0002666 – Commonwealth Aluminum, Lewisport, KY. Frankfort, KY. (July 19). DCN 02405.

LDEQ. 2002. State of Louisiana Department of Environmental Quality. Offices of Environmental Services Water Discharge Permit NPDES LA0110931 – CS Metals of Louisiana Inc., Convent, LA. Baton Rouge, LA. (December 9). DCN 02407.

MDNR. 2003a. State of Missouri Department of Natural Resources. State Operating Permit Fact Sheet NPDES MO0000337 – Doe Run Resources Recycling, Boss, MO. Jefferson City, MO. DCN 03315.

MDNR. 2003b. State of Missouri Department of Natural Resources. State Operating Permit NPDES MO0000337 – Doe Run Resources Recycling, Boss, MO. Jefferson City, MO. (November 14). DCN 03315.

MDNR. 2005. State of Missouri Department of Natural Resources. State Operating Permit NPDES MO0001121 – Doe Run, Glover Smelter, Glover, MO. Jefferson City, MO. (August 26). DCN 03317.

MDNR. 2004. State of Missouri Department of Natural Resources. State Operating Permit NPDES MO0105732 – Noranda Aluminum Inc., New Madrid, MO. Jefferson City, MO. (January 9). DCN 02505.

NYSDEC. 2001. New York State Department of Environmental Conservation. State Pollutant Discharge Elimination System Fact Sheet NPDES NY0001732 – ALCOA Massena West, Massena, NY. Watertown, NY. (July 16). DCN 02494.

NYSDEC. 2003. New York State Department of Environmental Conservation. State Pollutant Discharge Elimination System Discharge Permit NPDES NY0001732 – ALCOA Massena West, Massena, NY. Watertown, NY. (June 9). DCN 02494.

ODEQ. 2005. Oregon Department of Environmental Quality. National Pollutant Discharge Elimination System Waste Discharge Permit NPDES OR0001708 – Noranda Aluminum Specialties, The Dalles, OR. Bend, OR. (February 8). DCN 02762.

Olin. 2000. Olin Corporation. “Olin Brass.” *Business Lines*. (April 28). Available online at: http://www.olin.com/business/brass.asp. Date accessed: July 5, 2006. DCN 03753.

PDEP. 2001a. Commonwealth of Pennsylvania Department of Environmental Protection Water Management Program. Authorization to Discharge under the National Pollutant Discharge Elimination System Permit NPDES PA0002208 – Horsehead Corporation, Monaca, PA. Harrisburg, PA. (August 2). DCN 02409.

PDEP. 2001b. Commonwealth of Pennsylvania Department of Environmental Protection Water Management Program. Authorization to Discharge under the National Pollutant Discharge Elimination System Permit NPDES PA0012751 – Zinc Corporation of America, Palmerton, PA. Harrisburg, PA. (December 18). DCN 02893.

Plunkert, Patricia A. 2006. U.S. Geological Survey. "Aluminum Mineral Commodity Summaries." *U.S. Geological Survey*. (January). DCN 03755.

Port of Tacoma. 2000. *Port Prepares to Demolish Kaiser Smokestack: When Will the Kaiser Smokestack Demolition Blast Happen?* Available online at: http://www.portoftacoma.com/topstory.cfm?sub=69&lsub=847. DCN 03756.

Reddington, Mike. 2005. Olin Corporation. Telephone conversation with Mike Reddington of Olin Corporation and Jessica Wolford of Eastern Research Group, Inc. "Olin Corp. Main Plant Facility Phosphorous Releases in TRI 2003 (62024-LNCRP-SHAMR)." (December 20). DCN 02545.

TDEC. 2005. State of Tennessee Department of Environment and Conservation. State of Tennessee National Pollutant Discharge Elimination System Permit NPDES TN0029157 – Pasminco Zinc Inc., Clarksville, TN. Nashville, TN. (May 31). DCN 02403.

TDEC. 2004a. State of Tennessee Department of Environment and Conservation. State of Tennessee National Pollutant Discharge Elimination System Addendum to Rationale NPDES TN0065081 – ALCOA South Plant, Alcoa, TN. Nashville, TN. (January 7). DCN 03319.

TDEC. 2004b. State of Tennessee Department of Environment and Conservation. State of Tennessee National Pollutant Discharge Elimination System Permit NPDES TN0065081 – ALCOA South Plant, Alcoa, TN. Nashville, TN. (March 31). DCN 03319.

TNRCC. 1996. Texas Natural Resource Conservation Commission. Permit to Dispose of Wastes for NPDES TX0004715 – ALCOA Point Comfort, Point Comfort, TX. Austin, TX. (August 30). DCN 02422.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

U.S. EPA. 1989. *Development Document for Effluent Limitations Guidelines and Standards for the Nonferrous Metals Manufacturing Point Source Category*. Vol II. U.S. EPA. EPA-440-1-89-019.2. Washington, DC. (May).

UDEQ. Unknown. Utah Department of Environmental Quality. Statement of Basis for UT0000051 – Kennecott Utah Copper Corporation. Salt Lake City, UT. DCN 03320.

USEC. 2005. United States Enrichment Corporation Inc. "Portsmouth Gaseous Diffusion Plant." *USEC Facilities*. Available online at: http://www.usec.com/v2001_02/HTML/Facilities_PortsOverview.asp. Date accessed: July 3, 2006. DCN 03758.

USGS. 2005. U.S. Geological Survey. "Vanadium in January 2005." *Mineral Industry Surveys*. (April). Available online at: http://minerals.usgs.gov/minerals. DCN 03754.

WDE. 1997. State of Washington Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit NPDES WA0000680 – ALCOA Wenatchee Works, Malaga, WA. Olympia, WA. (September 2). DCN 02738.

WDE. 2000. State of Washington Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit NPDES WA0000876 – CVB Northwest, Mead, WA. Olympia, WA. (January 1). DCN 02739.

WDE. 2001a. State of Washington Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit NPDES WA0000931 – Port of Washington, Tacoma, WA. Olympia, WA. (October 10). DCN 02740.

WDE. 2001b. State of Washington Department of Ecology. Fact Sheet for NPDES Permit WA0000680 – ALCOA Wenatchee Works, Malaga, WA. Olympia, WA. (November 1). DCN 02738.

WDE. 2001c. State of Washington Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit Fact Sheet NPDES WA0000931 – Port of Washington, Tacoma, WA. Olympia, WA. (November 29). DCN 02740.

WDE. 2002. State of Washington Department of Ecology. National Pollutant Discharge Elimination System Waste Discharge Permit NPDES/WA0000086-Longview Aluminum, Longview, WA. Olympia, WA. (February 1). DCN 02863.

WDE. Unknown. State of Washington Department of Ecology. Fact Sheet for NPDES WA0000876-CVB Northwest, Mead, WA. Olympia, WA. DCN 02739.

11.0 ORGANIC CHEMICALS, PLASTICS, AND SYNTHETIC FIBERS (40 CFR PART 414)

EPA selected the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) Category for additional data collection and analysis because it ranked high in terms of toxic and nonconventional discharges during EPA's 2005 annual review (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 2004). This section summarizes the 2005 annual review and also describes the 2006 annual review. EPA's 2006 annual review builds on the 2005 annual review.

EPA is currently reviewing discharges from the Chlorinated Hydrocarbon Manufacturing Segment of the OCPSF Category as part of the Chlorine and Chlorinated Hydrocarbons (CCH) effluent guidelines rulemaking. Because a rulemaking for this segment of the OCPSF category is underway, EPA excluded discharges from these facilities from further consideration in this review (see Table V-1, 70 FR 51050, August 29, 2005).

11.1 OCPSF Category Background

This section provides background on the OCPSF Category including a brief profile of the OCPSF industry, background on 40 CFR Part 414, and a summary of findings from the OCPSF Category detailed study as part of the 2004 Plan.

11.1.1 OCPSF Industry Profile

The OCPSF Category includes many chemical industries producing a wide variety of end products, such as polypropylene, vinyl chloride and polyvinyl chloride (PVC), chlorinated solvents, rubber precursors, styrofoam additives, and polyester. Some OCPSF facilities are extremely complex and produce hundreds of chemicals, while others are simpler, producing one or two end products. Facilities in the following five SIC codes could perform operations covered by the OCPSF ELGs:

- 2821: Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers;
- 2823: Cellulosic and Other Man-Made Fibers;
- 2824: Synthetic Organic Fibers, Except Cellulose;
- 2865: Cyclic Crudes and Intermediates, and Organic Dyes and Pigments; and
- 2869: Industrial Organic Chemicals, Not Elsewhere Classified (NEC).

In addition, EPA is considering including operations from five other SIC codes as potential new subcategories of the OCPSF Category. See Section 11.3 for the discussion of the potential new subcategories.

Table 11-1 lists the five SIC codes with operations in the OCPSF Category and the five SIC codes included as potential new subcategories to the OCPSF Category.

OCPSF facilities discharge directly to surface water as well as to POTWs. Table 11-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds.

11.1.2 40 CFR Part 414

EPA first promulgated ELGs for the OCPSF Category (40 CFR Part 414) on November 5, 1987 (52 FR 42568). This category consists of eight subcategories that apply to the manufacture of products and product groups, as shown in Table 11-3 with the corresponding SIC codes and applicability. Subparts B through H have limitations for BOD_5, TSS, and pH. The regulation also includes limitations and/or pretreatment standards for certain toxic pollutants in three additional subparts:

- Subpart I - Direct Discharge Point Sources that use End-of-Pipe Biological Treatment;
- Subpart J - Direct Discharge Point Sources that do not use End-of-Pipe Biological Treatment; and
- Subpart K - Indirect Discharge Point Sources.

11.1.3 Previous Detailed Study Findings for the OCPSF Category

Previously, EPA conducted a detailed study of the OCPSF Category in support of the 2004 Plan (see Section 6.0 of the 2004 Plan (U.S. EPA, 2004)). EPA selected the OCPSF Category for study based on high TWPE from both TRI- and PCS- reported discharges. This subsection summarizes the findings from the 2004 detailed study.

Table 11-1. Number of Facilities in OCPSF SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2821: Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers	688	137	403	385
2823: Cellulosic and Other Man-Made Fibers	8	4	5	5
2824: Synthetic Organic Fibers, Except Cellulosic	94	9	40	42
2865: Cyclic Crudes and Intermediates, and Organic Dyes and Pigments	217	33	106	95
2869: Industrial Organic Chemicals, NEC	3,215	189	469	460
OCPSF Category Total[c]	**4,222**	**372**	**1,023**	**987**
Potential New Subcategories				
2842: Specialty Cleaning, Polishing, and Sanitation Preparations	604	3	138	135
2844: Perfumes, Cosmetics, and Other Toilet Preparations	1,586	10	43	39
2891: Adhesives and Sealants	585	14	185	185
2899: Chemicals and Chemical Preparations, NEC	3,582	45	339	330
5169: Chemicals and Allied Products	54,314	20	464	433
Potential New Subcategories Total	**60,671**	**92**	**1,169**	**1,122**

Source: U.S. Economic Census 2002 (U.S. Census, 2002); *PCSLoads2002_v2*; *TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]Excludes the potential new subcategories.
NEC – Not elsewhere classified.

Table 11-2. OCPSF Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2821: Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers	64	101	19	219
2823: Cellulosic and Other Man-Made Fibers	2	0	1	2
2824: Synthetic Organic Fibers, Except Cellulosic	9	11	2	18
2865: Cyclic Crudes and Intermediates, and Organic Dyes and Pigments	29	38	5	33
2869: Industrial Organic Chemicals, NEC	107	134	27	198
Potential New Subcategories				
2842: Specialty Cleaning, Polishing, and Sanitation Preparations	1	39	0	98
2844: Perfumes, Cosmetics, and Other Toilet Preparations	0	21	0	22
2891: Adhesives and Sealants	3	26	1	155
2899: Chemicals and Chemical Preparations, NEC	17	79	10	233
5169: Chemicals and Allied Products	6	40	0	418

Source: *TRIReleases2002_v4.*
NEC – Not elsewhere classified.

Table 11-3. Applicability of Subcategories in the OCPSF Category

Subpart	Subpart Name	Applicable SIC Code(s)	Subpart Applicability
B	Rayon Fibers	2823: Cellulosic Manmade Fibers	Cellulosic manmade fiber (Rayon) manufactured by the Viscose process.
C	Other Fibers	2823: Cellulosic Manmade Fibers 2824: Synthetic Organic Fibers, Except Cellulosic	All other synthetic fibers (except Rayon) including, but not limited to, products listed in Section 414.30.
D	Thermoplastic Resins	28213: Thermoplastic Resins	Any plastic product classified as a Thermoplastic Resin including, but not limited to, products listed in Section 414.40.
E	Thermosetting Resins	28214: Thermosetting Resins	Any plastic product classified as a Thermosetting Resin including, but not limited to, products listed in Section 414.50.
F	Commodity Organic Chemicals	2865: Cyclic Crudes and Intermediates, Dyes and Organic Pigments 2869: Industrial Organic Chemicals, NEC	Commodity organic chemicals and commodity organic chemical groups including, but not limited to, products listed in Section 414.60.
G	Bulk Organic Chemicals	2865: Cyclic Crudes and Intermediates, Dyes and Organic Pigments 2869: Industrial Organic Chemicals, NEC	Bulk organic chemicals and bulk organic chemical groups including, but not limited to, products listed in Section 414.70.
H	Specialty Organic Chemicals	2865: Cyclic Crudes and Intermediates, Dyes and Organic Pigments 2869: Industrial Organic Chemicals, NEC	All other organic chemicals and organic chemical groups including, but not limited to, products listed in the OCPSF Development Document (Vol. II, Appendix II-A, Table VII).

Source: *Product and Product Group Discharges Subject to Effluent Limitations and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category - 40 CFR 414,* Table 2-2 (U.S. EPA, 2005c).
NEC - Not elsewhere classified.

EPA identified dioxin and dioxin-like compounds as the primary pollutants responsible for the OCPSF industry's large toxic-weighted pollutant discharge. EPA concluded that the manufacture of ethylene dichloride, vinyl chloride monomer, and polyvinyl chloride, referred to collectively as the vinyl chloride manufacturing segment of the OCPSF industry, is the primary source of dioxin and dioxin-like compounds discharges. EPA found that the largest discharges of dioxin and dioxin-like compounds occur at large integrated facilities that also operated chlor-alkali plants. In addition, EPA found that discharges of dioxin and dioxin-like compounds from stand-alone chlor-alkali plants are significant. As a result, EPA identified vinyl chloride manufacturing, which is subject to the OCSPF ELGs (Part 414) and chlor-alkali manufacturing, which is subject to the Inorganic Chemicals Manufacturing ELGs (Part 415), for possible effluent guidelines revisions. In 2005, EPA's Vinyl Chloride and Chlor-Alkali rulemaking effort identified other manufacturing processes that operate under similar conditions to the chlor-alkali and vinyl chloride processes, and therefore have potential to discharge dioxin and dioxin-like compounds. EPA decided to expand the manufacturing operations considered for revised ELGs to include all chlorine manufacturing processes and manufacturing processes for chlorinated hydrocarbons manufactured by direct chlorination, oxychlorination, dehydrochlorination, or hydrochlorination. Chlorinated hydrocarbons that are regulated under the Pesticide Chemicals Category (40 CFR Part 455) or under the Pharmaceuticals Manufacturing Category (40 CFR 439) are not included in the CCH manufacturing segment.

EPA reviewed two additional sectors of the OCPSF Category for the 2004 detailed study: aniline and dye manufacturers and coal tar refiners. Aniline and dye manufacturers contributed the majority of aniline discharges reported to TRI for 2000. EPA learned that most of these facilities discharge their wastewater to POTWs. Aniline is highly treatable in biological systems and receiving POTWs indicated no interference issues with these discharges. The coal tar refiners contributed the majority of PACs discharges reported to TRI for 2000. EPA learned that the coal tar industry was declining, and that the PACs discharges were at concentrations near or at treatability levels. As a result, EPA determined that, based on the information available at that time, it was not appropriate to select the aniline and dye manufacturing and coal tar refining sectors of the OCPSF Category for possible effluent guidelines revision.

11.2 OCPSF Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the OCPSF Category including the screening-level review and category-specific review.

11.2.1 OCPSF Category 2005 Screening-Level Review

Table 11-4 presents the OCPSF Category and the vinyl chloride manufacturing sector TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*. The discharges for the OCPSF Category in Table 11-4 include loads from facilities in SIC codes EPA determined are potential new subcategories.

Table 11-4. OCPSF Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	Total TWPE
3	OCPSF	1,711,005	627,857	2,338,862
NA[c]	Vinyl Chlorine Sector[d]	15,083	2,796,270	2,811,353

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]The rankings presented in Tables 4-12, 4-13, and 4-14 represent the combined TWPE for the Vinyl Chloride and Chlor-Alkali sectors. The Vinyl Chloride sector was not ranked independently.
[d]The vinyl chloride sector of the OCPSF Category was reviewed for the 2005 screening-level review and includes facilities that manufacture ethylene dichloride, vinyl chloride monomer, and/or polyvinyl chloride and reported a primary SIC code associated with OCPSF (see Table 11-1). This sector includes some facilities that also perform chlor-alkali manufacturing operations. Note that EPA expanded the scope of the vinyl chloride manufacturing segment to include manufacture of chlorinated hydrocarbons for the 2006 review.

11.2.2 OCPSF Category 2005 Pollutants of Concern

Table 11-5 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. Discharges of hexachlorobenzene in PCS for 2002 accounted for 64 percent of the OCPSF Category 2002 PCS TWPE. Discharges of sodium nitrite and dioxin and dioxin-like compounds in TRI for 2002 accounted for 64 percent of the OCPSF Category 2002 TRI TWPE.

Table 11-5. 2005 Annual Review Results: OCPSF Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Hexachlorobenzene (HCB)	16	560	1,090,485	4	30	59,272
Dioxin and Dioxin-like Compounds	1	0.00025	178,624	9	0.022	152,200
Chlorine	60	171,029	87,082	25	58,937	30,009
Lead	40	29,313	65,661	Pollutants are not in the top five TRI 2002 reported pollutants.		
Nitrogen, Nitrite Total (as N)	4	115,292	43,042			
Sodium Nitrite	Pollutants are not in the top five PCS 2002 reported pollutants.			43	670,855	250,452
Dinitrotoluene				2	39,985	25,661
OCPSF Category Total	**239[c]**	**1,053,253,290**	**1,711,005**	**792[c]**	**54,528,174**	**627,857**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

11.3 Potential New Subcategories for the OCPSF Category

As part of the 2005 annual review, EPA reviewed industries with SIC codes not clearly subject to existing ELGs. EPA concluded the processes, operations, wastewaters, and pollutants of facilities in the SIC codes listed in Table 11-6 are similar to those of the OCPSF Category. Table 11-6 shows the combined TWPE from *TRIReleases2002_v2* and *PCSLoads2002_v2* for each SIC code that is a potential new subcategory. The discharges for the potential new subcategory SIC codes are a negligible percentage of the total 2002 TWPE for the OCPSF Category.

Table 11-6. Pollutant TWPE for Potential New Subcategories in OCPSF Category

SIC Code	SIC Description	Total 2002 TWPE	Percentage of Total OCPSF Category TWPE
2842	Specialty Cleaning, Polishing, and Sanitation Preparations	1,048	0.04
2844	Perfumes, Cosmetics, and Other Toilet Preparations	6,909	0.30
2891	Adhesives and Sealants	199	0.008
2899	Chemicals and Chemical Preparations, NEC	59,070	2.53
5169	Chemicals and Allied Products	587	0.03

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.
NEC – Not elsewhere classified.

11.4 OCPSF Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the OCPSF Category. EPA obtained additional data and identified:

- Pollutant loads reported under wrong parameter code;
- Errors in how PCS loads were estimated for two facilities;
- Changes in estimates of TWPE for dioxin for one facility; and
- Changes in estimates of TWPE for sodium nitrite.

11.4.1 OCPSF Category Facility Discharge Revisions

EPA received comments on the Preliminary 2006 Plan from the American Chemistry Council (ACC) stating that chlorine was measured upstream of the final outfall prior to commingling with other treated wastewater for two facilities, Equistar Chemicals LP in Channelview, TX and Solutia Inc./Equistar Chemicals LP in Alvin, TX (ACC, 2005). EPA set the discharges of chlorine from the Equistar Chemicals LP facility in Channelview, TX to zero in the revised 2002 PCS database, *PCSLoads2002_v4,* after verifying that chlorine was not measured at the final outfall. EPA was unable to verify the chlorine monitoring location for the Solutia Inc./Equistar Chemicals LP facility in Alvin, TX and therefore did not change the chlorine loads in *PCSLoads2002_v4*.

EPA also received comments on the Preliminary 2006 Plan from the ACC stating that one facility, Cytec Industries in Belmont, WV, reporting discharges of lead does not monitor lead and most likely misreported their manganese discharges using the parameter code for lead (ACC, 2005). EPA reviewed the permit limits for this facility to verify that it does not have monitoring requirements for lead and revised the reported discharge in *PCSLoads2002_v4* to represent pounds of manganese, not pounds of lead. The correction reduced the OCPSF Category's discharges of lead by 55,642 TWPE and increased the OCPSF Category's discharges of manganese by 1,750 TWPE.

EPA reviewed the discharges of chlorinated dibenzo(p) dioxin reported by one facility, Dover Chemical in Dover, OH, in the PCS 2002 database. For the Preliminary 2006 Plan, EPA used the TWF for the most toxic dioxin congener, 2,3,7,8-tetrachlorodibenzo(p)dioxin, to estimate the TWPE for Dover Chemical (U.S. EPA, 2005b). ACC submitted a comment to EPA stating that the parameter that Dover Chemical includes in its discharge monitoring reports (chlorinated dibenzo-p-dioxin effluent) represents the total mass for all 17 dioxin and dioxin-like congeners. Therefore, it is appropriate for EPA to apply the median TWF for the dioxin and dioxin-like congeners to estimate the TWPE for this discharge (ACC, 2005). In response to ACC's comment, EPA applied the median TWF for the 17 dioxin and furan congeners to recalculate the TWPE for Dover Chemical in the revised 2002 PCS database, *PCSLoads2002_v4*. As a result, the TWPE for Dover Chemical's dioxin discharge decreased from 178,624 TWPE to 2,690 TWPE.

EPA received comments from ACC about the hexachlorobenzene (HCB) discharges for Honeywell Nylon LLC in Hopewell, VA. ACC stated that the concentrations of HCB on the facility's 2002 discharge monitoring reports were also reported at the detection limit. This implies that the facility did not measure HCB at concentrations above the detection limit. According to EPA's methodology for calculating annual loads using PCS data (see Section 4.2.1.1), if HCB was not detected in any of facility's 2002 discharge monitoring reports, then the annual load for HCB should equal zero. In the revised PCS 2002 database, *PCSLoads2002_v4*, EPA set the facility loads for HCB to zero.

11.4.2 OCPSF Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF and POTW removal values used for sodium nitrite and dinitrotoluene, the POTW percent removal used for chlorine, and the TWF used for nitrite to better reflect the pollutant's properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373), and the POTW percent removal is now 90 percent (formerly 1.85 percent). The TWF that EAD applies for dinitrotoluene is now 0.043077 (formerly 0.64176) and the POTW percent removal is now 62.005 percent (formerly 47.12 percent). The POTW percent removal for chlorine is now 100 percent (formerly 1.87 percent). The TWF for nitrite is now 0.0032 (formerly 0.373). Table 11-7 presents the loads before and after corrections to the TWFs and POTW percent removals for the OCPSF Category.

Table 11-7. Impact of Changes to TWF and POTW Percent Removal for the OCPSF Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	43	250,452	292
TRI 2002	Dinitrotoluene	2	25,661	1,238
TRI 2002	Chlorine	25	30,009	28,999
PCS 2002	Nitrogen, Nitrite Total (as N)	4	43,042	369

Source: *TRIReleases2002_v2*; *TRIReleases2002_v4*; *PCSLoads2002_v2*; *PCSLoads2002_v2*.

11.4.3 OCPSF Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings based on methodology changes as described in Section 4.2 and changes made based on permit review. For the OCPSF Category, the most significant changes are also described in Sections 11.4.1 and 11.4.2. Table 11-8 shows the 2006 screening-level TWPE estimated for the OCPSF Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 11-8. OCPSF Category 2006 Screening-Level Review Results

Point Source Category	PCS 2002[a]	TRI 2002[b]	TRI 2003[b]
OCPSF Category[c]	397,951	349,429	1,021,401

Sources: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Values exclude TWPE from facilities included in the chlorinated hydrocarbon manufacturing segment, because EPA is investigating these facilities as part of the CCH rulemaking.

11.4.4 OCPSF Category 2006 Pollutants of Concern

Table 11-9 presents the pollutants of concern for the OCPSF Category based on the 2006 annual review.

HCB is a top pollutant in all three databases. Dioxin and dioxin-like compounds is a top pollutant in the TRI databases with an increase in discharges from 2002 to 2003. In addition, TWPE estimates for TRI-reported releases of PACs show a large increase from 2002 to 2003 (4,613 TWPE and 67,964 TWPE, respectively). EPA reviewed discharges from facilities reporting these three pollutants. Section 11.5 discusses EPA's review of facilities that discharge HCB, Section 11.6 discusses EPA's review of facilities that discharge dioxin and dioxin-like compounds, and Section 11.7 discusses EPA's review of facilities that discharge PACs.

Table 11-9. 2006 Annual Review: OCPSF Category Pollutants of Concern

SIC Code	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Hexachlorobenzene (HCB)	13	53	103,420	4	30	59,272	4	32	61,656
Chlorine	58	106,278	54,113	25	56,954	28,999	22	55,810	28,416
Fluoride	14	910,270	31,859	Pollutants are not in the top five TRI 2002 reported pollutants.			Pollutants are not in the top five TRI 2003 reported pollutants.		
Benzo(a)pyrene	16	288	28,990						
Copper	100	33,629	21,348						
Dioxin and Dioxin-like Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			8	0.019	115,132	6	0.440	703,572
Nitrate Compounds				131	44,533,702	33,252	Pollutants are not in the top five TRI 2003 reported pollutants.		
Hydroquinone				6	13,513	17,217			
PACs				Pollutants are not in the top five TRI 2002 reported pollutants.			10	675	67,964
PCBs							2	0.812	27,627
OCPSF Category Total	**232[c]**	**978,243,371**	**397,951**	**791[c]**	**53,973,135**	**349,429**	**762[c]**	**37,904,315**	**1,021,401**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

11.5 OCPSF Category HCB Discharges

EPA identified HCB as a pollutant of concern during the 2005 annual review. For the 2006 annual review, EPA reviewed HCB dischargers in TRI and PCS. The results of the 2006 annual review show that HCB continues to rank high in terms of TRI and PCS TWPE. The following subsections discuss EPA's review of OCPSF facilities that report HCB discharges to TRI and PCS.

11.5.1 OCPSF Category HCB Discharges in TRI

Table 11-10 shows the OCPSF facilities that reported discharges of HCB to wastewater to TRI for 2002 and 2003. One facility, DuPont Chambers Works in Deepwater, NJ, contributes 83 percent of the HCB TWPE for 2002 and 79 percent of the HCB TWPE for 2003. EPA is currently reviewing TRI-reported discharges of HCB from Du Pont Chambers Works to determine the basis of estimate. The Solutia Inc., Delaware River Plant in Bridgeport, NJ reported the second largest HCB discharge to TRI, contributing 16 percent of the total HCB TWPE for 2002 and 20 percent of the total HCB TWPE for 2003. EPA identified the Solutia Inc., Delaware River Plant, currently owned by Ferro Corporation, as a manufacturer of benzyl chloride (Olson, 2006). As a result, EPA plans to include this plant in its information collection under the CCH rulemaking effort (see Section 11.1.3) for the 2007 annual review. EPA plans to review discharges of several organic compounds, including HCB, during the rulemaking effort.

Table 11-10. OCPSF Facilities Reporting HCB Releases to TRI

Facility Name	Location	TRI 2002[a]		TRI 2003[a]	
		Pounds of HCB Released	HCB TWPE	Pounds of HCB Released	HCB TWPE
Du Pont Chambers Works	Deepwater, NJ	25.4	49,472	25.0	48,693
Solutia Inc., Delaware River Plant	Bridgeport, NJ	5.00	9,739	6.20	12,076
Sun Chemical Corp.	Cincinnati, OH	0.0157	30.6	0.440	856
Clariant LSM (Florida) Inc.	Gainesville, FL	0.0157	30.6	0.0157	30.6
OCPSF Category Total		**30.4**	**59,272**	**31.7**	**61,656**

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.

11.5.2 OCPSF Category HCB Discharges in PCS

Table 11-11 shows the OCPSF facilities for which PCS includes 2002 discharges of HCB. No one facility contributes more than 19 percent of the total HCB TWPE in the 2002 PCS database for the OCPSF Category. One facility, Du Pont Chamber Works, reports discharges of HCB to TRI but does not report discharges of HCB to PCS because the facility does not have a permit limit or monitoring requirements for HCB.

Table 11-11. OCPSF Facilities Reporting Discharges of HCB to PCS in 2002

NPDES ID	Facility Name	Facility Location	Average 2002 HCB Concentration (μg/L)	Pounds of HCB Discharged	HCB TWPE
WV0000868	Flexsys America LP	Nitro	2.5	10.0	19,537
SC0003557	Honeywell Nylon LLC/Columbia	Columbia	5.00[a]	8.28	16,127
SC0002798	Invista S.A.R.L./Spartanburg	Spartanburg	10.0	7.95	15,493
WV0002496	Ripplewood Phosphorus U.S. LLC	Gallipolis Ferry	4.13[a]	7.20	14,024
LA0038890	Nalco Company	Garyville	4.75[a]	6.48	12,621
WV0001112	Sunoco, Inc. (R & M)	Kenova	10.0	5.40	10,518
DE0020001	Metachem Products, LLC[b]	Delaware City	3.18	3.25	6,335
WV0001279	E I Dupont De Nemours & Co	Parkersburg	0.04	2.88	5,609
AL0002097	Honeywell International Inc	Fairfield	4.01[a]	0.500	982
WV0004588	Koppers Industries Inc	Follansbee	0.500	0.360	701
WV0004740	Crompton Corporation	Morgantown	0.550	0.360	701
WV0005169	Bayer Materialscience, LLC	New Martinsville	0.050	0.360	701
WV0022047	Crompton Corporation	Morgantown	0.550	0.0360	70.1
OCPSF Category Total				**53.1**	**103,420**

Source: *PCSLoads2002_v4*.
[a]Concentration was back-calculated using monthly mass and flow data.
[b]Facility is no longer active.

EPA reviewed monthly DMR data in the PCS 2002 database and on EPA's Envirofacts web page for the facilities listed in Table 11-11. Based on this review, EPA suspects that HCB loads in PCS may be calculated from concentrations that are based on nondetects. According to EPA Method 1625, the method detection limit for HCB is 10 ug/L. Concentrations for HCB range from 0.04 to 10 and are all less than or equal to the method detection limit. As part of the 2007 annual review, EPA will review discharges of HCB from the top four facilities to determine if the facilities measured HCB at concentrations above the detection limit.

11.6 OCPSF Category Dioxin and Dioxin-Like Compounds Discharges

EPA identified dioxin and dioxin-like compounds as a pollutant of concern during the 2005 annual review. For the 2006 annual review, EPA analyzed information about the single facility with "chlorinated dibenzo(p)dioxin effluent" data in PCS. EPA also reviewed information about facilities that reported discharges of dioxin and dioxin-like compounds to TRI to determine potential process sources and methods used to estimate reported discharges. The results of the 2006 annual review show that dioxin and dioxin-like compounds continue to rank high in terms of TRI TWPE. PCS dioxin TWPE, however, has decreased significantly from the 2005 annual review.

Table 11-12 shows the OCPSF facilities that reported discharges of dioxin and dioxin-like compounds to TRI in 2002 and 2003 and how the facilities estimated discharges of dioxin and dioxin-like compounds (based on contact with the facilities) (ERG, 2006). One facility, BP Solvay Polyethylene in Deer Park, TX contributes over 96 percent of the total dioxin and dioxin-like compound TRI 2003 TWPE for the OCSPF Category.

Dioxin discharges based on TCEQ sampling at three facilities contribute 99 percent of the dioxin and dioxin-like compounds TWPE for 2002. TCEQ conducted the sampling to support the total maximum daily load (TMDL) study for the Houston Ship Channel, which was placed on the Section 303(d) list after the Texas Department of Health issued a seafood consumption advisory for catfish and blue crabs in the upper portion of the Galveston Bay and Houston Ship Channel in September 1990. The purpose of the study is to develop a TMDL for dioxin in the Houston Ship Channel, including upper Galveston Bay, and to develop a plan for managing dioxin and dioxin-like compounds to correct existing water quality impairments and maintain good water quality. TCEQ analyzed effluent from the following facilities for dioxin and dioxin-like compounds: Albermarle, Atofina, Beechnut MUD, BP Solvay, Clean Harbors, Dow DP, DuPont, Equistar, Exxon, GB Biosciences, Newport MUD, OxyVinyls Battleground, OxyVinyls Deer Park, OxyVinyls La Porte, Rohm & Haas, Shell Chemical, Shell Refinery, Valero, Vopak, and several POTWs.

From 1999 to 2003 TCEQ conducted sampling at the facilities outfalls at Atofina, Shell, and BP Solvay and detected dioxin and dioxin-like compounds. The facilities use the dioxin congener concentrations measured by TCEQ to estimate the releases of dioxin and dioxin-like compounds that they report to TRI. Each facility updates its TRI releases each year by multiplying the same dioxin concentration by the facility's annual flow. Therefore, increases in TRI-reported releases of dioxin and dioxin-like compounds from year to year reflect increases in wastewater flow and not necessarily increases in dioxin discharges.

Table 11-12. OCPSF Facilities Reporting Dioxin Releases to TRI

Facility Name (Facility Location)	TRI 2002		TRI 2003		Basis of Estimate	Was Dioxin Detected?	Findings
	Pounds of Dioxin Discharged	Dioxin TWPE	Pounds of Dioxin Discharged	Dioxin TWPE			
Atofina Petrochemicals Inc. (La Porte, TX)	0.00310	57,489	0.00000992	799	TCEQ sampling episode in 1999	TCEQ detected 1,2,3,4,6,7,8 -HpCDD, OCDD, and OCDF (TCEQ, 2003)	TCEQ sampling at the final outfall for the facility's NPDES permit and provided one concentration that represented a mixture of dioxin congeners. Facility multiplies this concentration by the total wastewater flow for the outfall. Facility continues to use the TCEQ dioxin number every year for their TRI reports.
BP Solvay Polyethylene N.A. (Deer Park, TX)	NR	NR	0.436	678,344	TCEQ sampling episode in 2002	TCEQ detected 1,2,3,4,6,7,8 -HpCDD, OCDD, and 1,2,3,4,7,8-HxCDF (TCEQ, 2003)	TCEQ sampling at the final outfall for the facility's NPDES permit and provided one concentration that represented a mixture of dioxin congeners. Facility multiplies this concentration by the total wastewater flow for the outfall. Facility continues to use the TCEQ dioxin number every year for their TRI reports.
Celanese Acetate Celco Plant (Narrows, VA)	0.0000300	941	NR	NR	Worst-case scenario engineering estimate	No	Facility uses dissolving-grade wood pulp as a raw material. Celanese had reviewed a study that looked at the dioxin content of wood pulp and its potential to end up in stormwater. Wastewater monitoring data for Celanese's Form 2C application shows all nondetects for dioxin. Celanese stopped reporting water releases of dioxin to TRI in 2004.
Cytec Industries Inc. (Wallingford, CT)	0.000198	13,460	0.0000882	5,982	Engineering estimate	Not monitored	Dioxin water release was based on an engineering estimate for the operation of an incinerator that was used to dry out biosolids. This incinerator is no longer in operation and site did not report dioxin to TRI for 2005.

Table 11-12 (Continued)

Facility Name (Facility Location)	TRI 2002		TRI 2003		Basis of Estimate	Was Dioxin Detected?	Findings
	Pounds of Dioxin Discharged	Dioxin TWPE	Pounds of Dioxin Discharged	Dioxin TWPE			
Dow Chemical Co. Midland Ops. (Midland, MI)	0.00948	25,502	NR	NR	Routine monitoring conducted by facility	Yes - Reported all congeners except 1,2,3,6,7,8-HxCDF, and 1,2,3,6,7,8-HxCDD to TRI for 2002/2003.	Dioxin sources include historical process and waste management units no longer in operation at the site. A very small amount may also come from an on-site incinerator. The TRI dioxin water release is a TM 17 value that sums the average congener concentrations from samples collected throughout the year. Dow uses EPA Method 1613B to analyze for dioxin and sets all concentrations that are below the detection limit to zero.
Du Pont Chambers Works (Deepwater, NJ)	0.00231	334	0.000287	0.580	Engineering estimate	Not monitored	A contaminated ferric chloride additive used for solids settling in the wastewater treatment plant was the dioxin source. Du Pont used information from the vendor on the dioxin composition of the contaminated ferric chloride to estimate their TRI releases. The site has since stopped using ferric chloride for settling. The dioxin release included in the TRI 2004 database will be zero.
Lyondell Chemical Co. (Westlake, LA)	0.00250	219	NR	NR	Routine monitoring conducted by facility	Yes – Did not report a distribution to TRI for 2002.	A small amount of dioxin is produced by an on-site hazardous waste incinerator scrubber. The bulk of the dioxin enters the plant with the source water from the Sabine River. The site monitors the intake and final effluent for dioxin, then calculates a balance to report what is discharged. The balance is reported to TRI.
Sasol N.A. Inc. (Baltimore, MD)	0.0000372	3.26	NR	NR	Routine monitoring conducted by facility	Yes – Reported 1,2,3,4,6,7,8-HpCDD and OCDD to TRI for 2002.	Facility formerly operated a chlorination process that generated dioxin. They began sampling process wastewater and final effluent in 2001 and detected trace amounts of OCDD. The dioxin release reported to TRI was based on this single detected congener (concentration was just above the detection limit). The site stopped monitoring for dioxin in 2003 when the chlorination process was shut down. They no longer report dioxin water releases to TRI.
Sasol N.A. Inc. Lake Charles Chemical Complex (Westlake, LA)	0.000882	17,183	0.000882	4,479	Sampling results from studies conducted over the years	Yes - Reported 17 congeners to TRI for 2002/2003.	Facility receives wastewater from the Georgia Gulf Lake Charles VCM plant. The VCM process wastewater is the source of dioxin.

Table 11-12 (Continued)

Facility Name (Facility Location)	TRI 2002		TRI 2003		Basis of Estimate	Was Dioxin Detected?	Findings
	Pounds of Dioxin Discharged	Dioxin TWPE	Pounds of Dioxin Discharged	Dioxin TWPE			
Shell Chemical Co. Deer Park (Deer Park, TX)	NR	NR	0.00216	13,967	TCEQ sampling episode in 2003	TCEQ detected 10 dioxin congeners (TCEQ, 2003)	TCEQ sampling at the outfall for the facility's chemical plant and provided dioxin congener concentration data for 17 dioxin congeners. Facility multiplies this concentration by the total wastewater flow for the outfall. Facility continues to use the TCEQ dioxin number every year for their TRI reports. Facility treats wastewater for an OxyVinyls EDC/VCM plant, which is a large source of dioxins in their wastewater. Facility has also identified other process sources that are small contributors of dioxin.
OCPSF Category Total	**0.0185**	**115,132**	**0.440**	**703,572**			

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*; *Telephone conversations with various OCPSF facility representatives and Meghan Kandle of Eastern Research Group, Inc.* (ERG, 2006).
NR – Not reported.
TCEQ – Texas Commission on Environmental Quality.
TM-17 – Total mass of 17 dioxin and dioxin-like congeners.
EDC – Ethylene dichloride.
VCM – Vinyl chlorine monomer.

Based on the information in Table 11-12, EPA identified the following sources of dioxin in OCPSF wastewater:

- **Historical Processes** - Three facilities, Cytec Industries, Dow Chemical, and Sasol Baltimore, MD, reported dioxin to TRI based on processes that are no longer in operation. Dow and Sasol did not report discharges of dioxin and dioxin-like compounds to TRI for 2003.

- **Raw Materials** - Two facilities, DuPont Chambers Works and Celanese Acetate, estimated discharges of dioxin and dioxin-like compounds based on contamination of raw materials. Celanese's estimate was based on theoretical contamination of wood pulp and DuPont's estimate was based on actual contamination of ferric chloride. Celanese stopped reporting discharges of dioxin and dioxin-like compounds to TRI in 2003, and DuPont stopped reporting dioxin and dioxin-like compounds to TRI in 2004 (U.S. EPA, 2006).

- **Vinyl Chloride Wastewater** - Two facilities, Sasol Lake Charles, LA and Shell Deer Park, TX, treat wastewater from nearby vinyl chloride monomer plants, which are the major source of the dioxin and dioxin-like compounds that the facility reports to TRI. As discussed in Section 11.1.3, EPA is reviewing production of vinyl chloride monomer as part of the CCH rulemaking effort.

- **Wet Air Pollution Controls** - One facility, Lyondell, stated that an on-site incinerator is the source of dioxin and dioxin-like compounds that was reported to TRI for 2002. The facility stated that the amount of dioxin and dioxin-like compounds discharged by the incinerator scrubber is small (only 219 TWPE in Table 11-12). Lyondell did not report discharges of dioxin and dioxin-like compounds to TRI for 2003 or 2004 (U.S. EPA, 2006).

- **No Process Source Identified** - Facility contacts at Atofina and BP Solvay could not identify a potential process source for the dioxin and dioxin-like compounds that TCEQ detected at their outfalls.

11.7 OCPSF Category PACs Discharges

EPA did not identify PACs as a pollutant of concern during the 2005 annual review. The results of the 2006 annual review show a large increase in TRI TWPE associated with PACs from 2002 to 2003. In addition, benzo(a)pyrene is a top pollutant in terms of PCS TWPE for the 2006 review. The following subsections discuss EPA's review of OCPSF facilities that report PACs discharges to TRI and PCS.

11.7.1 OCPSF Facilities Reporting PACs to TRI

Table 11-13 lists the OCPSF facilities that reported discharges of PACs to TRI for 2002 and 2003. One facility, DSM Chemicals in Augusta, GA, contributed more than 90 percent of the PACs TWPE for 2003, but did not report PACs discharges for 2002. EPA contacted DSM Chemicals to discuss the basis of estimate for the 2003 TRI-reported PACs discharges (Connell, 2006). DSM confirmed that the TRI-reported discharge is based on measured concentrations of three PACs congeners: benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno-1,2,3-c-pyrene. The facility samples for PACs and other priority pollutants once per year. Prior to 2003, the sampling did not include data on PACs concentrations. DSM suspects that the Number 2 fuel oil used at the site is the source of PACs in their wastewater.

In 2004, EPA reviewed the coal tar refining sector of the OCPSF Category based on discharges of PACs reported to TRI for 2000. EPA identified three U.S. coal tar refining companies (10 facilities) operating in 2000: Honeywell International, Inc., Koppers Industries, Inc., and Reilly Industries, Inc. Seven of these facilities continue to report discharges of PACs to TRI and are listed in Table 11-13. Since 2000, Honeywell, Inc. closed all three of its coal tar refining operations, and Reilly Tar & Chemical Company closed its Cleveland, OH facility. As of 2004, six facilities owned by two companies continued to refine coal tar in the United States. EPA's review of the coal tar industry concluded that the industry was declining, and that the PACs discharges were at concentrations near or at treatable levels. As a result, EPA determined that, based on the information available in 2004, it was not appropriate to select coal tar refining sector of the OCPSF Category for possible effluent guidelines revision.

In addition to coal tar refiners, Table 11-13 lists four facilities that reported releases of PACs to TRI for 2002 or 2003:

- DSM Chemicals in Augusta, GA produces caprolactam – a raw material for the production of nylon-6, cyclohexanone, ammonium sulphate for fertilizer use, and polyester resins for the powder coating industry (DSM, 2006);

- DuPont Chambers Works produces fluorochemicals, elastomers, and hytrel polyester elastomer (U.S. EPA, 2004);

- Neutrogena in Los Angeles, CA packages toiletries and soaps (Food & Drug Packaging, 2004); and

- Sasol NA in Baltimore, MD produces commodity and specialty chemicals for soaps, detergents and personal care products (Sasol, 2006).

Table 11-13. OCPSF Facilities Reporting PACs Releases to TRI

Facility Name	Facility Location	TRI 2002			TRI 2003		
		PAC Discharge before POTW Removal	Total PAC Pounds Released[a]	PAC TWPE	PAC Discharge before POTW Removal	Total PAC Pounds Released[a]	PAC TWPE
DSM Chemicals North America Inc.	Augusta, GA	NA	NA	NA	611	611	61,503
Du Pont Chambers Works	Deepwater, NJ	15.0	15.0	1,510	32.0	32.0	3,221
Honeywell International, Inc.[b]	*Birmingham, AL*	*6.00*	*6.00*	*604*	*6.00*	*6.00*	*604*
Honeywell International, Inc.[b]	*Ironton, OH*	*7.00*	*7.00*	*705*	NA	NA	NA
Koppers Inc.[b]	Cicero, IL	0.570	0.0420	4.22	0.600	0.0442	4.45
Koppers Industries, Inc. Follansbee Tar Plant[b]	Follansbee, WV	4.00	4.00	403	4.00	4.00	403
Koppers Industries, Inc. Woodward Tar Plant[b]	Dolomite, AL	12.6	12.6	1,268	20.0	20.0	2,013
Neutrogena Corp.	Los Angeles, CA	0.130	0.00957	0.963	0.0100	0.000736	0.0741
Reilly Industries, Inc.[b]	Granite City, IL	16.0	1.18	119	20.0	1.47	148
Reilly Industries, Inc.[b]	Lone Star, TX	NA	NA	NA	5.00	0.368	37.0
Sasol N.A., Inc.	Baltimore, MD	NA	NA	NA	0.300	0.300	30.2
Total		**61.3**	**45.8**	**4,613**	**699**	**675**	**67,964**

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
Italics denote facilities no longer in operation.
[a]Discharges include transfers to POTWs and account for POTW removals.
[b]Facility is a coal tar refiner and was included in EPA's detailed study of the OCPSF Category for the 2004 Plan.
NA – Not applicable. Facility did not report PACs releases for reporting year.

11.7.2 OCPSF Facilities Reporting Benzo(a)pyrene Discharges to PCS

Table 11-14 lists the OCPSF facilities that report discharges of benzo(a)pyrene to PCS for 2002. As shown in Table 11-14, three facilities contribute 74 percent of the total benzo(a)pyrene TWPE for the OCPSF Category. EPA contacted GE Silicones and Bayer Cropscience to confirm the benzo(a)pyrene discharges in PCS (Heintzman, 2006; Smith, 2006). Both facilities stated that benzo(a)pyrene has never been measured at concentrations above its detection limit. According to Bayer Cropscience, the facility's permit writer directs the facility to report nondetects at their detection limit concentration and use the detection limit and wastewater flow to report the mass discharge on its Discharge Monitoring Report (DMR). GE Silicones contacts stated that they report benzo(a)pyrene as a nondetect on their DMR. However, the state of West Virginia does not include the less than (<) sign to label the concentration as a detection limit when it uploads the DMR data into PCS. As shown in Table 11-14, 10 of the 18 facilities for which PCS has discharge data for benzo(a)pyrene are located in West Virginia. Therefore, EPA suspects that some of the benzo(a)pyrene loads in PCS may be calculated using detection limit concentrations and not represent actual discharges of benzo(a)pyrene.

Table 11-14. OCPSF Facilities for which PCS includes Benzo(a)pyrene 2002 Discharge Data

Facility Name	Facility Location	Pounds Discharged	TWPE	% of Total TWPE
GE Silicones LLC	Friendly, WV	82.5	8,304	28.6%
Celanese Acetate LLC/Celriver	Rock Hill, SC	67.1	6,751	23.3%
Bayer Cropscience Institute	Institute, WV	64.8	6,523	22.5%
Invista S.A.R.L./Spartanburg	Spartanburg, SC	21.2	2,135	7.4%
E I Dupont De Nemours & Co	Parkersburg, WV	11.0	1,105	3.8%
Flexsys America LP	Nitro, WV	10.0	1,010	3.5%
Honeywell Nylon LLC/Columbia	Columbia, SC	8.28	833	2.9%
Ripplewood Phosphorus U.S. LLC	Gallipolis Ferry, WV	7.20	725	2.5%
Nalco Company	Garyville, LA	6.48	652	2.2%
Sunoco, Inc. (R & M)	Kenova, WV	3.60	362	1.2%
Bayer Materialscience, LLC	New Martinsville, WV	3.60	362	1.2%
Koppers Industries, Inc.	Follansbee, WV	1.05	106	0.4%
Honeywell International, Inc.	Fairfield, AL	0.504	50.7	0.2%
Crompton Corporation	Morgantown, WV	0.360	36.2	0.1%
US Filter Operating Services	Clinton, IA	0.300	30.2	0.1%
Crompton Corporation	Morgantown, WV	0.0360	3.62	0.01%
Total			**28,990**	

Source: *PCSLoads2002_v4*.

11.8 OCPSF Water Conservation through Mass-Based Permit Limits

EPA's evaluation of options for promoting water conservation through mass-based limits is discussed in a memorandum entitled, Options for Promoting Water Conservation Through the use of Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) Mass-based Limits, dated November 2006 (Johnston, 2006).

11.9 OCPSF Category Conclusions

- The OCPSF Category was selected for detailed review because of high TWPE in the 2005 and 2006 annual reviews.

- Dioxin and dioxin-like compounds is the highest ranking pollutant in terms of TWPE in the TRI 2002 and 2003 databases. EPA contacted the facilities that reported discharges of dioxin and dioxin-like compounds to TRI in either 2002 or 2003 to determine the basis of estimate for the dioxin and dioxin-like compounds release. EPA concludes the following based on its conversations with the facilities:

  — Currently, no OCPSF facility that reported dioxin and dioxin-like compounds suspects a manufacturing process as the major source of dioxin and dioxin-like compounds.

  — Facilities that did identify a process source of dioxin and dioxin-like compounds have stopped operating the dioxin-generating process.

  — Four out of 10 facilities that report dioxin and dioxin-like compounds to TRI in either 2002 or 2003 stated that they did not report a dioxin and dioxin-like compounds release to TRI for subsequent reporting years. Three of these facilities stopped reporting because the facilities stopped using the operation or material that was the suspected source of dioxin and dioxin-like compounds. One facility stopped reporting dioxin and dioxin-like compounds because the estimate was based on theoretical contamination from a raw material and the facility has never detected dioxin in its wastewater.

  — Three facilities that report dioxin and dioxin-like compounds discharge wastewater to the Houston Ship Channel. TCEQ conducted sampling at these facilities' outfalls and detected dioxin. The facilities use the dioxin and dioxin-like compounds concentration measured by TCEQ to estimate the dioxin and dioxin-like compounds releases they report to TRI. Each facility updates its TRI releases each year by multiplying the same dioxin and dioxin-like compounds concentration by the facility's annual flow. Therefore, increases in estimated dioxin and dioxin-like compounds releases from year to year reflect increases in wastewater flow and not necessarily increases in dioxin and dioxin-like compounds discharges. TCEQ is developing a dioxin TMDL to address these discharges.

- HCB and PACs also rank high in terms of TRI TWPE for the OCSPF Category. The majority of the TRI TWPE for each pollutant is from one facility. EPA has contacted these two facilities to determine the basis of estimate for the TRI-reported discharges. Future OCPSF category review by EPA could focus on:

  — Verification of HCB releases reported to TRI including method of estimation, effluent concentrations, and review of process sources; and

  — Further review of non-coal-tar-refining facilities reporting discharges of PACs to TRI including the basis of estimate for the PACs release and review of process sources.

- HCB was a top pollutant in *PCSLoads2002_v2* for the OCPSF Category for the 2005 annual review. Discharges of HCB decreased from 1,090,000 TWPE to 103,420 TWPE during the 2006 annual review based on comments from ACC. ACC commented that the loads for the top HCB discharger were calculated using the HCB detection limit and the facility's wastewater flow, and that the facility never detected HCB in its wastewater. EPA's review of the remaining HCB dischargers indicates that additional HCB loads may be based on concentrations that were reported at the HCB detection limit. Future review could focus on verifying HCB discharges in PCS.

- Benzo(a)pyrene is a top pollutant in *PCSLoads2002_v4* for the OCPSF Category. Three facilities contribute 74 percent of the total TWPE. Based on facility contacts, EPA suspects that some of the benzo(a)pyrene discharges in PCS may be based on detection limit concentrations and do not represent actual discharges of benzo(a)pyrene. Future review could focus on verifying benzo(a)pyrene discharges in PCS and further evaluating facilities reporting discharges to PCS including information on effluent concentrations, manufacturing processes, and potential process sources.

11.10 OCPSF Category References

ACC. 2005. Comment submitted by Bob Elam, Director, Environment, American Chemistry Council (ACC). "Re: EPA Docket ID Numbers OW-2004-0032 and OW-2002-0020: Notice of Preliminary 2006 Effluent Guidelines Program Plan; Request for Comments." (November 28). EPA-HQ-OW-2004-0032-1068.

Connell, Beth. 2006. Telephone conversation with Beth Connell of DSM Chemicals, Augusta, GA, and Meghan Kandle of Eastern Research Group, Inc. "PACs Discharges reported to TRI for 2003." (August 4). DCN 03704.

DSM. 2006. DSM in the United States. Available online at http://www.dsm.com/en_US/html/about/location_finder.htm. Date accessed: June 21. DCN 03708.

ERG. 2006. Eastern Research Group, Inc. Telephone conversations with various OCPSF facility representatives and Meghan Kandle of Eastern Research Group, Inc. "Basis of Estimation for Dioxin Releases Reported to TRI." DCN 03706.

Food and Drug Packaging. 2004. "Top 25 Personal Care Packagers." *Food and Drug Packaging*. (July). DCN 03709.

Heintzman, Dennis. 2006. Telephone conversation with Dennis Heintzman of GE Silicones, Friendly, WV, and Meghan Kandle of Eastern Research Group, Inc. "Benzo(a)pyrene Discharges in PCS for 2002." (August 3). DCN 03705.

Johnston, Carey. 2006. U.S. EPA. Memorandum to Public Record for the Effluent Guidelines Program Plan 2005/2006. "Options for Promoting Water Conservation Through the use of Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) Mass-based Limits." (November). DCN 03702.

Olson, Alan. 2006. Telephone conversation with Alan Olson of Ferro Corporation, Bridgeport, NJ, and Dan-Tam Nguyen of Eastern Research Group, Inc. "Information Collection Effort to Finalize Mailing List for CCH Questionnaire." (July 12). DCN 03707.

Sasol. 2006. Sasol North Americal, Inc. – Baltimore, MD. Available online at http://www.sasolbaltimore.com. Date accessed: June 21. DCN 03710.

Smith, Gordon. 2006. Telephone conversation with Gordon Smith of Bayer Cropscience, Institute, WV, and Meghan Kandle of Eastern Research Group, Inc. "Benzo(a)pyrene Discharges in PCS for 2002." (August 3). DCN 03703.

TCEQ. 2003. Texas Commission on Environmental Quality. Total Maximum Daily Load Program. *Total Maximum Daily Loads for Dioxins in the Houston Ship Channel. Final Report*. (October). DCN 03712.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Dischargers*. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

U.S. EPA. 2005c. *Product and Product Group Discharges Subject to Effluent Limitations and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category - 40 CFR 414*. Washington, DC. (April). DCN 03711.

12.0 ORE MINING AND DRESSING (40 CFR PART 440)

EPA selected the Ore Mining and Dressing (Ore Mining) Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review, particularly discharges reported to PCS in 2002 (U.S. EPA, 2005b) (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous review of this industry (U.S. EPA, 2004). This section summarizes the 2005 annual review and also describes the results of EPA's 2006 annual review of the discharges associated with the Ore Mining Category. EPA's 2006 annual review builds on the 2005 annual review.

12.1 Ore Mining Category Background

This subsection provides background on the Ore Mining Category including a brief profile of the ore mining industry and background on 40 CFR Part 440.

12.1.1 Ore Mining Industry Profile

The ore mining and dressing industry includes facilities that mine, mill, or prepare 23 separate metal ores (U.S. EPA, 2005b). This industry is divided into nine SIC codes, as shown in Table 12-1. The following SIC codes are not required to report discharges to TRI:

- 1011: Iron Ores;
- 1081: Metal Mining Services; and
- 1094: Uranium-Radium-Vanadium Ores.

Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census data by equivalent SIC code. The facilities in SIC code 1081 subject to the Ore Mining ELGS do not translate directly to a NAICS code, and EPA could not determine the number of facilities in the 2002 U.S. Economic Census for SIC code 1081.

Of the almost 400 ore mines in the 2002 U.S. Economic Census, only 81 (20 percent) reported to TRI in 2002, because facilities in SIC codes 1011, 1081, and 1094 are not required to report discharges to TRI. Of the 35 ore mines reporting wastewater discharges in TRI, most facilities are direct dischargers. Table 12-2 presents the types of discharges reported by facilities in the 2002 TRI database.

12.1.2 40 CFR Part 440

EPA first promulgated ELGs for the Ore Mining Category (40 CFR Part 440) on December 3, 1982 (47 FR 54609). This category consists of 12 subcategories, as shown in Table 12-3 with the related SIC codes and descriptions of the subcategories' applicability (U.S. EPA, 1982; U.S. EPA, 1988). BAT limitations are set equal to BPT levels for priority pollutants for this category. The priority pollutants arsenic, cadmium, copper, lead, mercury, nickel, and zinc, are regulated in at least one subcategory (U.S. EPA, 2005b). None of the subcategories include PSES or PSNS limitations.

Table 12-1. Number of Facilities in Ore Mining SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS	2002 TRI	2003 TRI
1011: Iron Ores	24	6	NR[a]	NR[a]
1021: Copper Ores	33	15	17	20
1031: Lead and Zinc Ores	22	27	13	12
1041: Gold Ores	180	28	34	32
1044: Silver Ores	11	5	3	3
1061: Ferroalloy Ores, Except Vanadium	72	6	7	7
1081: Metal Mining Services	NA[b]	0	NR[a]	NR[a]
1094: Uranium-Radium-Vanadium Ores	17	17	NR[a]	NR[a]
1099: Miscellaneous Metal Ores, NEC	39	6	6	7
Total	**>398**	**110**	**80**	**81**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2; TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Facilities in this SIC code are not required to report to TRI.
[b]Poor bridging between NAICS and SIC codes. Number of facilities could not be determined.
NR – Not reported.
NA – Not applicable.
NEC – Not elsewhere classified.

Table 12-2. Ore Mining Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
1011: Iron Ores	NR[a]	NR[a]	NR[a]	NR[a]
1021: Copper Ores	6	0	0	12
1031: Lead and Zinc Ores	10	0	0	2
1041: Gold Ores	8	4	0	22
1044: Silver Ores	1	0	0	2
1061: Ferroalloy Ores, Except Vanadium	3	0	0	4
1081: Metal Mining Services	NR[a]	NR[a]	NR[a]	NR[a]
1094: Uranium-Radium-Vanadium Ores	NR[a]	NR[a]	NR[a]	NR[a]
1099: Miscellaneous Metal Ores, NEC	3	0	0	4

Source: *TRIReleases2002_v4.*
[a]Facilities in this SIC code are not required to report to TRI.
NR – Not reported.
NEC – Not elsewhere classified.

Table 12-3. Ore Mining Category Subcategory Applicability

Sub-part	Subcategory Title	Related SIC Code(s)	Subcategory Applicability
A	Iron Ore	1011: Iron Ores	Iron Ore Mines and Mills using Physical or Chemical Separation or Magnetic & Physical Separation in the Mesabi Range
B	Aluminum Ore	1099: Miscellaneous Metal Ores, NEC	Bauxite Mines Producing Aluminum Ore
C	Uranium, Radium, & Vanadium Ores	1094: Uranium-Radium-Vanadium Ores	Open-Pit or Underground Mines and Mills using Acid Leach, Alkaline Leach, or Combined Acid & Alkaline Leach to Produce Uranium, Radium, & By-product Vanadium
D	Mercury Ore	1099: Miscellaneous Metal Ores, NEC	Open-Pit or Underground Mercury Ore Mines and Mills using Gravity Separation or Froth-Flotation
E	Titanium Ores	1099: Miscellaneous Metal Ores, NEC	Titanium Ore Mines from Lode Deposits and Mills using Electrostatic, Magnetic & Physical Separation, or Flotation; Dredge Mines and Mills for Placer Deposits of Rutile, Ilmenite, Leucoxene, Monazite, Zircon, and Other Heavy Metals
F	Tungsten Ore	1061: Ferroalloy Ores, Except Vanadium	Tungsten Mines and Mills using Gravity Separation or Froth-Flotation
G	Nickel Ore	1061: Ferroalloy Ores, Except Vanadium	Nickel Ore Mines and Mills
H	Vanadium Ore (Mined Alone, not as By-product)	1094: Uranium-Radium-Vanadium Ores	Vanadium Ore Mines and Mills
I	Antimony Ore	1099: Miscellaneous Metal Ores, NEC	Antimony Ore Mines and Mills
J	Copper, Lead, Zinc, Gold, Silver, & Molybdenum Ores	1021: Copper Ores 1031: Lead and Zinc Ores 1041: Gold Ores 1044: Silver Ores 1061: Ferroalloy Ores, Except Vanadium	Copper, Lead, Zinc, Gold, Silver, & Molybdenum Ore Open-Pit or Underground Mines, except for Placer Deposits, and Mills using Froth-Flotation and/or Other Separation Techniques; Mines and Mills using Dump, Heap, In-Situ Leach, or Vat-Leach to Extract Copper from Ores or Ore Waste Materials; Gold or Silver Mills using Cyanidation; Except for Mines and Mills from the Quartz Hill Molybdenum Project in the Tongass National Forest, Alaska
K	Platinum Ore	1099: Miscellaneous Metal Ores, NEC	Platinum Ore Mines and Mills
M	Gold Placer Mine	1041: Gold Ores	Placer Deposit Gold Ore Mines, Dredges, & Mills using Gravity Separation

Source: *Development Document for Effluent Limitations Guidelines and Standards for the Ore Mining and Dressing Point Source Category* (U.S. EPA, 1982); *Development Document for Effluent Limitations Guidelines and Standards for the Ore Mining and Dressing Point Source Category Gold Placer Mine Subcategory* (U.S. EPA, 1988).
NEC - Not elsewhere classified.

12.2 Ore Mining Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Ore Mining Category including the screening-level review and category-specific review.

12.2.1 Ore Mining 2005 Screening-Level Review

Table 12-4 presents the Ore Mining Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 12-4. Ore Mining Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
7	Ore Mining	406,548	66,544	473,093

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

12.2.2 Ore Mining Category 2005 Pollutants of Concern

Table 12-5 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. The top five pollutants account for approximately 90 percent of the 2002 TRI and PCS combined TWPE.

12.3 Potential New Subcategories for the Ore Mining Category

EPA did not identify any potential new subcategories for the Ore Mining Category.

12.4 Ore Mining Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Ore Mining Category. EPA obtained additional data and identified facilities classified in the wrong category.

Table 12-5. 2005 Annual Review: Ore Mining Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Molybdenum	4	770,329	155,174	Pollutants are not in the top five TRI 2002 reported pollutants.		
Cyanide	9	109,018	121,764			
Cadmium and Cadmium Compounds	29	2,360	54,556	10	1,046	24,181
Lead and Lead Compounds	32	10,406	23,309	24	5,672	12,705
Arsenic and Arsenic Compounds	13	3,143	12,701	8	2,562	10,352
Vanadium and Vanadium Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			2	147,060	5,147
Silver and Silver Compounds				1	250	4,118
Ore Mining Category Total	**73[c]**	**625,769,753**	**406,548**	**34[c]**	**541,214**	**66,544**

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

12.4.1 Ore Mining Category Facility Classification Revisions

As part of the 2006 annual review, EPA reviewed permits for facilities in the SIC codes corresponding to the Nonferrous Metals Manufacturing Category. This review is discussed in Section 10.4.2. EPA determined that discharges from two facilities it had classified as nonferrous metals manufacturers, ALCOA Bauxite and Kennecott Utah, were subject to the Ore Mining ELGS. ALCOA Bauxite's discharges result from the reclaimed mine drainage and maintenance of the closed ALCOA and Reynolds Metals Bauxite Residue Disposal Areas. The facility's discharges are regulated by 40 CFR Part 440 (ADEQ, 2005a; ADEQ, 2005b). Kennecott Utah's discharges are from an integrated copper mine, smelter, and refiner. The majority of the facility's discharges are from outfalls regulated by 40 CFR Part 440 (UDEQ, Unknown). EPA changed the category classifications of these facilities in the revised databases, *TRIReleases2002_v4* and *PCSLoads2002_v4*, as described in Section 4.5 of this document.

12.4.2 Ore Mining Category 2006 Screening-Level Review

The results of the 2006 screening-level review are the TRI and PCS rankings after the revisions described in Section 4.2 of this document. This accounts for methodology changes described in Section 4.2 and changes made based on permit review. For the Ore Mining Category, the most significant changes are also described in Section 12.4.1. Table 12-6 shows the 2006 screening-level TWPE estimated for the Ore Mining Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 12-6. Ore Mining Category 2006 Screening-Level Review Results

Point Source Category	PCS 2002 TWPE[a]	TRI 2002 TWPE[b]	TRI 2003 TWPE[b]
Ore Mining	410,266	70,214	77,649

Sources: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

12.4.3 Ore Mining Category 2006 Pollutants of Concern

Table 12-7 presents the pollutants of concern for the Ore Mining Category identified in the 2006 annual review. Molybdenum and cyanide discharges from PCS are responsible for approximately 68 percent of the category's TWPE in *PCSLoads2002_v4*. One facility, North Shore Mining, Silver Bay, MN, is responsible for approximately 93 percent of the molybdenum TWPE in *PCSLoads2002_v4*. North Shore Mining reports discharges as SIC code 1011: Iron Ores. Another facility, Zortman Mining Inc., Zortman, MT, is responsible for approximately 98 percent of the cyanide TWPE in *PCSLoads2002_v4*. Zortman Mining Inc. reports discharges as SIC code 1041: Gold Ores.

12.5 Ore Mining Category Stormwater Multi-Sector General Permits (MSGP)

EPA received comments from previous effluent guidelines program plans stating that discharges from facilities in this category may not be adequately quantified in the PCS and TRI databases and that these discharges can cause significant water quality impacts (Johnson, 2003). In particular, EPA is evaluating the impact of discharges from waste rock and overburden piles, which are not now regulated by effluent guidelines, and whether these discharges are adequately controlled by the Storm Water Multi-Sector General Permits (MSGP).[13] See 65 FR 64746 (Oct. 30, 2000 and 70 FR 72116, December 1, 2005).

The MSGP includes very general benchmark values for sampling and general requirements to develop a stormwater pollution prevention plan, but does not establish numeric limits or stormwater containment/treatment requirements. The MSGP establishes benchmark monitoring for pollutants including TSS, pH, hardness, arsenic, beryllium, cadmium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, zinc, and uranium.[14] The data from this sampling are now available due to the 2000 MSGP requirements.

[13]Mine sites not regulated by the MSGP include: (1) sites with their stormwater discharges regulated by an individual permit; and (2) sites without any discharge of stormwater. A facility has the option of obtaining an individual permit for stormwater discharges instead of requesting coverage under the MSGP; however, in practice this is seldom done. The current MSGP expires this year; however EPA intends to reissue it. Almost all mine sites discharge stormwater (e.g., stormwater discharges from haul roads, process areas, equipment storage areas, mine waste rock).
[14]Table G-4 of the MSGP lists what wastewaters from mining activities are covered by Part 440 and what wastewaters are to be covered by the industrial MSGP. In response to litigation from the National Mining Association, EPA revised its interpretation of applicability for wastewaters from hard rock mining operations. Under the revised interpretation, runoff from waste rock and overburden piles is not subject to effluent guidelines unless it naturally drains (or is intentionally diverted) to a point source and combines with "mine drainage" that is otherwise subject to the effluent guidelines (65 FR 64774, October 30, 2000).

Table 12-7. 2006 Annual Review: Ore Mining Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Molybdenum	4	770,329	155,174	Pollutants are not in the top five TRI 2002 reported pollutants.			Pollutants are not in the top five TRI 2003 reported pollutants.		
Cyanide	7	109,018	121,764						
Cadmium and Cadmium Compounds	26	2,360	54,556	10	848	19,603	9	642	14,878
Lead and Lead Compounds	30	10,406	23,309	25	5,526	12,378	23	5,153	11,542
Arsenic and Arsenic Compounds	11	3,143	12,701	9	3,312	13,383	8	5,882	23,770
Silver and Silver Compounds	Pollutants are not in the top five PCS 2002 reported pollutants.			2	500	8,235	2	500	8,235
Vanadium and Vanadium Compounds				3	147,310	5,156	3	240,200	8,407
Ore Mining Category Total	**50[c]**	**702,310,349**	**410,266**	**35[c]**	**462,061**	**70,214**	**32[c]**	**597,196**	**77,649**

Source: *PCSLoads2002_v4; TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

Commenters on previous effluent guidelines program plans have requested that EPA reverse its decision to exclude discharges from waste rock and overburden piles from the Part 440 applicability definition of "mine drainage." Specifically, commenters suggested that EPA should conduct a rulemaking to address discharges from waste rock piles, overburden piles, and other sources of water pollution at mine sites that are not currently covered by Part 440 (see 63 FR 47285, September 4, 1998).

The Agency will review the MSGP data for usefulness in revising the effluent guidelines, for example, to determine the mass and concentrations of pollutants discharged and effluent variability associated with these discharges, and to evaluate the performance and effectiveness of the permit controls (primarily "best management practices") at reducing pollutants. Additionally, EPA may gather other relevant data (such as cost data) on wastewater treatment technologies for this category. Preliminary MSGP data indicate high concentrations of metals in active and inactive mine site runoff. The volumes of discharge can be significant due to the large land area covered by the mine sites. Additionally, EPA Regions are evaluating whether states are adequately addressing mine site runoff. Finally, EPA is also investigating the potential for facilities in this category to contaminate ground water and, through infiltration and inflow, adversely affect POTW operations (U.S. EPA, 2002).

12.6 Ore Mining Category Conclusions

- The high TWPE ranking for the Ore Mining Category in the 2005 annual review was due to discharges of molybdenum and cyanide reported to PCS.

- After EPA revised the databases, the facilities with discharges subject to the Ore Mining ELGs account for 480,480 TWPE using combined TRI and PCS data from 2002.

- EPA determined there is incomplete data available for a full analysis of the Ore Mining Category. EPA intends to continue reviewing the ore mining industry for the 2007/2008 planning cycle.

12.7 Ore Mining Category References

ADEQ. 2005a. Arkansas Department of Environmental Quality. Authorization to Discharge Under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act Fact Sheet for NPDES AR0000582 – ALCOA Bauxite Works, Bauxite, AR. Little Rock, AR. (May 23). DCN 03313.

ADEQ. 2005b. Arkansas Department of Environmental Quality. Authorization to Discharge Under the National Pollutant Discharge Elimination System and the Arkansas Water and Air Pollution Control Act NPDES AR0000582 – ALCOA Bauxite Works, Bauxite, AR. Little Rock, AR. (May 31). DCN 03313.

Johnson, Carey. 2003. U.S. EPA. Memorandum to Public Record for the Effluent Guidelines Program Plan for 2004/2005. "Description and Results of EPA Methodology to Synthesize

Screening Level Results for the CWA 304(m) Effluent Guidelines Program Plan for 2004/2005." (December 23). DCN 00548.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1982. *Development Document for Effluent Limitations Guidelines and Standards for the Ore Mining and Dressing Point Source Category*. EPA-440/1-82/061. Washington, DC.

U.S. EPA. 1988. *Development Document for Effluent Limitations and Guidelines for New Source Performance Standards for the Ore Mining and Dressing Point Source Category Gold Placer Mine Subcategory*. EPA-440/1-88-061. Washington, DC.

U.S. EPA. 2002. EPA Issues Draft Discharge Permits and Proposed Variances for Three Silver Valley Wastewater Treatment Plants. *Environmental Fact Sheet*. (August). DCN 02090.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

UDEQ. Unknown. Utah Department of Environmental Quality. Statement of Basis for UT0000051 – Kennecott Utah Copper Corporation, Magna, UT. Salt Lake City, UT. DCN 03320.

13.0 PESTICIDE CHEMICALS (40 CFR PART 455)

EPA selected the Pesticide Chemicals Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-I, 70 FR 51050, August 29, 2005). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Pesticide Chemicals Category (U.S. EPA, 2005b). EPA's 2006 annual review builds on the 2005 annual review.

13.1 Pesticide Chemicals Category Background

This subsection provides background on the Pesticide Chemicals Category including a brief profile of the pesticide chemicals industry and background on 40 CFR Part 455.

13.1.1 Pesticide Chemicals Industry Profile

The pesticide chemicals industry includes facilities that manufacture pesticide active ingredients and formulate, package, and repackage pesticide products. Most of the pollutant loadings that EPA identified in the PCS and TRI databases are associated with pesticide chemicals manufacturing, not with pesticides formulating, packaging, and repackaging. As a result, most of Section 13.0 discusses pesticide chemicals manufacturing.

Approximately 100 facilities manufacture pesticide chemicals in the United States (U.S. EPA, 1993). Of these, approximately half also formulate, package, or repackage pesticides (although more than 2,000 U.S. facilities formulate, package, or repackage pesticides (U.S. EPA, 1996)). Approximately half of the pesticide chemicals manufacturers also manufacture other organic chemicals, whose discharges are covered by the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) ELGs. Typically, a facility will manufacture only one pesticide and is the only facility in the country that manufactures it.

To estimate the pollutant loads associated with the Pesticides Chemicals Category, EPA included discharges from facilities with a primary SIC code of 2879: Pesticide and Agricultural Chemicals, Not Elsewhere Classified (NEC), as well as the discharges of pesticide chemicals from facilities with other primary SIC codes. Although facilities with many SIC codes could perform operations covered by Part 455, the main SIC code that is covered by the Pesticide Chemicals ELGs is SIC code 2879. In TRI and PCS, discharges of pesticides result from facilities with the following primary SIC codes:

- 2048: Prepared Feed and Feed Ingredients for Animals and Fowls, Except Dogs and Cats;
- 2812: Alkalies and Chlorine;
- 2816: Inorganic Pigments;
- 2821: Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers;

- 2823: Cellulosic Manmade Fibers;
- 2824: Manmade Organic Fibers, Except Cellulose;
- 2834: Pharmaceutical Preparations;
- 2842: Specialty Cleaning, Polishing, and Sanitation Preparations;
- 2844: Perfumes, Cosmetics, and Other Toilet Preparations;
- 2865: Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments;
- 2869: Industrial Organic Chemicals, NEC;
- 2891: Adhesives and Sealants; and
- 2899: Chemicals and Chemical Preparations, NEC.

Nonpesticide discharges from facilities in these SIC codes are regulated by other point source categories: the Inorganic Chemicals Manufacturing Category; the Pharmaceutical Manufacturing Category; and the OCPSF Category.[15] EPA reviews the nonpesticide discharges from these facilities with their respective point source categories.

Table 13-1 lists the SIC codes with operations in the Pesticide Chemicals Category. The majority of facilities in the Pesticide Category report a primary SIC code of 2879 in TRI and 2869 in PCS. Also, in the 1993 rulemaking, EPA identified roughly 100 pesticides manufacturers, whereas Table 13-1 includes facilities that only package, formulate, package, and repackage pesticides. Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census data by equivalent SIC code. The facilities in SIC codes that are possibly subject to the multiple ELGs (Pesticide Chemicals and others) do not correlate directly to a NAICS code, and therefore EPA could not determine the number of facilities in the 2002 U.S. Economic Census for these SIC codes.

[15] For the OCPSF Category, discharges from the manufacture of chlorine and chlorinated hydrocarbons are being reviewed as part of the chlorine and chlorinated hydrocarbons effluent guidelines rulemaking. These facilities' pesticide chemicals manufacturing discharges are still included in the Pesticide Chemicals Category.

Table 13-1. Number of Facilities with Pesticide Chemicals Discharges Listed by Primary SIC Code

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2879: Pesticides and Agricultural Chemicals, Not Elsewhere Classified (NEC)[c]	239	29	124	113
2048: Prepared Feed and Feed Ingredients for Animals and Fowls, Except Dogs and Cats[c]	NA[d]	0	1	0
2812: Alkalies and Chlorine[c]		7	1	0
2816: Inorganic Pigments[c]		1	0	0
2821: Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers[c]		58	3	3
2823: Cellulosic Manmade Fibers[c]		0	1	1
2824: Manmade Organic Fibers, Except Cellulose[c]		0	0	0
2834: Pharmaceutical Preparations[c]		0	1	1
2842: Specialty Cleaning, Polishing, and Sanitation Preparations[c]		1	1	2
2844: Perfumes, Cosmetics, and Other Toilet Preparations[c]		0	0	0
2865: Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments[c]		24	2	2
2869: Industrial Organic Chemicals, NEC[c]		76	12	11
2891: Adhesives and Sealants[c]		0	1	1
2899: Chemicals and Chemical Preparations, NEC[c]		0	6	6
Chlorine and Chlorinated Hydrocarbons Rulemaking[e]		0	3	2
Total	**239**	**196**	**156**	**142**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v4; TRIReleases2002_v4; TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]Discharges of pesticides from these facilities are regulated by the Pesticide ELGs. All other dischargers are regulated under other ELGs.
[d]Poor bridging between NAICS and SIC codes. Number of facilities could not be determined.
[e]These facilities produce chlorine or chlorinated hydrocarbons as well as pesticides, and their nonpesticide discharges are being reviewed as part of the review for the Chlorine and Chlorinated Hydrocarbons effluent guidelines rulemaking.
NEC – Not elsewhere classified.

Pesticide chemicals manufacturing facilities discharge directly to surface water as well as to POTWs. Table 13-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities in SIC code 2879 reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds.

13.1.2 40 CFR Part 455

The ELGs for the Pesticide Chemicals Category were first promulgated on April 25, 1978 (43 FR 17776) for Subparts A and B. EPA last revised the ELGS for the Pesticide Chemicals Category Subparts A, B, and D in 1998 (U.S. EPA, 1993; U.S. EPA, 1998), and promulgated ELGS for pesticide chemicals formulating, packaging, and repackaging (Subparts C and E) in 1996 (U.S. EPA, 1998). EPA promulgated BPT, BAT, BCT, and NSPS for Subparts A through E, and Subparts A, C, and E include PSES and PSNS limitations. This category consists of five subcategories, as shown in Table 13-3 with a description of each subcategory's applicability. All facilities that manufacture pesticide active ingredients are subject to priority pollutant limits under Subpart A. In addition, there are numerical limitations for 49 pesticide active ingredients under BPT. Under Subparts C and E, facilities that formulate, package, or repackage pesticide products are subject to either a zero discharge limit or a pollution prevention alternative that allows a small discharge after implementation of specific pollution prevention techniques and treatment.

Table 13-2. Pesticide Chemicals Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharge
2879: Pesticides and Agricultural Chemicals, Not Elsewhere Classified (NEC)	18	13	5	88
2048: Prepared Feed and Feed Ingredients for Animals and Fowls, Except Dogs and Cats[a]	0	1	0	0
2812: Alkalies and Chlorine[a]	0	0	0	0
2816: Inorganic Pigments[a]	0	0	0	0
2821: Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers[a]	1	2	0	0
2823: Cellulosic Manmade Fibers[a]	1	0	0	0
2824: Manmade Organic Fibers, Except Cellulose[a]	0	0	0	0
2834: Pharmaceutical Preparations[a]	0	0	1	0
2842: Specialty Cleaning, Polishing, and Sanitation Preparations[a]	0	1	0	0
2844: Perfumes, Cosmetics, and Other Toilet Preparations[a]	0	0	0	0
2865: Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments[a]	2	0	0	0
2869: Industrial Organic Chemicals, NEC[a]	6	6	0	0
2891: Adhesives and Sealants[a]	0	1	0	0
2899: Chemicals and Chemical Preparations, NEC[a]	1	4	1	0
Chlorine and Chlorinated Hydrocarbons Rulemaking[a]	2	0	0	0

Source: *TRIReleases2002_v4*.
[a]EPA identified facilities known to perform pesticide chemicals manufacturing operations.

Table 13-3. Applicability of Subcategories in the Pesticide Chemicals Point Source Category

Sub-part	Subpart Title	Subpart Applicability
A	Organic Pesticide Chemicals Manufacturing	Discharges resulting from the manufacture of organic and organo-tin pesticide active ingredients. Intermediates used to manufacture the active ingredients and active ingredients used solely in experimental pesticides are excluded from coverage.
B	Metallo-Organic Pesticide Chemicals Manufacturing	Discharges resulting from the manufacture of metallo-organic pesticide active ingredients containing mercury, cadmium, arsenic, or copper. Intermediates used to manufacture the active ingredients are excluded from coverage.
C	Pesticide Chemicals Formulating and Packaging	Discharges resulting from all pesticide formulating, packaging, and repackaging operations except repackaging of agricultural pesticides performed at refilling establishments. Formulation, packaging, and/or repackaging of sanitizer products (including pool chemicals), microorganisms, inorganic wastewater treatment chemicals, specified mixtures, and liquid chemical sterilant products as defined in the Federal Food, Drug and Cosmetic Act and in the Federal Insecticide, Fungicide and Rodenticide Act is excluded. Also excluded is the development of new formulations of pesticide products and the associated efficacy and field testing at on-site or stand-alone research and development laboratories where the resulting pesticide product is not produced for sale.
D	Test Methods for Pesticide Pollutants	Analytical test methods that must be used to determine the concentration of pesticide active ingredients in the wastewater.
E	Repackaging of Agricultural Pesticides Performed at Refilling Establishments	Discharges resulting from all repackaging of agricultural pesticides performed by refilling establishments whose primary business is wholesale or retail sales; and where no pesticide manufacturing, formulating, or packaging occurs. Does not apply to wastewater discharges from custom application or custom blending and repackaging of microorganisms or certain specified mixtures, or non-agricultural pesticide products.

Source: *Pesticide Chemicals Point Source Category - 40 CFR 455*.

13.2 Pesticide Chemicals Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Pesticides Chemicals Category including the screening-level review and category-specific review.

13.2.1 Pesticide Chemicals Category 2005 Screening-Level Review

Table 13-4 presents the Pesticide Chemicals Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 13-4. Pesticide Chemical Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[b]	2002 TRI TWPE[c]	Total TWPE
5	Pesticide Chemicals	50,690	554,485	605,175

Source: *2005 Annual Screening-Level Analysis Report* (U.S. EPA, 2005a); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

13.2.2 Pesticides Chemicals Category 2005 Pollutants of Concern

Typically, a pesticide chemicals manufacturing facility manufactures only one pesticide active ingredient and is the only facility in the country producing that ingredient (U.S EPA, 1993). As a result, in the TRI and PCS databases, the top pesticide chemicals, in terms of TWPE, are only reported by one or two facilities. Table 13-5 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. The estimated TWPE from the TRI database is much greater than the TWPE from the PCS database. Picloram contributed approximately 90 percent of the category TRI TWPE.

13.3 Potential New Subcategories for the Pesticide Chemicals Category

EPA did not identify any potential new subcategories for the Pesticide Chemicals Category.

Table 13-5. 2005 Annual Review: Pesticide Chemicals Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Chemical	Total Pounds Released	TWPE	Number of Facilities Reporting Chemical	Total Pounds Released	TWPE
Picloram	Pollutants are not in the top five PCS 2002 reported pollutants			2	240,111	498,021
Dichlorvos				1	6.2	34,935
Diazinon				3	12.3	7,685
Cyfluthrin				1	26.0	5,463
Merphos				1	23.0	1,549
Carbaryl	1	153	42,918	Pollutants are not in the top five TRI 2002 reported pollutants.		
Diazinon	1	2.1	1,344			
Hyxachlorocyclohexane	1	14.8	1,038			
Chlorine	3	1,608	819			
1,3-Dichloropropene	76	1,097	620			
Pesticide Chemicals Category Total	**203**[c]	**122,209,015**	**50,690**	**64**[c]	**1,754,350**	**554,485**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

13.4 Pesticide Chemicals Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Pesticide Chemicals Category. EPA's 2006 annual review of the Pesticide Chemicals Category included reviewing the 2003 TRI data and verifying facility discharges.

13.4.1 Pesticide Chemicals Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings based on methodology changes as described in Section 4.2. Table 13-6 shows the 2006 screening-level TWPE estimated for the Pesticide Chemicals Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 13-6. Pesticide Chemicals Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Pesticide Chemicals	50,299	554,673	485,460

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

13.4.2 Pesticide Chemicals Category 2006 Pollutants of Concern

Table 13-7 presents the pollutants of concern for the Pesticide Chemicals Category based on the 2006 annual review. In all cases, the top pollutant is reported by only one or two facilities, which is typical for the industry (U.S. EPA, 1993). The remainder of this subsection discusses the discharges reported for picloram, the top TRI 2002 and 2003 pollutant of concern in terms of TWPE, and carbaryl, the top PCS 2002 pollutant of concern in terms of TWPE.

Table 13-7. 2006 Annual Review: Pesticide Chemicals Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Picloram	Pollutants are not in the top five PCS 2002 reported pollutants.			2	240,111	498,021	1	213,664	443,167
Dichlorvos				1	6.24	34,935	1	1.24	6,929
Diazinon	1	2.16	1,344	3	12.4	7,685	3	8.35	5,196
Cyfluthrin	Pollutants are not in the top five PCS 2002 reported pollutants.			1	26	5,463	1	26	5,463
Merphos				1	23	1,549	1	10	674
Carbaryl, Total	1	153	42,918	Pollutants are not in the top five TRI 2002 reported pollutants.					
Hexachlorocyclo hexane, Total	1	14.8	1,038						
Chlorine	3	1,608	819						
Daconil ($C_8Cl_4N_2$)	1	83	613						
Pesticide Chemicals Category Total	**48[c]**	**122,206,792**	**50,299**	**67[c]**	**1,757,740**	**554,673**	**63[c]**	**1,927,344**	**485,460**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

13.4.3 Pesticide Chemicals Category Picloram Discharges

Picloram accounts for approximately 90 percent of the category's 2002 TRI TWPE and approximately 91 percent of the category's 2003 TRI TWPE. Table 13-8 presents the facilities reporting discharges of picloram to TRI in 2002 and 2003.

Table 13-8. Pesticide Chemicals Category Picloram Discharges

Facility (Location)	2002 TRI		2003 TRI	
	Total Pounds Released[a]	TWPE	Total Pounds Released[a]	TWPE
Dow Chemical Co. Freeport Facility (Freeport, TX)	239,991	497,772	213,664	443,167
Dow Chemical Co. Midland Ops. (Midland, MI)	120	249	NA	NA

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Facilities are direct dischargers so discharges are not transferred to POTWs.
NA – Not applicable. Facility did not report discharges of picloram to TRI in 2003.

The majority of the picloram TWPE in the TRI 2002 and 2003 databases are from discharges reported by Dow Chemical Co. Freeport Facility. The facility's NPDES permit does not have limits for picloram discharges, and PCS does not have data on the facility's picloram discharges (TCEQ, 2002; TCEQ, 2003).

EPA contacted Dow Chemical Co. Freeport Facility to determine how it estimated its TRI wastewater discharges of picloram and if picloram discharges were being controlled by the best available technology economically achievable. In letters dated October 26, 2005, and July 26, 2006, Dow Chemical Co. stated that its Freeport facility manufactures picloram as one of its many products (Falcon, 2005). The facility recovers picloram for sale, but some picloram remains in the wastewater because of solubility and filtration inefficiency. Dow's Freeport Facility measures the total organic carbon (TOC) in the wastewater daily, and estimates the wastewater picloram content as a percentage of the TOC based on process knowledge, water chemistry, and the downstream wastewater treatment removal. EPA continues to work with the facility to determine if picloram is being controlled by the best available technology economically achievable.

EPA reviewed Dow Chemical Co. Freeport Facility's NPDES permit, but could not determine which outfall receives the picloram wastewater (TCEQ, 2002; TCEQ, 2003). As a result, EPA could not estimate the concentration of picloram in the facility's wastewater for a specific outfall. However, Table 13-9 uses flow data from the entire facility to estimate the concentration of picloram in the effluent wastewater. EPA considers the estimate in Table 13-9 as a lower bound of the concentration in wastewater from the picloram manufacturing process, because EPA used an estimated flow that includes wastewater from most of Dow's Freeport facility's organic chemicals manufacturing processes, off-site wastewater, stormwater, noncontact cooling water, ground water, and other nonprocess wastewater.

Table 13-9. Estimated Picloram Concentrations in Dow Chemical Co. Freeport Facility's Final Effluent

Year	Total Facility Flow (MGY)	Outfall Flows Included for Total Flow[a]	Pounds of Picloram Reported (lbs/yr)	Estimated Picloram Concentration (mg/L)
2002	108,000	001	239,991	266
2003	117,000		213,664	218

[a]Picloram-containing wastewater most likely discharges through Outfall 001. Outfall 001 receives wastewater from most of Dow Freeport's organic chemicals manufacturing, as well as off-site wastewater, stormwater, ground water, and noncontact cooling water. Outfall 002 receives wastewater from inorganic chemicals manufacturing, as well as utility wastewater, cooling water, treated ground water, and process stormwater. Outfall 003 receives wastewater from organic chemicals manufacturing such as polycarbonate, styrene, allyl chloride, and epichlorohydrin wastewater, as well as off-site wastewater, stormwater, noncontact cooling water, boiler blowdown, and utility wastewater.

Activated carbon is the most effective treatment technology based on the treatability transfer analysis done for the 1993 rulemaking. In 1997, EPA set a drinking water Maximum Contaminant Level Goal at 0.5 mg/L for picloram. Picloram is soluble in water at 430 mg/L, at 25° C (Cornell, 2006).

13.4.4 Pesticide Chemicals Category Total Carbaryl Discharges

Total carbaryl accounts for approximately 85 percent of the category's 2002 PCS TWPE. Table 13-10 presents the facilities reporting discharges of picloram to PCS in 2002.

Table 13-10. Pesticide Chemicals Category Total Carbaryl Discharges in PCS 2002

Facility (Location)	Total Pounds Released	TWPE
Bayer Cropscience Institute (Institute, WV)	153	42,918

Source: *PCSLoads2002_v2*.

EPA verified Bayer Cropscience Institute's carbaryl discharges by reviewing the facility's permit and detailed PCS data and contacting the WV Department of Environmental Protection to verify the facility's carbaryl loads (WVDEP, 2002). The total carbaryl discharges from the facility are incorrectly estimated by *PCSLoads2002_v4*. Based on DMR data, the facility discharged approximately 5.5 pounds (1,500 TWPE) of total carbaryl in 2002, whereas the *PCSLoads2002_v4* database estimates 153 pounds (42,900 TWPE) because of double-counting outfalls and data-entry errors. EPA will correct the estimated pollutant load for total carbaryl in future review cycles.

13.5 Pesticide Chemicals Category Conclusions

- The Pesticide Chemicals Category was selected for detailed review because of high TWPE in the *PCSLoads2002_v4*, *TRIReleases2002_v4*, and *TRIReleases2003_v2* databases.

- Discharges of picloram from Dow Chemical's Freeport, TX facility account for 99 percent of the category load from the TRI databases. The facility estimates its picloram discharges as a percentage of TOC in the wastewater. EPA estimated the concentration of picloram discharged in final effluent at more than 200 mg/L. Activated carbon is the most effective treatment technology based on the treatability transfer analysis done for the 1993 rulemaking (40 CFR 455, Table 10). EPA continues to work with the facility to better understand the treatment and discharge of picloram.

- EPA identified an error in the estimation of total carbaryl loads from Bayer Cropscience Institute in *PCSLoads2002_v4*. Based on DMR data, the facility discharged approximately 5.5 lbs (1,500 TWPE) of total carbaryl in 2002. Because of data-entry errors and double-counting of outfalls, *PCSLoads2002_v4* estimated approximately 153 lbs (42,900 TWPE) of total carbaryl discharged. EPA will correct the estimated pollutant load for total carbaryl in future review cycles, and it is no longer a pollutant of concern (at less than 3 percent of the category PCS TWPE).

13.6 Pesticide Chemicals Category References

Cornell. 2006. Cornell University Herbicide Profile 10/88. Available online at: http://extoxnet.orst.edu/pips/picloram.htm. Date accessed: June 12, 2006. DCN 03979.

Falcon, Fran Quinlan. 2005. Letter from Fran Quinlan Falcon, Environmentally Leveraged Delivery Leader, The Dow Chemical Company, and Audrey Kasenge, Eastern Research Group, Inc. "EPA Effluent Guideline Review on TRI Chemical Picloram in Response to EPA's e-mail requests dated June 9, 2005 and October 20, 2005." (October 26). DCN 02670.

TCEQ. 2002. Permit to Discharge Wastes Under Provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code Fact Sheet and Executive Director's Preliminary Decision NPDES TX00064831 – The Dow Chemical Company, Freeport, TX. Austin, TX. (November 1). DCN 01897.

TCEQ. 2003. Permit to Discharge Wastes Under Provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code NPDES TX00064831 – The Dow Chemical Company, Freeport, TX. Austin, TX. (December 19). DCN 01894.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1993. *Development Document for Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards for the Pesticide Chemicals Manufacturing Point Source Category (Final)*. EPA-821-R-93-016. Washington, DC. (September).

U.S. EPA. 1996. *Development Document for Best Available Technology, Pretreatment Technology, and New Source Performance Technology for the Pesticide Formulating, Packaging, and Repackaging Industry – Final*. EPA-821-R-96-019. Washington, DC. (September).

U.S. EPA. 1998. Amendments to the Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards for the Organic Pesticide Chemicals Manufacturing Industry—Pesticide Chemicals Point Source Category; Direct Final Rule and Proposed Rule (see 63 FR 3944, July 22, 1998). Available online at: www.epa.gov/EPA-WATER/1998/July/Day-22/w19514.pdf. Date accessed: July 1, 2005.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Dischargers*. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

WVDEP. 2002. West Virginia Department of Environmental Protection, Division of Water Resources. National Pollution Discharge Elimination System Water Pollution Control Permit NPDES WV0000086 – Bayer Cropscience Institute, Charleston, WV. Charleston, WV. (June). DCN 02894.

14.0 PETROLEUM REFINING (40 CFR PART 419)

EPA selected the Petroleum Refining Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous detailed study of this industry (U.S. EPA, 2004). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Petroleum Refining Category. EPA's 2006 annual review builds on the 2005 annual review. Because EPA completed a detailed study of this industry in 2004, most of the 2006 annual review focused on newly identified pollutant discharges (i.e., discharges not reported by a facility in the data used for the 2004 detailed study).

14.1 Petroleum Refining Category Background

This subsection provides background on the Petroleum Refining Category including a brief profile of the petroleum refining industry and background on 40 CFR Part 419.

14.1.1 Petroleum Refining Industry Profile

The petroleum refining industry includes facilities that produce gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes. This industry is represented by one SIC code, 2911 Petroleum Refining; however, EPA is considering including operations from four other SIC codes as new subcategories of the Petroleum Refining Category (see the Potential New Subcategories Section (Section 14.3)).

Table 14-1 presents the number of facilities in the SIC codes that compose the petroleum refining industry. Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census by the equivalent SIC code. The facilities in SIC code 5171 do not correlate directly to a NAICS code and therefore EPA could not determine the number of facilities in the 2002 U.S. Economic Census for SIC code 5171.

Petroleum refineries discharge directly to surface water as well as to POTWs. Table 14-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of petroleum refineries reporting to TRI reported discharging directly. The majority of facilities reporting to TRI in SIC codes classified as potential new subcategories reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting threshold.

Table 14-1. Number of Facilities in Petroleum Refining SIC Codes

SIC	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2911: Petroleum Refining	199	153	163	163
Potential New Subcategories				
2992: Lubricating Oils and Greases	407	21	144	139
2999: Products Of Petroleum and Coal, NEC	74	17	22	28
4612: Crude Petroleum Pipelines	271	23	0	0
5171: Petroleum Bulk Stations and Terminals	NA[c]	446	599	541
Potential New Subcategories Total	**>752**	**507**	**765**	**708**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2; TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]Poor bridging between SIC codes and NAICS codes. Number of facilities could not be determined.
NA – Not applicable.
NEC – Not elsewhere classified.

Table 14-2. Petroleum Refining Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2911: Petroleum Refining	95	19	15	34
Potential New Subcategories				
2992: Lubricating Oils and Greases	10	20	4	110
2999: Products Of Petroleum and Coal, NEC	6	0	0	16
4612: Crude Petroleum Pipelines	0	0	0	0
5171: Petroleum Bulk Stations and Terminals	139	27	17	416
Potential New Subcategories Total	**250**	**66**	**36**	**576**

Source: *TRIReleases2002_v4*.

14.1.2 40 CFR Part 419

EPA first promulgated ELGs for the Petroleum Refining Category (40 CFR Part 419) on October 18, 1982 (47 FR 46446). There are five subcategories that all have BPT, BAT, BCT, PSES, NSPS, and PSNS. EPA established numerical limitations for ammonia as nitrogen, hexavalent chromium, phenolic compounds, sulfide, and total chromium in at least one subcategory. Section 7 of the 2004 TSD provides more information on the existing regulations for the Petroleum Refining Category (U.S. EPA, 2004).

14.2 Petroleum Refining Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Petroleum Refining Category including the screening-level review and category-specific review.

14.2.1 Petroleum Refining Category 2005 Screening Level Review

Table 14-3 presents the Petroleum Refining Category TWPE calculated, using *TRIReleases2002_v2* and *PCSLoads2002_v2*. The discharges in Table 14-3 include loads from facilities in SIC codes EPA determined are potential new subcategories.

Table 14-3. Petroleum Refining Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
4	Petroleum Refining	166,045	503,802	669,847

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

14.2.2 Petroleum Refining Category 2005 Pollutants of Concern

Table 14-4 shows the pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*.

Discharges of dioxin and dioxin-like compounds and PACs contributed approximately 76 percent of the TWPE in *TRIReleases2002_v2*. Discharges of metals account for approximately nine percent of the total TWPE in *TRIReleases2002_v2*. From *PCSLoads2002_v2*, sulfide accounts for approximately 50 percent of the TWPE.

Table 14-4. 2005 Annual Review: Petroleum Refining Category Pollutants of Concern

Pollutant	2002 TRI[a]			2002 PCS[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Dioxin and Dioxin-Like Compounds	17	0.011 (5.16 grams)	295,598	Pollutants are not in the top five PCS 2002 reported pollutants.		
PACs	61	3,309	88,473			
Sodium Nitrite	3	121,788	45,468			
Mercury and Mercury Compounds	68	124	14,465			
Lead and Lead Compounds	97	5,644	12,643			
Sulfide	Pollutants are not in the top five TRI 2002 reported pollutants.			77	29,851	83,626
Chlorine				17	45,011	22,918
Fluoride				12	406,609	14,231
Silver				7	769	12,669
Selenium				17	7,560	8,477
Petroleum Refining Category Total	**352**	**18,512,185**	**503,802**	**107**	**7,606,182,343**	**166,045**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.
[b]Discharges include only major dischargers.

14.3 Potential New Subcategories for the Petroleum Refining Category

EPA reviewed industries with SIC codes not clearly subject to existing ELGs. EPA concluded the processes, operations, wastewaters, and pollutants of facilities in the SIC codes listed in Table 14-5 are similar to those of the Petroleum Refining Category. See the *Preliminary 2005 Review of Prioritized Categories of Industrial Discharges* (U.S. EPA, 2005b). Table 14-5 shows the combined TWPE from *TRIReleases2002_v2* and *PCSLoads2002_v2* for each SIC code that is a potential new subcategory. The discharges for the potential new subcategory SIC codes are a negligible percentage of the total 2002 TWPE for the Petroleum Refining Category. Consistent with the conclusions drawn during the 2004 detailed study (U.S. EPA, 2004), EPA found that large numbers of these facilities discharge no wastewater and only a small number of facilities discharge significant TWPE.

Table 14-5. Petroleum Refining Category Potential New Subcategories Pollutant TWPE

SIC Code	SIC Description	Total 2002 TWPE	Percentage of Total Petroleum Refining Category TWPE
2992	Lubricating Oils and Greases	3,836	0.57%
2999	Products of Petroleum & Coal, NEC	1,915	0.29%
4612	Crude Petroleum Pipelines	247	0.04%
5171	Petroleum Bulk Stations & Terminals	1,551	0.23%

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.

14.4 Petroleum Refining 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Petroleum Refining Category. EPA obtained additional data and identified changes in estimates of TWPE for sodium nitrite and PACs.

14.4.1 Petroleum Refining Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EPA revised the TWF and POTW removal values it used for sodium nitrite in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EPA applies to sodium nitrite is now 0.0032 (formerly 0.373), and the POTW removal is now 90 percent (formerly 1.87 percent). As discussed in Section 4.2.3, during its 2006 annual review of the Petroleum Refining Category, EPA also revised the TWFs for two individual PACs and developed TWFs for two additional PACs. These TWF revisions resulted in a change to the petroleum refining-specific TWF for PACs to 26.3 (formerly 25.4). The calculation of the petroleum refining PACs TWF is discussed in Section 4.3.1. Table 14-6 presents the loads before and after corrections to the sodium nitrite TWF and POTW percent removal and petroleum refining-specific PACs TWF for the Petroleum Refining Category. Based on the revised TWPE, sodium nitrite is no longer a pollutant of concern for the Petroleum Refining Category.

Table 14-6. Impact of Changes to TWF and POTW Percent Removal for the Petroleum Refining Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	3	45,468	74
TRI 2002	PACs	61	88,473	85,642

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*.

14.4.2 Petroleum Refining Category 2006 Screening-Level Review

As a result of its 2006 screening-level review, EPA revised the TRI and PCS rankings as described in Section 4.2, based on methodology changes described in Section 4.2 and changes made based on contacts with facilities. For the Petroleum Refining Category, the most significant changes are also described in Section 14.4.1. Table 14-7 shows the 2006 screening-level TWPE estimated for the Petroleum Refining Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 14-7. Petroleum Refining Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Petroleum Refining	165,076	467,009	498,367

Source: *PCSLoads2002_v4; TRIReleases2002_v4; TRIReleases2003_v4*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

14.4.3 Petroleum Refining Category 2006 Pollutants of Concern

Table 14-8 presents the pollutants of concern for the Petroleum Refining Category identified as part of the 2006 annual review.

Dioxin and dioxin-like compounds contribute approximately 63 percent of the Petroleum Refining Category TWPE in *TRIReleases2002_v4*, and approximately 75 percent of the Petroleum Refining Category TWPE in *TRIReleases2003_v2*. PACs discharges contribute approximately 18 percent of the Petroleum Refining Category TWPE in *TRIReleases2002_v4* and approximately 7 percent of the TWPE in *TRIReleases2003_v2*. The 2006 annual review of the PCS data shows the same results as the 2005 annual review.

14.5 Petroleum Refining Category Update on Pollutants of Concern

EPA completed a detailed study of the Petroleum Refining Category for the 2004 annual review (U.S. EPA, 2004). This subsection summarizes the results of the detailed study pollutants of concern and the discharges of these pollutants in the *PCSLoads2002_v4*, *TRIReleases2002_v4*, and *TRIReleases2003_v2* databases.

Table 14-8. 2006 Annual Review: Petroleum Refining Category Pollutants of Concern

Chemical	PCS 2002[a]			TRI 2002[b]			TRI 2003[b]		
	Number of Facilities Reporting Chemical	Total Pounds	TWPE	Number of Facilities Reporting Chemical	Total Pounds	TWPE	Number of Facilities Reporting Chemical	Total Pounds	TWPE
Sulfide	77	29,851	83,626	Pollutants are not in the top five TRI 2002 reported pollutants			Pollutants are not in the top five TRI 2003 reported pollutants		
Chlorine	17	45,011	22,918						
Fluoride	12	406,609	14,231						
Silver	7	769	12,669						
Selenium	17	7,560	8,477						
Dioxin and Dioxin-Like Compounds[c]	Pollutants are not in the top five PCS 2002 reported pollutants			16	0.0114	296,024	18	0.0123	374,030
PACs				61	3,309	85,642	59	1,291	32,825
Mercury and Mercury Compounds				68	124	14,465	66	110	12,912
Lead and Lead Compounds				97	5,644	12,643	116	9,882	22,136
Nitrate Compounds				62	16,796,417	12,541	61	15,706,670	11,728
Petroleum Refining Category Total	**118[d]**	**7,606,670,158**	**165,076**	**352[d]**	**18,412,828**	**467,009**	**343[d]**	**17,314,282**	**498,367**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]The TWPE for dioxin and dioxin-like compounds for the 2006 annual review changed by less than 0.15 percent from the 2005 annual review due to an additional dioxin distribution in the SIC code average dioxin distribution. There were no changes made to the reported dioxin and dioxin-like compound discharge pounds or the individual TWFs for dioxin and dioxin-like compounds.
[d]Number of facilities reporting TWPE greater than zero.

14.5.1 Petroleum Refining Category Dioxin and Dioxin-Like Compound Discharges

During its 2004 detailed study of the petroleum refining industry, EPA found the following regarding dioxin and dioxin-like compound dischargers:

- Dioxin and dioxin-like compound discharges reported by 15 of 17 petroleum refining facilities to TRI in 2000 were either not based on measured concentrations or were estimated using one-half the analytical detection limit when dioxin and dioxin-like compounds were not detected.

- Catalytic reformer regeneration wastewater is the major source of dioxin and dioxin-like compounds in petroleum refining wastewaters.

- Based on available analytical data, high concentrations of dioxin and dioxin-like compounds, including TCDD and TCDF, may be detected in catalytic reformer regeneration wastewater.

- Based on available analytical data, oil/water separators effectively remove dioxin and dioxin-like compounds from petroleum refining wastewaters prior to discharge. Because dioxin and dioxin-like compounds have a low water solubility and extreme hydrophobicity, the dioxin and dioxin-like compounds from catalytic regeneration wastewaters most likely partition to the oily and solid phases in the API separator.

EPA reviewed more recent-TRI reported discharges of dioxin and dioxin-like compounds by petroleum refineries to see if there were any new data to supplement its earlier analyses. As was the case with the 2004 detailed study, EPA found that most petroleum refineries do not monitor for dioxin and dioxin-like compounds. Only 17 refineries reported dioxin and dioxin-like compounds discharges in *TRIReleases2002_v4*. Of these, 15 refineries also reported dioxin and dioxin-like compounds discharges in *TRIReleases2000_v4* and 14 reported such discharges in *TRIReleases2003_v2*. Table 14-11, at the end of this section, lists the petroleum refineries reporting dioxin and dioxin-like compound discharges in *TRIReleases2000_v4*, *TRIReleases2002_v4*, and *TRIReleases2003_v2*, their reported discharges, the basis of estimate for the discharge, whether the facility detected dioxin and dioxin-like compounds in its wastewater, and any additional information collected.

The majority of the reported dioxin and dioxin-like compound discharge loads are estimated as flow multiplied by one-half of the detection limit or using industry-derived emission factors. Only 3 of the 17 dioxin and dioxin-like compound discharges reported for 2002 are based on analytical data with measurements above the sample detection limit. EPA also identified two petroleum refineries that reported dioxin and dioxin-like compound discharges based on analytical measurements to TRI in 2003, but did not report dioxin and dioxin-like compound discharges to TRI in 2000 or 2002. EPA contacted these refineries to determine how they estimated their dioxin and dioxin-like compound discharges. Table 14-9 summarizes the information EPA collected from these five petroleum refineries.

Table 14-9. Petroleum Refineries that Based Dioxin and Dioxin-Like Compound Discharges on Analytical Measurement Data

Facility	Location	2006 Review TWPE	Review	Findings
BP Toledo	Oregon, OH	54,100	2004 Detailed Study	Facility sampled its effluent once in September 2000. The facility detected nine dioxin congeners, including the most toxic form, 2,3,7,8-TCDD; however, no dioxin and dioxin-like compounds were detected above the Method 1613B minimum level (Nelson, 2004).
Tesoro Northwest	Anacortes, WA	47,000	2004 Detailed Study	Facility measured its effluent four times between 2000 and 2001, and each sample was analyzed by two independent analytical laboratories. The facility detected between 6 and 14 dioxin congeners in its final effluent, several of which were detected below the Method 1613B minimum level. The most toxic congener, 2,3,7,8-TCDD, was detected by one laboratory for one of the samples (Spurling, 2005).
Conoco Phillips	Wilmington, CA	9,020	2005 Annual Review	Facility measured discharges from the catalytic reformer regeneration unit in 1992 and detected all 17 dioxin congeners. The facility sends the catalytic reformer regeneration waste through a wastewater treatment plant and the treated wastewater discharges to a POTW (Hamann, 2005).
Shell Chemical Company	Deer Park, TX	14,600	2006 Annual Review	Facility has not independently analyzed its wastewaters for dioxin and dioxin-like compounds; however, in 2003 the Texas Commission on Environmental Quality (TCEQ), as part of a total maximum daily load program along the Houston Ship Channel, collected and measured the facility's refinery effluent. The TCEQ analyzed the dioxin and dioxin-like compounds in the particle-bound fraction and the dissolved fraction of the refinery effluent. The TCEQ detected six dioxin and dioxin-like compounds in the particle-bound fraction and 16 dioxin and dioxin-like compounds in the dissolved fraction, but none were detected above the Method 1613B minimum level. The most toxic congener, 2,3,7,8-TCDD, was not detected in either fraction (Brzuzy, 2006).
Tesoro Alaska	Kenai, AK	46	2006 Annual Review	Facility measured discharges in 2001 and 2003 from its catalytic reformer regeneration unit after the wastewater passed through a granulated activated carbon filter, but before the API separators and other wastewater treatment. In 2001, the facility detected 13 dioxin and dioxin-like compounds above the Method 1613B minimum level. The facility sampled the wastewater again in 2003, and did not detect any of the dioxin and dioxin-like compounds above the Method 1613B minimum level (Rosin, 2006).

Two of the facilities identified in Table 14-9, were analyzed and discussed in the 2004 detailed study. For a complete discussion of EPA's review and conclusions for the BP Toledo and the Tesoro Northwest facilities, see the 2004 Technical Support Document (U.S. EPA, 2004). The new information obtained from the other three petroleum refineries supports the conclusions drawn during the 2004 detailed study. Two of the three facilities based their final effluent dioxin discharges on analytical data collected of catalytic reformer regeneration wastewater prior to on-site treatment. The third facility did not detect any dioxin congeners above the method 1613B minimum level.

14.5.2 Petroleum Refining Category Polycyclic Aromatic Compounds (PACs) Discharges

During its 2004 detailed study of the Petroleum Refining Category, EPA found the following regarding PACs dischargers:

- Discharges of PACs reported by 18 of 19 petroleum refineries to TRI in 2000 were either not based on measured concentrations in refinery effluent or were estimated using one-half the analytical detection limit when individual PACs were not detected.
- There is no obvious source of PACs releases to refinery wastewaters, other than potential leaks and spills of crude oil and petroleum products.
- Based on available analytical data, there is little evidence that PACs are present in concentrations above the detection limit in petroleum refinery wastewater discharges.

EPA reviewed more recent TRI-reported discharges of PACs by petroleum refineries to see if there were any new data to supplement its earlier analyses. As was the case with the 2004 detailed study, EPA found that most petroleum refineries do not monitor for individual PACs. Thirty-nine refineries reported PACs discharges in *TRIReleases2002_v4 or TRIReleases 2003v2*. Of these, 19 refineries reported PACs discharges in *TRIReleases2000_v4,* and 34 reported such discharges in *TRIReleases2003_v2*. Table 14-12, at the end of this section, lists the petroleum refineries reporting PACs discharges in *TRIReleases2000_v4, TRIReleases2002_v4*, or *TRIReleases2003_v2*, the reported discharges, the basis of estimate for the discharge, and any additional information collected.

The majority of the reported PACs discharge loads are estimated as flow multiplied by one-half the detection limit, or using industry-derived emission factors. During the 2004 detailed study, EPA verified that only one facility measured PACs in its refinery effluent above the method detection level. In the 2005 annual review, EPA verified an additional facility measured PACs in its refinery effluent above the method detection level. In this 2006 annual review, EPA verified one additional refinery measured PACs in their effluent above the method detection level. Therefore, EPA verified that 3 of the 39 PACs discharges reported for 2002 or 2003 are based on analytical data with measurements above the method detection limit. Table 14-10 summarizes the information that EPA has collected from these three facilities.

Table 14-10. Petroleum Refineries that have Detected PACs in Refinery Effluent

Facility	Location	2006 Review TWPE	Review	Findings
Lyondell Citgo	Houston, TX	3,930	2004 Detailed Study	Facility measured five individual PACs above the method detection limits in its discharge to the Washburn Tunnel Facility (part of Gulf Coast Waste Disposal Authority); however, PACs were not detected in the Washburn Tunnel Facility's discharge to surface water (U.S. EPA, 2004). Gulf Coast is an industrial POTW designed to treat industrial discharges without on-site pretreatment.
Marathon Ashland	Detroit, MI	172	2005 Annual Review	Facility measured five individual PACs above the method detection limits in its discharge to the Detroit Wastewater Treatment Plant (Sheard, 2005). EPA was unable to determine if the Detroit Wastewater Treatment Plant measured PACs in its discharge to surface water.
Premcor Refining Group	Delaware City, DE	81	2006 Annual Review	Facility routinely measured its wastewater treatment plant effluent for PACs from 1999 through 2003. During 2002 and 2003, the facility detected eight individual PACs above the method detection limits; however, not all of the eight PACs were detected during each sampling event. The facility's wastewater treatment plant consists of Coalescing Plate Interceptor (CPI) and API separators, spill diversion tanks, equalization tanks, dissolved nitrogen floatation tanks, two-stage aeration tanks, biotreatment tanks, clarifier tanks, sand filtration, guard basin, and a final API separator prior to discharge (Chelpaty, 2006).

The information collected during this 2006 review supports the conclusions drawn during the 2004 detailed study. EPA determined that most of the PACs discharges reported to TRI are not based on analytical data. EPA did verify that three facilities have detected PACs in their refinery effluent; however, this is out of the 163 petroleum refineries that report to TRI. Of these three facilities, two discharge indirectly to POTWs and receive additional treatment prior to discharge to surface waters. PAC discharges from the third facility represent 81 TWPE. At this time, EPA has not identified a source of PACs other than potential leaks and spills of crude oil or petroleum products.

14.5.3 Petroleum Refining Category Metals Discharges

During its 2004 detailed study of the Petroleum Refining Category, EPA found the following regarding metals discharges:

- Metals that may be present in petroleum refining wastewater include aluminum, arsenic, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc.

- Crude petroleum is the primary source of metals in refinery wastewater. The concentration of a metal in crude depends on the source of the crude.

- The concentration of metal pollutants in refinery wastewaters is at or near treatable level, leaving little to no opportunity to reduce metals discharges through conventional end-of-pipe treatment.

For petroleum refineries, the metals TWPE in *TRIReleases2003_v2* increased by 38 percent compared to discharges in *TRIReleases2002_v4*. The three metal pollutants with the largest TWPE increases are lead, copper, and cadmium, as discussed below:

- **Cadmium**. Increase of 5000 percent attributed to a single facility, Sinclair Oil Tulsa Refinery, Tulsa, OK, which reports cadmium discharges as a range. The range increased from 1 – 10 lbs to 11 – 500 lbs. For database purposes, the discharge increased from 5 to 250 pounds (the median values of the ranges).

- **Lead**. Increase is attributed to a single facility, Chalmette Refining LLC, Chalmette, LA, which increased its reported lead discharge from 16 to 4,992 pounds. EPA is in the process of contacting this facility for additional information.

- **Copper**. Increase is attributed to a single facility, Chalmette Refining LLC, Chalmette, LA, which increased its copper discharge from 32 to 7,603 pounds. EPA is in the process of contacting this facility for additional information.

Discharges of other metals reported in TRI by petroleum refineries, in terms of pounds and TWPE, were consistent with the discharges in the 2004 detailed study.

Silver discharges from petroleum refineries reporting to *PCSLoads2002_v2* represent the fourth largest pollutant discharge in terms of TWPE. Silver is not currently regulated under the petroleum refining ELGs, and therefore refineries only monitor for silver if their permit contains state or water-quality-based limits. *PCSLoads2002_v2* shows silver discharges from seven facilities, for a total of 769 pounds. One facility, Premcor Refining Group in Port Arthur, TX, was responsible for approximately 98 percent (752 pounds) of the category's silver discharges. EPA contacted the Premcor Refining Group (now Valero Energy Corporation) requesting clarification of the reported silver discharge and the source of silver in wastewater. EPA determined that most of the times the facility analyzed its final effluent for silver, the metal was not detected above the sample detection limit (0.02 mg/L). The facility stated that since January 1, 2003, silver was only detected in 2 of 174 analyses (Hughes, 2006).

EPA determined that the conclusions drawn during the 2004 detailed study still apply because the discharges for most metals did not change from the 2004 detailed study to the 2006 annual review, and for those metals that did change, the change can be attributed to one facility. Therefore, EPA concludes that metals may be present in petroleum refining wastewaters, but their concentrations are at or near treatable levels, leaving little to no opportunity to reduce metals discharges through conventional end-of-pipe treatment.

14.5.4 Petroleum Refining Category Sulfide Discharges

During its 2004 detailed study of the Petroleum Refining Category, EPA found the following regarding sulfide discharges:

- Based on available analytical data, petroleum refineries are achieving final effluent concentrations less than baseline values and less than existing limits at 40 CFR Part 419; and

- Refineries are treating sulfide to concentrations at or near treatable levels.

Sulfide is currently regulated under the existing petroleum refining ELGs, and therefore, is monitored and reported for many facilities in *PCSLoads2002_v4*. In 2002, sulfide was reported by 77 of the 107 major dischargers reporting to PCS. The amount of sulfide discharged decreased from *PCSLoads2000_v6* to *PCSLoads2002_v4* by approximately 17 percent; however, the number of facilities reporting discharges of sulfide increased by 10 percent.

EPA determined that the conclusions drawn during the 2004 detailed study still apply because the amount of sulfide discharged decreased from the 2004 detailed study to the 2006 annual review. Therefore, EPA continues to find that petroleum refineries are achieving final sulfide concentrations less than baseline values and less than existing 40 CFR Part 419 limits.

14.5.5 Petroleum Refining Category Pollution Control Technologies

During the 2004 detailed study of the petroleum refining industry, EPA investigated treatment technologies for the control of dioxin and dioxin-like compounds, PACs, and sulfide. For more information about these control technologies, see the 2004 Technical Support Document (U.S. EPA, 2004). During the 2006 annual review, EPA did not identify any new control technologies in use for dioxin and dioxin-like compounds, PACs, metals, or sulfide in petroleum refinery wastewater. As new treatment technologies and/or pollution prevention methods become available, EPA will evaluate their treatment effectiveness compared with current pollutant discharges from petroleum refiners.

14.6 Petroleum Refining Category Conclusions

- EPA previously determined that dioxin and dioxin-like compounds are produced during catalytic reforming and catalyst regeneration operations at petroleum refineries. Of the 163 identified U.S. petroleum refineries, 17 report discharges of dioxin and dioxin-like compounds to TRI. Of the 17 refineries reporting discharges in 2002, only five reported dioxin discharges based on analytical measurements. Only two of these facilities detected dioxin and dioxin-like compounds above the Method 1613B minimum level and both of these facilities measured dioxin at the point immediately following catalytic regeneration and prior to wastewater treatment.

- Petroleum refineries report PACs discharges to TRI; however, these discharges are either based on one-half the detection limit multiplied by the flow or are estimated using emission factors. Out of 39 dischargers that reported PACs, EPA has verified only three petroleum refineries that measured PACs in their final effluent. Of these, two discharge indirectly to POTWs and receive additional treatment prior to discharge to surface waters and the third reported PAC discharges representing 81 TWPE. Therefore, there is little evidence that PACs are being discharged to surface waters in concentrations above the detection limit.

- Sulfide discharges are currently regulated by 40 CFR 419, and facilities are achieving final effluent concentrations less than baseline values and less than the existing limits.

- Metals may be present in petroleum refining wastewaters, but their concentrations are at or near treatable levels, leaving little to no opportunity to reduce metal discharges through conventional end-of-pipe treatment.

14.7 Petroleum Refining References

Beener, David. 2005. Telephone conversation with David Beener of ExxonMobil Joliet Refinery, Channahon, IL, and TJ Finseth of Eastern Research Group, Inc. "ExxonMobil Joliet Dioxin Discharges in TRI 2002." (June 2). DCN 01905.

Bennett, Toni. 2005. Telephone conversation with Toni Bennett of Calcasieu, Lake Charles, LA, and TJ Finseth of Eastern Research Group, Inc. "Calcasieu PACs Discharges in TRI 2002." (May 31). DCN 01908.

Brzuzy, Louis. 2006. Telephone conversation with Louis Brzuzy of Shell, Deer Park, TX, and TJ Finseth of Eastern Research Group, Inc. "Shell Deer Park Refinery Dioxin and Dioxin-Like Compound Discharges." (August 30). DCN 03772.

Chelpaty, Heather. 2006. Telephone conversation with Heather Chelpaty of Valero, Delaware City, DE, and TJ Finseth of Eastern Research Group, Inc. "Valero Delaware City Refinery Dioxin and Dioxin-Like Compounds and PACs Discharges." (August 7). DCN 03771.

GCA. Unknown. Gulf Coast Waste Disposal Authority. 2003 Peak Performance Award Application. DCN 04078.

Golden, Jan. 2005. Telephone conversation with Jan Golden of Flint Hills Resources, Corpus Christi, TX, and TJ Finseth of Eastern Research Group, Inc. "Flint Hills PACs Discharges in TRI 2002." (May 23). DCN 01904.

Hamann, Ernie, et al. 2005. Telephone conversation with Ernie Hamann and Brian Christlieb of Conoco Phillips, Wilmington, CA, and TJ Finseth of Eastern Research Group, Inc. "Dioxin Releases from Conoco Phillips Wilmington, CA to TRI 2002." (June 13). DCN 01906.

Hughes, Steve. 2006. Telephone conversation with Steve Hughes of Valero, Port Arthur, TX, and TJ Finseth of Eastern Research Group, Inc. "Valero Port Arthur Refinery Silver, Mercury, and Lead Discharges." (July 12). DCN 03770.

Marton, Reed. 2005. Telephone conversation with Reed Marton of Conoco Phillips Lake Charles Refinery, Westlake, LA, and TJ Finseth of Eastern Research Group, Inc. "Conoco Phillips Dioxin and PACs Discharges in TRI 2002 and Sulfide Discharge in PCS 2002." (May 20). DCN 01907.

Nelson, Jim, et al. 2004. Telephone conversation with Jim Nelson of BP Oil Co., Roger Claff of American Petroleum Institute, Jan Matuszko of U.S. EPA/EAD, and Jill Lucy of Eastern Research Group, Inc. "Dioxin Discharges from BP Oil Company's Toledo Refinery." (July 26). DCN 01172.

Pierce, D.W. 2005. Letter to T.J. Finseth, Eastern Research Group, Inc., from D.W. Pierce, Chevron. "Chevron Dioxin and PACs Wastewater Discharges." (July 22). DCN 01924.

Rosin, Scott. 2006. Telephone conversation with Scott Rosin of Tesoro, Kenai, AK, and TJ Finseth of Eastern Research Group, Inc. "Dioxin and PAC Discharges Reported to TRI from Tesoro Alaska." (September 7). DCN 03773.

Sheard, Honor. 2005. Telephone conversation with Honor Sheard of Marathon Ashland, Detroit, MI, and TJ Finseth of Eastern Research Group, Inc. "Marathon Ashland, Detroit, MI, Dioxin and PACs Discharges." (February 3). DCN 01545.

Spurling, Rebecca. 2005. Telephone conversation with Rebecca Spurling of Tesoro Northwest Co., Anacortes, WA, and TJ Finseth of Eastern Research Group, Inc. "Tesoro Northwest Dioxin Discharges in TRI 2002." (June 29). DCN 01957.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary 2005 Review of Prioritized Categories of Industrial Dischargers*. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

Zipf, Lynn. 2004. U.S. EPA. Memorandum to 304(m) Record, EPA Docket Number OW-2004-0074 from Lynn Zipf, EPA and Jan Matuszko, EPA. "Revisions to TWFs for Dioxin and its Congeners and Recalculated TWPEs for OCPSF and Petroleum Refining." (August 10). DCN 01166.

Table 14-11. 2000, 2002, and 2003 Dioxin Discharges Reported to TRI by Petroleum Refineries

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Did Facility Detect Dioxin and Dioxin-like Compounds at Any Level?	Information Collected by EPA on Dioxin Releases Reported to TRI in 2000, 2002, and 2003
			Grams[a]	TWPE[b]	Basis of Estimate[c]	Grams[a]	TWPE[b]	Basis of Estimate[c]	Grams[a]	TWPE[b]	Basis of Estimate[c]		
98221SHLLLWESTM	**Tesoro Northwest Co.**	**Anacortes, WA**	**5.20**	**97,100**	**M**	**1.63**	**45,500**	**M**	**1.70**	**47,000**	**M**	**Yes**	**Facility collected two samples of final effluent in both 2000 and 2001. Several congeners detected above the detection limit (Spurling, 2005).**
77590MRTHNFOOTO	Marathon Ashland Petroleum LLC	Texas City, TX	2	272,00	O	0.00435	301	O	NR	NR	NR	No	Because 2002/2003 reported dioxin discharges are small relative to other facilities, EPA has not contacted this facility.
70669CNCLKOLDSP	Conoco Lake Charles Refinery	Westlake, LA	0.54	73,400	E	0.539	48,600	O	0.539	48,600	O	No	Estimate is based on emission factors (Marton, 2005).
94802CHVRN841ST	Chevron Prods. Co. Richmond Refinery	Richmond, CA	0.34	45,600	O	0.76	19,200	O	0.682	36,800	O	No	Estimate is based on detection limit. Two samples were analyzed (no results above sample detection limit) (U.S. EPA, 2004).
90245CHVRN324WE	Chevron USA Prods. Co.	El Segundo, CA	0.33	30,100	M	0.109	11,200	M	0.344	35,300	M	No	Wastewater effluent was analyzed for dioxins in 2002. None of the congeners were detected above the sample detection limit. Estimate based on one-half the detection limit (Pierce, 2005).
43616SHLCM4001C	**BP Oil Co. Toledo Refinery**	**Oregon, OH**	**0.286**	**53,200**	**M**	**0.36**	**51,200**	**M**	**0.38**	**54,100**	**M**	**Yes**	**One set of samples was collected and analyzed: 9 congeners were above the detection limit (Nelson, 2004).**
07036XXN 1400P	Bayway Refining Co.	Linden, NJ	0.254	63,700	M	0.25	5,230	M	NR	NR	NR	No	Based on one-half the detection limit. Treated effluent samples are all not detected (U.S. EPA, 2004).
74603CNCPN1000S	Conoco Inc. Ponca City Refinery	Ponca City, OK	0.181	24,627	O	0.445	30,800	O	0.283	21,900	O	No	Discharge was estimated using non-refinery-specific data for dioxin in petroleum products (U.S. EPA, 2004).
59101CNCBL401SO	Conoco Inc. Billings Refinery	Billings, MT	0.162	22,000	O	NR	NR	NR	NR	NR	NR	No	Discharge was estimated using non-refinery-specific data for dioxin in petroleum products (U.S. EPA, 2004).
08066MBLLCBILLI	Valero Refining Co. New Jersey	Paulsboro, NJ	0.09	12,300	O	0.088	6,100	O	0.088	6,810	O	No	Facility reported wastewater release for 2000 should be 0.0002 grams (U.S. EPA, 2004).
00851HSSLVLIMET	Hovensa LLC	Christiansted, VI	0.0693	9,440	C	0.0335	2,320	C	1.10	85,200	C	No	Estimate based on EPA discharge factors (U.S. EPA, 2004).

Table 14-11 (Continued)

TRI ID	Refinery	Location	2000 TRI Grams[a]	2000 TRI TWPE[b]	2000 TRI Basis of Estimate[c]	2002 TRI Grams[a]	2002 TRI TWPE[b]	2002 TRI Basis of Estimate[c]	2003 TRI Grams[a]	2003 TRI TWPE[b]	2003 TRI Basis of Estimate[c]	Did Facility Detect Dioxin and Dioxin-like Compounds at Any Level?	Information Collected by EPA on Dioxin Releases Reported to TRI in 2000, 2002, and 2003
80022CNCDN5801B	Conoco Denver Refinery	Denver, CO	0.06	8,170	O	0.0950	6,580	E	0.074	5,730	E	No	Based on internally generated emission factors per corporate policy (U.S. EPA, 2004).
39567CHVRNPOBOX	Chevron Prods. Co. Pascagoula Refinery	Pascagoula, MS	0.035	4,770	O	0.086	3,680	O	0.099	4,230	O	No	Facility used monitoring data collected in 2001 from the catalytic reformer units to develop an emission factor (Pierce, 2005).
62454MRTHNMARAT	Marathon Ashland Petroleum LLC	Robinson, IL	0.03	4,080	O	0.04	2,780	O	0.0404	3,130	O	No	Because 2002/2003 reported dioxin discharges are small relative to other facilities, EPA has not contacted this facility.
00654PHLPSPHILI	Chevron Phillips Chemical Puerto Rico	Guayama, PR	0.00218	297	E	NR	NR	NR	0.00596	461	E	No	Because 2002/2003 reported dioxin discharges are small relative to other facilities, EPA has not contacted this facility.
70602CTGPTHIGHW	Citgo Petroleum Corp	Lake Charles, LA	0.0016	218	E	0.00257	178	E	0.00257	199	E	No	Based on EPA discharge factors (U.S. EPA, 2004).
79905CHVRN6501T	Chevron USA El Paso Refinery	El Paso, TX	0.0187	2,550	O	NR	NR	NR	NR	NR	NR	No	Based on one-half the detection limit (U.S. EPA, 2004).
90748NCLLS1660W	**Conoco Phillips Co. La Refinery Wilmington Plant**	**Wilmington, CA**	**0.320**	**-**	**M**	**0.28**	**22,300**	**M**	**0.0884**	**9,020**	**M**	**Yes**	**Facility used monitoring data collected from catalytic reformer discharge after regeneration. Facility detected all 17 congeners (Hamann, 2005).**
60434MBLJLINTER	ExxonMobil Oil Corp. Joliet Refinery.	Channahon, IL	NR	NR	NR	0.434	39,600	O	0.0007	64	O	No	For 2002, facility had monitoring data reporting TCDD as not detected. Discharge estimated based on one-half detection limit (Beener, 2005).
19706TXCDL2000W	Premcor Refining Group Inc Delaware City Refinery	Delaware City, DE	NR	NR	NR	NR	NR	NR	0.022	559	O	No	Facility estimated discharge based on dioxin and dioxin-like compound measurements from the co-located power plant, not from refinery wastewaters (Chelpaty, 2006).
77536DRPRK5900H	**Shell Chemical Company Deer Park**	**Deer Park, TX**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.152**	**14,600**	**O**	**Yes**	**TCEQ analyzed effluent for dioxin and dioxin-like compounds and detected six congeners in the particle-bound fraction and 16 congeners in the dissolved fraction. TCDD was not detected in either fraction (Brzuzy, 2006).**

Table 14-11 (Continued)

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Did Facility Detect Dioxin and Dioxin-like Compounds at Any Level?	Information Collected by EPA on Dioxin Releases Reported to TRI in 2000, 2002, and 2003
			Grams[a]	TWPE[b]	Basis of Estimate[c]	Grams[a]	TWPE[b]	Basis of Estimate[c]	Grams[a]	TWPE[b]	Basis of Estimate[c]		
99611TSRLSMILE2	**Tesoro Alaska - Kenai Refinery**	**Kenai, AK**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.0006**	**46**	**M**	**Yes**	**Facility used monitoring data collected from catalytic reformer discharge after regeneration in 2003. Facility detected 5 congeners; however, none were detected above the Method 1613B minimum level (Rosin, 2006).**
Refineries Not in EPA's Analysis: No Discharge of Dioxins													
48217MRTHN1300S	Marathon Ashland Petroleum LLC	Detroit, MI	8.06	0	NA[d]	8.06	0	O	-	-	-	No	Incorrect number reported for 2000 and 2002: should be zero discharge. Refinery submitted TRI correction form (Sheard, 2005).

Source: *TRIReleases2003_v2*; *TRIReleases2002_v4*; Memorandum: Revisions to TWFs for Dioxin and its Congeners and Recalculated TWPEs for OCPSF and Petroleum Refining (Zipf, 2004).
NR – Not Reported.
[a]For indirect discharges, the mass shown is the mass transferred to the POTW that is ultimately discharged to surface waters, accounting for an estimated 83% removal of dioxin and dioxin-like compounds by the POTW.
[b]The TWPEs in this table were calculated using the 2006 TWFs (the 2006 dioxin and dioxin-like compound TWFs did not change from the August or December 2004 TWFs).
[c]Refineries reported basis of estimate in TRI as: M - Monitoring data/measurements; C - Mass balance calculations; E - Published emission factors; and O - Other approaches (e.g., engineering calculations).
[d]No basis of estimate was reported.
Note: Bolded lines indicate facilities that measured for and detected dioxin and dioxin-like compounds.

Table 14-12. 2000, 2002, and 2003 PACs Discharges Reported to TRI by Petroleum Refineries

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Information Collected by EPA on 2000, 2002, and 2003 PAC Discharge Estimates
			Pounds[a]	TWPE[b]	Basis of Estimate[c]	Pounds[a]	TWPE[d]	Basis of Estimate[c]	Pounds[a]	TWPE[e]	Basis of Estimate[c]	
77592TXSCTLOOP1	Valero Refining Co. Texas	Texas City, TX	64	14,800	M	69	1,810	M	NR	NR	NR	Estimate based on one-half the detection limit. One sample contained PACs (U.S. EPA, 2004).
94572NCLSNOLDHI	Tosco San Francisco Refinery	Rodeo, CA	57	13,100	M	8	210	M	NR	NR	NR	Estimate based on one-half the detection limit (U.S. EPA, 2004).
70037LLNCRHIGHW	Tosco Refining Co. Alliance Refinery	Belle Chasse, LA	40	9,220	O	31	815	M	34.9	887	M	Estimate based on one-half the detection limit (U.S. EPA, 2004).
70669CNCLKOLDSP	Conoco Lake Charles Refinery	Westlake, LA	22	5,069	O	31	815	O	51	1,300	O	Estimate based on emission factors (Marton, 2005).
96707CHVRN91480	Chevron Prods. Co. Hawaii Refinery	Kapolei, HI	20	4,610	M	277	7,280	M	261	6,630	M	Estimate based on one-half the detection limit. Individual PACs sampled from 2000 NPDES permit renewal were all nondetect (Pierce, 2005).
99611TSRLSMILE2	Tesoro Alaska Co. Kenai Refinery	Kenai, AK	19	4,380	O	19	497	O	18.9	480	O	Facility measured eight PACs in the refinery effluent in October 2000. However, none of the eight individual PACs were measured above the method detection limit (Rosin, 2006).
39567CHVRNPOBOX	Chevron Prods. Co. Pascagoula Refinery	Pascagoula, MS	17	3,920	O	110	2,890	O	115	2,920	O	Estimates based on EPA's BAT effluent guidelines estimate for PACs (Pierce, 2005).
62454MRTHNMARAT	Marathon Ashland Petroleum LLC	Robinson, IL	15	3,460	O	21	552	O	1	25	O	Because the facility reports the basis of estimate as "other", EPA has not contacted this facility.
62084SHLLLRTE11	Tosco Wood River Refinery	Roxana, IL	10	2,300	O	9	234	O	10	254	O	Estimate based on one-half the detection limit (U.S. EPA, 2004).

Table 14-12 (Continued)

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Information Collected by EPA on 2000, 2002, and 2003 PAC Discharge Estimates
			Pounds[a]	TWPE[b]	Basis of Estimate[c]	Pounds[a]	TWPE[d]	Basis of Estimate[c]	Pounds[a]	TWPE[e]	Basis of Estimate[c]	
74603CNCPN1000S	Conoco Inc. Ponca City Refinery	Ponca City, OK	9	2,070	O	8	210	O	8	203	O	Refinery estimated discharge using API data for PACs in petroleum products (U.S. EPA, 2004).
84116CHVRN2351N	Chevron USA Prods. Co	Salt Lake City, UT	8	1,840	O	59	1,550	M	59	1,500	M	EPA has not contacted this facility.
80022CNCDN5801B	Conoco Denver Refinery	Commerce City, CO	5	1,150	O	9	237	O	53	1,350	O	Estimate based on internally generated emission factors (U.S. EPA, 2004).
70047TRNSM14902	Orion Refining Corp.	New Sarpy, LA	4	922	C	9	237	O	9	229	O	Estimate based on one-half the detection limit (U.S. EPA, 2004).
90744TXCRF2101E	Equilon Enterprises LLC Los Angeles Refining	Wilmington, CA	3	732	O	3	83	NA[f]	0.957	24	M	Because 2002/2003 reported PACs discharges are small relative to other facilities, EPA has not contacted this facility.
77017LYNDL12000	**Lyondell-Citgo Refining L.P.**	**Houston, TX**	**175**	**40,400**	**NA[f]**	**163**	**4,290**	**M**	**154**	**3,930**	**O**	**Indirect discharger - PACs were detected in refinery effluent, but were not detected in the POTW effluent (the Gulf Coast Waste Authority) (GCA).**
77506CRWNC111RE	Crown Central Petroleum Corp. Houston Refinery	Pasadena, TX	7	1,650	NA[f]	5	121	NA[f]	NR	NR	NR	Indirect discharger - PACs were not detected in the POTW effluent (U.S. EPA, 2004).
48217MRTHN1300S	**Marathon Ashland Petroleum L.L.C.**	**Detroit, MI**	**6**	**1,370**	**NA[f]**	**7**	**180**	**NA[f]**	**6.75**	**172**	**M**	**Facility detected five PACs in final effluent (Sheard, 2005).**
79905CHVRN6501T	Chevron USA El Paso Refinery	El Paso, TX	4	933	NA[f]	2	46	NA[f]	NR	NR	NR	Estimate based on one-half the detection limit (U.S. EPA, 2004).
70606CLCSRWESTE	Calcasieu	Lake Charles, LA	1.1[g]		M	191	5,020	O	182	4,630	O	Estimate based on emission factors (Bennett, 2005).

Table 14-12 (Continued)

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Information Collected by EPA on 2000, 2002, and 2003 PAC Discharge Estimates
			Pounds[a]	TWPE[b]	Basis of Estimate[c]	Pounds[a]	TWPE[d]	Basis of Estimate[c]	Pounds[a]	TWPE[e]	Basis of Estimate[c]	
67042TXCRF1401S	Frontier	El Dorado, KS	1.1[g]		O	1	26	O	0.7	18	O	Not in *TRIReleases2000_v4*: 1.1 lb/yr discharge PACs based on discharges at similar refinery reported to TRI (U.S. EPA, 2004).
00851HSSLVLIMET	Hovensa L.L.C.	Christiansted, VI	2	461	NA[f]	NR	NR	NR	NR	NR	NR	Discharge from accidental spill; monitoring data indicate zero discharge of PACs (U.S. EPA, 2004).
78410KCHRFSUNTI	Flint Hills Resources L.P. West Plant	Corpus Christi, TX	NR	NR	NR	1,770	46,500	M	8	203	M	Estimate based on one-half the detection limit. Facility did not detect any PACs in final effluent (Golden, 2005).
90245CHVRN324WE	Chevron USA Inc. Chevron Prods. Co. Div.	El Segundo, CA	NR	NR	NR	287	7,530	M	117	2,970	M	In 2002, facility analyzed wastewater for seven PACs: all were nondetect. Estimate based on EPA's BAT effluent guidelines estimate for PACs (Pierce, 2005).
19706TXCDL2000W	**Premcor Refining Group**	**Delaware City, DE**	**NR**	**NR**	**NR**	**1.4**	**37**	**O**	**3.2**	**81**	**O**	**In 2002 and 2003, the facility detected eight individual PACs in the refinery effluent from wastewater treatment (Chelpaty, 2006).**
77590MRTHNFOOTO	Marathon Ashland Petroleum L.L.C.	Texas City, TX	NR	NR	NR	93	2,450	M	30.2	768	M	EPA has not contacted this facility.
70750HLLPTHWY10	Valero Refining Co. Louisiana	Krotz Springs, LA	NR	NR	NR	19	499	O	19	483	O	EPA has not contacted this facility.
74107SNCLR902W2	Sinclair Oil Corp. Tulsa Refinery.	Tulsa, OK	NR	NR	NR	17	452	M	17.7	450	M	EPA has not contacted this facility.
94802CHVRN841ST	Chevron Prods. Co. Richmond Refinery.	Richmond, CA	NR	NR	NR	14	363	M	14.8	376	M	EPA has not contacted this facility.
73098KRRMC906SO	Wynnewood Refining Co.	Wynnewood, OK	NR	NR	NR	10	263	O	10	254	O	EPA has not contacted this facility.

Table 14-12 (Continued)

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Information Collected by EPA on 2000, 2002, and 2003 PAC Discharge Estimates
			Pounds[a]	TWPE[b]	Basis of Estimate[c]	Pounds[a]	TWPE[d]	Basis of Estimate[c]	Pounds[a]	TWPE[e]	Basis of Estimate[c]	
59101CNCBL401SO	Conoco Phillips Billings Refinery.	Billings, MT	NR	NR	NR	8	210	M	0.4	10	M	EPA has not contacted this facility.
70723TXCRFFOOTO	Convent Refinery.	Convent, LA	NR	NR	NR	2	61	O	2	51	O	EPA has not contacted this facility.
79905LPSRF6500T	Western Refining Co. El Paso Refinery.	El Paso, TX	NR	NR	NR	2	47	NA[f]	4.01	102	O	EPA has not contacted this facility.
94553TSCCRAVONR	Tesoro Refining & Marketing Co.	Martinez, CA	NR	NR	NR	1.3	34	M	0.6	15	M	EPA has not contacted this facility.
98221PGTSN600ST	Shell Oil Prods. U.S. Puget Sound Refinery.	Anacortes, WA	NR	NR	NR	1.1	28	O	0.9	23	O	EPA has not contacted this facility.
82701WYMNG740WE	Wyoming Refining Co.	Newcastle, WY	NR	NR	NR	1.1	28	E	-	-	-	EPA has not contacted this facility.
08861CHVRN1200S	Chevron Prods. Co.	Perth Amboy, NJ	NR	NR	NR	0.8	21	O	0.6	15	O	EPA has not contacted this facility.
93420NCLSN2555W	Conoco Phillips Santa Maria Facility	Arroyo Grande, CA	NR	NR	NR	0.8	21	O	2	51	O	EPA has not contacted this facility.
19061BPLCMPOSTR	Conoco Phillips Co. Trainer Refinery.	Trainer, PA	NR	NR	NR	0.4	11	O	0.2	5.08	O	EPA has not contacted this facility.
93307KRNLRRR677	Kern Oil & Refining Co.	Bakersfield, CA	NR	NR	NR	0.02	1	NA[f]	0.0206	0.52	M	EPA has not contacted this facility.
42501THSMR501RE	Somerset Refinery. Inc.	Somerset, KY	NR	NR	NR	0.01	0	M	0.08	2.03	M	EPA has not contacted this facility.
36611BLCHRVIADU	Trigeant Ep Ltd	Chickasaw, AL	NR	NR	NR	NR	NR	NR	0.000662	0.017	C	EPA has not contacted this facility.
46394MCLC2815I	BP Products North America Whiting Business Unit	Whiting, IN	NR	NR	NR	NR	NR	NR	1	25	O	EPA has not contacted this facility.
70051MRTHNHWY61	Marathon Ashland Petroleum LLC	Garyville, LA	NR	NR	NR	NR	NR	NR	5	127	C	EPA has not contacted this facility.
70143TNNCL500WE	Chalmette Refining LLC	Chalmette, LA	NR	NR	NR	NR	NR	NR	11	280	O	EPA has not contacted this facility.

Table 14-12 (Continued)

TRI ID	Refinery	Location	2000 TRI			2002 TRI			2003 TRI			Information Collected by EPA on 2000, 2002, and 2003 PAC Discharge Estimates
			Pounds[a]	TWPE[b]	Basis of Estimate[c]	Pounds[a]	TWPE[d]	Basis of Estimate[c]	Pounds[a]	TWPE[e]	Basis of Estimate[c]	
78408STHWS1700N	Flint Hills Resources L.P. East Plant	Corpus Christi, TX	NR	NR	NR	NR	NR	NR	1	25	M	EPA has not contacted this facility.

Source: *TRIReleases2003_v2*; *TRIReleases2002_v4*; *TRIReleases2000_v4*.
NR – Not Reported.
[a]For indirect dischargers, the mass shown is the mass transferred to the POTW that is ultimately discharged to surface waters, accounting for an estimated 92.64% removal of PACs by the POTW.
[b]The 2000 TWPE was calculated using the August 2004 TWFs.
[c]Refineries reported basis of estimate in TRI as: M - Monitoring data/measurements; C - Mass balance calculations; E - Published emission factors; and O - Other approaches (e.g., engineering calculations).
[d]The 2002 TWPE was calculated using the December 2004 TWFs.
[e]The 2003 TWPE was calculated using the April 2006 TWFs.
[f]No basis of estimate was reported.
[g]The facility discharge is not in *TRIReleases2000_v4*; however, industry commented that 1.1 pounds of PACs were reported to TRI in 2000 as discharged.
Note: Bolded lines indicate facilities that measured for and detected PACs.

15.0 PLASTICS MOLDING AND FORMING (40 CFR PART 463)

EPA selected the Plastics Molding and Forming (PMF) Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FR 51050, August 29, 2005). The high TWPE for the PMF Category is due primarily to carbon disulfide discharges from six cellulose products manufacturers (U.S. EPA, 2005b). Excluding these discharges from the category reduces the combined PCS and TRI TWPE for 2002 by approximately 73 percent. This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the PMF category. EPA's 2006 annual review builds on the 2005 annual review.

15.1 PMF Category Background

This subsection provides background on the PMF Category including a brief profile of the PMF industry, background on 40 CFR Part 463, and background on 40 CFR Part 63 Subpart UUU, the Cellulose Products National Emission Standards for Hazardous Air Pollutants (NESHAP).

15.1.1 PMF Industry Profile

The plastics molding and forming industry includes facilities that are engaged in blending, molding, forming, or other types of processing of plastic materials. These processes commonly include extrusion, coating and laminating, thermoforming, calendaring, casting, foaming, cleaning, and finishing (U.S. EPA, 1984). Table 15-1 lists the nine SIC codes with operations in the PMF Category.

Table 15-1. Number of Facilities in Plastics Molding and Forming SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]
3081: Unsupported Plastics Film & Sheet	866	59	78
3082: Unsupported Plastics Profile Shapes	670	1	28
3083: Laminated Plastics Plate, Sheet, & Profile Shapes	291	4	68
3084: Plastics Pipe	437	5	25
3085: Plastics Bottles	403	2	3
3086: Plastics Foam Products	1,185	6	222
3087: Custom Compounding of Purchased Resin	579	14	200
3088: Plastics Plumbing Fixtures	541	0	165
3089: Plastics Products, NEC	12,689	34	670
Total	**17,661**	**125**	**1,458**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
NEC - Not elsewhere classified.

15.1.2 40 CFR Part 463

EPA first promulgated ELGs for the PMF Category (40 CFR Part 463) on December 17, 1984 (49 FR 49040). There are three subcategories, all of which have BPT, NSPS, PSES, and PSNS limitations.

EPA determined in the 2005 annual review that the facilities responsible for the majority of the category TWPE in *TRIReleases2002_v2* and *PCSLoads2002_v2* manufacture cellulose film, sponge, and meat casings (U.S. EPA, 2005b). The discharges from these cellulose products manufacturers are not covered by Part 463. The products are made of regenerated cellulose using the viscose process. The applicability of the PMF Category excludes products manufactured from regenerated cellulose, as well as the molding and forming of regenerated cellulose (U.S. EPA, 1984). Further, the *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Plastics Molding and Forming Point Source Category* states that 40 CFR Part 414, Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) Point Source Category, covers only the manufacture of rayon, a regenerated cellulose fiber, and excludes the manufacture of cellulose film, sponge, and meat casings (U.S. EPA, 1987; U.S. EPA, 2005c). Thus, wastewater discharges from the manufacture of cellulose products are not covered by any existing categorical effluent limitations guidelines or pretreatment standards. Additionally, neither PMF nor OCPSF regulate discharges of carbon disulfide, the pollutant of concern for the cellulose products manufacturers identified in the 2005 annual review.

15.1.3 40 CFR Part 63 Subpart UUUU

The NESHAP for Cellulose Products Manufacturing (40 CFR Park 63, Subpart UUUU) was proposed on August 2000 and promulgated on June 11, 2002 (67 FR 40055). The Cellulose Products Manufacturing NESHAP regulates the following source categories:

- **Miscellaneous Viscose Processes**. Includes the cellulose food casings, rayon, cellulosic sponge, and cellophane manufacturing industries.

- **Cellulose Ethers Production**. Includes the methyl cellulose, hydroxypropyl methyl cellulose, hydroxypropyl cellulose, hydroxyethyl cellulose, and carboxymethly cellulose manufacturing industries.

The Cellulose Products Manufacturing NESHAP establishes emissions limits for hazardous air pollutants HAP, such as carbon disulfide, carbonyl sulfide, ethylene oxide, methanol, methyl chloride, propylene oxide, and toluene. The Cellulose Products Manufacturing NESHAP includes requirements for the reduction in HAP emissions from process vents, carbon disulfide unloading and storage, toluene storage, equipment leaks and wastewater. EPA determined that wastewater generation for existing sources, for both the Miscellaneous Viscose Processes and Cellulose Ethers Production source categories, would increase by approximately 2.1 million gallons per year relative to the baseline due to the installation of air pollution control devices, such as Lo-Cat® scrubbers and carbon adsorbers (see 67 FR 40055, June 11, 2002).

The Cellulose Products Manufacturing NESHAP requires emission reductions for the cellulose food casing, cellulosic sponge, cellophane, and rayon manufacturing industries in the Miscellaneous Viscose Process Source Category. These industries are required to reduce HAP emissions from process vents in the following amounts:

- **Cellulose Food Casings**. Reduce total uncontrolled sulfide emissions, reported as carbon disulfide, by at least 25 percent based on a 6-month rolling average.

- **Cellulosic Sponge**. Reduce total uncontrolled sulfide emissions, reported as carbon disulfide, by at least 75 percent based on a 6-month rolling average.

- **Cellophane**. Reduce total uncontrolled sulfide emissions, reported as carbon disulfide, by at least 75 percent based on a 6-month rolling average.

- **Rayon**. Reduce total uncontrolled sulfide emissions, reported as carbon disulfide, by at least 35 percent within three years from the effective date based on a 6-month rolling average. Additional reductions of total uncontrolled sulfide emissions are required by at least 40 percent within eight years from the effective date based on a 6-month rolling average.

Additionally, all cellulose products manufacturing facilities must reduce by at least 83 percent their uncontrolled carbon disulfide emissions from process vents, unloading and storage operations, equipment leaks, and wastewater no later than June 13, 2005 for existing sources (see 67 FR 40055, June 11, 2002).

15.2 PMF Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the PMF Category including the screening-level review and category-specific review.

15.2.1 PMF Category 2005 Screening-Level Review

Table 15-2 presents the PMF Category TWPE calculated using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 15-2. PMF Category 2005 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
Plastic Molding and Forming	466[c]	97,297	97,762

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Excludes discharges from Innovia Films Inc. These discharges were excluded from the category PCS TWPE because, after initial review, EPA determined the discharges were not representative of the PMF category (U.S. EPA, 2005a). However, Innovia Films Inc. discharges were included in the 2005 detailed review of the PMF category, discussed in Section 15.4.

15.2.2 PMF Category 2005 Pollutants of Concern

Table 15-3 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five pollutants with the highest TWPE in *PCSLoads2002_v2*. Discharges from Innovia Films Inc. were not included in the 2005 screening-level review category totals presented in Table 15-2, but are included in Table 15-3. The top five pollutants account for approximately 92 percent of the TRI and PCS 2002 combined TWPE.

Carbon disulfide contributed 58 percent of the category TRI TWPE for 2002 and approximately 97 percent of the category PCS TWPE for 2002. EPA reviewed web sites for facilities reporting carbon disulfide discharges to TRI and PCS in 2002 and determined that all the facilities manufacture regenerated cellulose products (Devro, Unknown; Innovia Films, 2004; Spontex, 2004; Viskase, 2002).

One facility, Sealed Air Corporation Cryovac Division, Simpsonville, SC, reported discharges of dioxin and dioxin-like compounds that contributed 34 percent of the category TRI TWPE for 2002. Section 15.5.4 presents additional discussion about the dioxin and dioxin-like compounds discharges.

Table 15-3. 2005 Annual Review: PMF Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]		
	Number of Facilities Reporting Chemical	Total Pounds Released	TWPE	Number of Facilities Reporting Chemical	Total Pounds Released	TWPE
Carbon Disulfide	1	60,041	168,125	4	20,252	56,709
Dioxin and Dioxin-Like Compounds	Pollutants are not reported to PCS.			1	0.0015 (0.683 g)	33,452
Sodium Nitrite				1	13,937	5,203
Lead and Lead Compounds				45	274	614
Formaldehyde				5	191,411	446
Magnesium	1	1,829,470	1,583	Pollutants are not reported to TRI.		
Sulfate	1	197,419,795	1,106			
Nitrogen, Nitrate Total (as N)	1	144,077	807			
Calcium	1	10,333,219	289			
PMF Category Total	**9**	**214,533,873**	**172,483**	**153**	**1,380,691**	**97,297**

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.
[a]Discharges include major dischargers only. Discharges from Innovia Films Inc. are included, so the PMF Category total for 2002 PCS is higher than from the 2005 screening-level review presented in Table 15-2.
[b]Discharges include transfers to POTWs and account for POTW removals.

15.2.3 PMF Category Cellulose Products Facilities 2005 Pollutants of Concern

Table 15-4 separates the discharges from the cellulose products manufacturers and the rest of the category for *TRIReleases2002_v2* and *PCSLoads2002_v2*. The cellulose products manufacturers account for 73 percent of the combined 2002 TRI and PCS category TWPE. Almost all of the TWPE for the cellulose products manufacturers is from discharges of carbon disulfide.

Table 15-4. 2005 Annual Review: PMF Category Discharges Excluding Cellulose Products Manufacturers

	2002 PCS[a]		2002 TRI[b]	
	Total Pounds Discharged	TWPE	Total Pounds Discharged	TWPE
Cellulose Products Manufacturers	212,796,835	172,170	39,830	56,879
PMF Category Excluding Cellulose Products Manufacturers	1,737,038	313	1,340,861	40,418
Total	**214,533,873**	**172,483**	**1,380,691**	**97,297**

Source: *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include major dischargers only. Discharges from Innovia Films Inc. are included.
[b]Discharges include transfers to POTWs and account for POTW removals.

15.3 Potential New Subcategories for the PMF Category

EPA did not identify any potential new subcategories for the PMF category.

15.4 PMF Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the PMF Category. EPA obtained additional data and identified:

- Errors in how PCS loads were estimated for one facility; and
- Changes in estimates of TWPE for sodium nitrite and nitrate.

15.4.1 PMF Category Facility Discharge Revisions

EPA determined that one facility, Innovia Films Inc., responsible for 97 percent of the *PCSLoads2002_v2* TWPE, reported an SIC code in *TRIReleases2002_v2* that linked to the Pulp, Paper, and Paperboard Point Source Category. Innovia Films Inc. manufactures cellophane, a regenerated cellulose product. EPA concluded that discharges from Innovia Films Inc. should be included in the PMF Category with the other facilities manufacturing regenerated cellulose products. The revised TRI database, *TRIReleases2002_v4,* incorporates this change.

EPA contacted Innovia Films Inc., the only facility reporting discharges of carbon disulfide for the PMF Category in *PCSLoads2002_v2*. Innovia Films Inc. provided corrections to the effluent flow (Martin, 2006), allowing EPA to recalculate the pounds of pollutants discharged. The TWPE for Innovia Films Inc. were reduced by approximately 88 percent. Table 15-5 lists the changes to the pollutant load for Innovia Films Inc. which is incorporated in the revised PCS database *PCSLoads2002_v4*.

Table 15-5. PCS Database Changes for Innovia Films Inc.

Pollutant	Before Database Corrections, *PCSLoads2002_v2*		After Database Corrections, *PCSLoads2002_v4*	
	Pounds Discharged	TWPE	Pounds Discharged	TWPE
Carbon Disulfide	60,041	168,125	7,066	19,785
Nitrogen, Nitrate Total (as N)	144,077	807	34,173	109
Calcium	10,333,219	289	1,277,219	36
Chlorine	182	92	113	58
Magnesium	1,829,470	1,583	188,815	163
Sulfate	197,419,795	1,106	24,187,480	135
Nitrogen, Ammonia	10,231	15	2,232	3
Toluene	4	0.02	4	0.02
Total	**212,557,816**	**172,018**	**25,697,102**	**20,372**

Source: *PCSLoads2002_v2; PCSLoads2002_v4*.

15.4.2 PMF Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review EAD revised the TWF and POTW removal values used for sodium nitrite in the TRI and PCS databases to better reflect the pollutant’s properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373), and the POTW removal is now 90 percent (formerly 1.85 percent). EAD also revised the TWF for nitrate compounds to better reflect the pollutant’s properties. The TWF that EAD applies for nitrate compounds is now 0.000062 (formerly 0.000747). EPA also developed a TWF of 0.0032 for nitrate as N, a pollutant parameter reported only to PCS (formerly 0.0056 based on nitrate TWF). Table 15-6 shows the resulting changes in EPA’s estimated sodium nitrite, nitrate compounds, and nitrate as N for the PMF Category.

Table 15-6. Impact of Changes to TWF and POTW Percent Removal for the PMF Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	1	5,203	0.92
TRI 2002	Nitrate Compounds	10	13	2,199
PCS 2002	Nitrate as N[a]	1	807	109

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*; *PCSLoads2002_v2*; *PCSLoads2002_v4*.
[a]Total pounds of nitrate as N discharged decreased due to Innovia Films Inc. load corrections.

15.4.3 PMF Category 2006 Screening-Level Review

The results of the 2006 screening-level review are the TRI and PCS rankings after the revisions described in Section 4.2. This accounts for methodology changes described in Section 4.2 and changes made based on facility contacts. For the PMF Category, the most significant changes are also described in Sections 15.4.1 and 15.4.2. Table 15-7 shows the 2006 screening-level TWPE estimated for the PMF Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 15-7. PMF Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
PMF	20,838	117,741	111,409

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

15.4.4 PMF Category 2006 Pollutants of Concern

Table 15-8 presents the pollutants of concern for the PMF Category as part of the 2006 annual review. After the database corrections, carbon disulfide continues to be the top PMF Category pollutant, in terms of TWPE. Nitrate compounds discharges are now a pollutant of concern due to the increase in TWF. Sodium nitrite is no longer a pollutant of concern due to the decrease in TWF and increase in POTW percent removal. Nitrate as N is also no longer a pollutant of concern due to the decrease in TWF.

One facility, Sealed Air Corporation Cryovac Division, Simpsonville, SC, reported dioxin and dioxin-like compounds that contributed 34 percent of the category TRI TWPE for 2002 and 38 percent of the category TRI TWPE in 2003. Sealed Air Corporation Cryovac Division manufactures plastic wrap for fresh meats, cheeses, vegetables, and baked goods. Table 15-9 presents the discharges of dioxin and dioxin-like compounds for 2002 to 2004 for this facility. The total pounds discharged before POTW removal are presented because the facility is an indirect discharger. The facility’s discharges of dioxin and dioxin-like compounds reported to TRI in 2004 are 91 percent lower than discharges reported to TRI in 2002.

Table 15-8. 2006 Annual Review: PMF Category Pollutants of Concern

<table>
<tr><th rowspan="2">Pollutant</th><th colspan="3">2002 PCS[a]</th><th colspan="3">2002 TRI[b]</th><th colspan="3">2002 TRI[b]</th></tr>
<tr><th>Number of Facilities Reporting Pollutant</th><th>Total Pounds Released</th><th>TWPE</th><th>Number of Facilities Reporting Pollutant</th><th>Total Pounds Released</th><th>TWPE</th><th>Number of Facilities Reporting Pollutant</th><th>Total Pounds Released</th><th>TWPE</th></tr>
<tr><td>Carbon Disulfide</td><td>1</td><td>7,066</td><td>19,785</td><td>6</td><td>28,626</td><td>80,157</td><td>6</td><td>23,223</td><td>65,028</td></tr>
<tr><td>Dioxin and Dioxin-Like Compounds</td><td rowspan="4" colspan="3">Pollutants are not in the top five pollutants reported to PCS in 2002.</td><td>0.0015 (0.683 g)</td><td>33,452</td><td>33,452</td><td>1</td><td>0.0010 (0.474 g)</td><td>41,950</td></tr>
<tr><td>Nitrate Compounds</td><td>394,162</td><td>2,207</td><td>2,207</td><td>10</td><td>392,646</td><td>2,199</td></tr>
<tr><td>Lead and Lead Compounds</td><td>274</td><td>614</td><td>614</td><td>54</td><td>395</td><td>886</td></tr>
<tr><td>Formaldehyde</td><td>191,411</td><td>446</td><td>446</td><td>4</td><td>198,355</td><td>462</td></tr>
<tr><td>Magnesium</td><td>1</td><td>188,815</td><td>163</td><td rowspan="4" colspan="3">Pollutants are not in the top five pollutants reported to TRI in 2002.</td><td rowspan="4" colspan="3">Pollutants are not in the top five pollutants reported to TRI in 2003.</td></tr>
<tr><td>Copper</td><td>3</td><td>217</td><td>138</td></tr>
<tr><td>Sulfate</td><td>1</td><td>24,187,480</td><td>135</td></tr>
<tr><td>Nitrogen, Ammonia</td><td>6</td><td>116,858</td><td>130</td></tr>
<tr><td>PMF Category Total</td><td>9[c]</td><td>27,998,002</td><td>20,838</td><td>153[c]</td><td>1,385,366</td><td>117,741</td><td>159[c]</td><td>1,492,648</td><td>111,409</td></tr>
</table>

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*; *PCSLoads2002_v4*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

Table 15-9. Sealed Air Corporation Cryovac Division Dioxin and Dioxin-Like Compounds Discharges

Year	Basis of Estimate	Total Pounds (Grams) Discharged to POTW	Total Pounds (Grams) Discharged to Surface Water[a]	TWPE
2000	Monitoring or Measurements	0.05005 (22.7)	0.00851 (3.86)	288,065
2001	Monitoring or Measurements	0.04321 (19.6)	0.00735 (3.33)	213,739
2002	Monitoring or Measurements	0.00886 (4.02)	0.00151 (0.68)	33,457
2003	Other	0.00615 (2.79)	0.00105 (0.47)	41,957
2004	Monitoring or Measurements	0.00079 (0.36)	0.00013 (0.06)	5,414

Source: Envirofacts.
[a]Discharges to surface water reflect the mass and TWPE estimated by EPA after POTW treatment (i.e., the removal of dioxin and dioxin-like compounds at the POTW is accounted for).

15.5 Regenerated Cellulose Products Discussion

In 2005, EPA reviewed the PMF Category and determined that carbon disulfide was the pollutant with the highest TWPE. In the TRI and PCS databases, carbon disulfide discharges come from facilities that manufacture regenerated cellulose products, such as cellophane, cellulosic sponge, and meat casings (U.S. EPA, 2005b). As a result, Section 15.5 focuses on facilities manufacturing regenerated cellulose products, and includes a process description, information about facilities that manufacture cellulose products, wastewater sources of carbon disulfide, and wastewater treatment at facilities that manufacture cellulose products.

15.5.1 Regenerated Cellulose Process Description

In 2000, EPA's Office of Air Quality Planning and Standards (OAQPS) completed a study of the cellulose products manufacturing facilities in support of the Cellulose Products Manufacturing NESHAP. The information gathered during the OAQPS study is summarized in the memorandum *Industry Profile of Cellulose Products Manufacturing Facilities in the U.S* (Schmidtke, 2000). The process description that follows is based on the description in this memorandum.

The viscose process is used to manufacture cellulose film, sponge, meat casings, and rayon. In the viscose process, sheets of dissolving-grade cellulose pulp are saturated with caustic to convert the cellulose into alkali cellulose. The alkali cellulose is pressed to remove the excess caustic and is shredded to increase the surface area for easier processing. After shredding, the alkali cellulose resembles "white crumbs." The alkali cellulose partially oxidizes and degrades by aging in ambient air. The aged alkali cellulose and gaseous carbon disulfide are mixed in a vessel to form sodium cellulose xanthate, resembling "yellow crumbs." The sodium cellulose xanthate is dissolved in aqueous caustic solution, creating the viscose solution. The viscose is ripened, filtered, degassed, and extruded prior to regeneration of the cellulose.

Regenerated cellulose is formed by adding sulfuric acid to the viscose solution (Schmidtke, 2000). The following reactions describe the basic viscose process:

1. Alkali Cellulose
   $(C_6H_9O_4\text{-}OH)_x + NaOH \rightarrow (C_6H_9O_4\text{-}ONa)_x + H_2O$
   Cellulose + Sodium Hydroxide → Alkali Cellulose + Water

2. Sodium Cellulose Xanthate
   $(C_6H_9O_4\text{-}ONa)_x + CS_2 \rightarrow (C_6H_9O_4\text{-}O\text{-}CS_2Na)_x$
   Alkali Cellulose + Carbon Disulfide → Sodium Cellulose Xanthate

3. Viscose Solution
   $(C_6H_9O_4\text{-}O\text{-}CS_2Na)_x + NaOH + H_2O \rightarrow (C_6H_9O_4\text{-}O\text{-}CS_2Na)_x \bullet H_2O$
   Sodium Cellulose Xanthate + Sodium Hydroxide + Water → Viscose Solution

4. Regenerated Cellulose
   $(C_6H_9O_4\text{-}O\text{-}CS_2Na)_x \bullet H_2O + H_2SO_4 \rightarrow (C_6H_9O_4\text{-}OH)_x + CS_2 + H_2S + S + H_2SO_4 + Na_2SO_4 + CO_2$
   Viscose Solution + Sulfuric Acid → Regenerated Cellulose + Carbon Disulfide + Hydrogen Sulfide + Sulfur + Sulfuric Acid + Sodium Sulphate + Carbon Disulfide

The manufacture of rayon, cellophane, and meat casings differ in the type of extrusion dye and the post-regeneration processing. Processes for each product type are described below.

- **Rayon fiber**. The viscose is extruded through a spinneret into a bath of sulfuric acid and zinc sulfate to regenerate the cellulose. After regeneration, the rayon fiber is washed, bleached, and lubricated with different chemicals depending on the desired product (Schmidtke, 2000).

- **Cellophane**. The viscose is extruded through a narrow slit to form a thin sheet, which passes through a sulfuric acid bath to regenerate the cellulose. A hot water bath, used to purify the cellophane, is followed by desulfurization, neutralization, bleaching, washing, and softening. The cellophane is then dried for packaging (Schmidtke, 2000).

- **Food casings**. The viscose is extruded through a circular dye or over a paper substrate as fibrous casing. The extruded viscose is contacted with sulfuric acid and sometimes ammonium sulfate, depending on the product, to regenerate the cellulose. The regenerated cellulose passes through wash tanks, including additional sulfuric acid and warm water. Glycerin is added to the food casings as a conditioner and dyes may be added as coloring for the casing prior to drying (Schmidtke, 2000).

The manufacture of cellulosic sponge differs slightly. The sheets of dissolving-grade pulp are converted into alkali cellulose, followed by xanthation into sodium cellulose xanthate and formation of the viscose solution. The viscose solution is then mixed with sodium sulphate crystals, other fibers, and dyes. The mixture is poured into a mold or extruded under high temperature to melt the sodium sulphate crystals, leaving the pores characteristic of sponges. The remaining processing of the cellulose sponges includes bleaching, washing, cutting, and possibly packaging. Some facilities that manufacture sponges do not make viscose and thus do not use carbon disulfide. Instead they purchase blocks of hardened viscose which they dissolve to form the softened viscose for processing (Schmidtke, 2000).

15.5.2 Regenerated Cellulose Facility Information

EPA identified cellulose products manufacturers in the United States using the TRI and PCS databases and data from a study of the cellulose products manufacturing industry conducted by EPA's OAQPS during their development of NESHAP regulations (Schmidtke, 2000). Table 15-10 lists the eight U.S. cellulose products manufacturers.

Six of the facilities reported wastewater discharges of carbon disulfide to TRI in 2002 and 2003. Table 15-11 lists the total discharges for the regenerated cellulose facilities in *TRIReleases2002_v4* and *TRIReleases2003_v2*. Table 5-12 lists the discharges of carbon disulfide in *TRIReleases2002_v4* and *TRIReleases2003_v2*. Table 15-13 lists the total discharges in *PCSLoads2002_v4*. The carbon disulfide TWF in the databases is 2.81, while the POTW removal used in the TRI databases is 84 percent.

Table 15-10. Cellulose Manufacturers in the United States

TRI ID (PCS ID)	Facility Name	Facility Location	Product Type	Discharge Type	Permit Notes
53821-MCMPN-217NO	3M Corporation	Prairie du Chien, WI	Cellulosic Sponges	Indirect	Does not report discharges to PCS. Does not report wastewater discharges to TRI after 2001. No permit available.
14150-GNRLM-305SA	3M Corporation	Tonawanda, NY	Cellulosic Sponges	Indirect	Does not report discharges to PCS. No permit available.
66542-FLXLN-6000S (KS0003204)	Innovia Films Inc.	Tecumseh, KS	Cellophane	Direct	Carbon disulfide monitoring required after activated sludge basin because it inhibits the biological process at concentrations above 35 mg/L. Must notify regulators if carbon disulfide exceeds 17.5 mg/L.
NR	Nylogene Corporation	Elyria, OH	Cellulosic Sponges	NA	Does not report discharges to PCS. Does not report wastewater discharges to TRI. No permit available.
38402-SPNTX-SANTA	Spontex Inc.	Columbia, TN	Cellulosic Sponges	Direct	Permit writer used OCPSF Subpart D – Thermoplastic Resins for BPT, but did not apply BAT because the facility produced less than 5 million lbs of product per year.
61832-TPKNC-915NM	Teepak L.L.C.	Danville, IL	Meat Casings	Indirect	Facility only has a general storm water permit.
37774-VSKSC-EASTL (TN0001457)	Viskase Corporation	Loudon, TN	Meat Casings	Indirect[a]	Permit limits are based on state regulations and treatability.
72370-VSKSC-RT198 (AR0036544)	Viskase Corporation	Osceola, AR	Meat Casings	Direct	Facility is a minor discharge facility.

Source: Company Web Sites (Devro, Unknown; Innovia Films, 2004; Spontex, 2004; Viskase, 2002); *TRIReleases2002_4*; *TRIReleases2003_2*; Facility NPDES Permits (TDEC, 2002; IEPA, 2003; KDHE, 2001; ADEQ, 2000; TDEC, 2005); *Industry Profile of the Cellulose Products Manufacturing Facilities in the U.S.* (Schmidtke, 2000).

[a]EPA believes the facility is an indirect discharger because the facility reports POTW transfers and not surface water releases to TRI. PCS does not contain data for this facility, although they have a NPDES permit that expires in December 2006. EPA believes they began discharging only to a POTW sometime after 1991.

NA – Not available. EPA is unable to determine if these facilities are direct or indirect dischargers.

NR – Not reported. This facility does not report to TRI or PCS.

Table 15-11. TRI 2002 and 2003 Discharges for Cellulose Products Manufacturing Facilities

Facility Name	TRI 2002			TRI 2003		
	Total Pounds Discharged to POTW	Total Pounds Discharged to Stream[a]	Total TWPE	Total Pounds Discharged to POTW	Total Pounds Discharged to Stream[a]	Total TWPE
Viskase Corporation Loudon, TN	77,279	12,383	34,639	80,288	12,865	35,987
Innovia Films Inc. Tecumseh, KS	NA	17,300	20,596	NA	6,544	13,658
Teepak L.L.C. Danville, IL	57,600	14,391	20,665	39,700	12,922	11,255
3M Corporation Tonawanda, NY	6,400	1,024	2,867	6,200	992	2,778
Viskase Corporation Osceola, AR	NA	12,855	1,013	NA	9,622	862
Spontex Inc. Columbia, TN	NA	201	563	NA	234	655

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.
NA – Not applicable. These facilities are direct dischargers and do not report discharges to POTW.

Table 15-12. TRI 2002 and 2003 Carbon Disulfide Discharges for Cellulose Products Manufacturing Facilities

Facility Name	TRI 2002			TRI 2003		
	Carbon Disulfide Pounds Reported	Carbon Disulfide Pounds Released to Stream[a]	Carbon Disulfide TWPE	Carbon Disulfide Pounds Reported	Carbon Disulfide Pounds Released to Stream[a]	Carbon Disulfide TWPE
Viskase Corporation Loudon, TN	77,000	12,320	34,498	80,000	12,800	35,842
Innovia Films Inc. Tecumseh, KS	NA	7,350	20,581	NA	4,877	13,656
Teepak L.L.C. Danville, IL	46,100	7,376	20,581	25,100	4,016	11,245
3M Corporation Tonawanda, NY	6,400	1,024	2,867	6,200	922	2,778
Viskase Corporation Osceola, AR	NA	355	994	NA	304	851
Spontex Inc. Columbia, TN	NA	201	562	NA	234	655

Source: *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.
NA – Not applicable. These facilities are direct dischargers and do not report discharges to POTW.

Table 15-13. PCS 2002 Discharges for Cellulose Products Manufacturing Facilities

Facility Name	Facility Location	PCS 2002	
		Total Pounds Discharged	Total TWPE
Innovia Films Inc.	Tecumseh, KS	26,021,647	20,372
Viskase Corporation	Osceola, AR	239,019	152
3M Corporation	Tonawanda, NY	NA	NA
Spontex Inc.	Columbia, TN	NR	NR
Teepak L.L.C.	Danville, IL	NA	NA
Viskase Corporation[a]	Loudon, TN	NA	NA

Source: *PCSLoads2002_v4*.
[a]EPA believes the facility is an indirect discharger because the facility reports POTW transfers and not surface water releases to TRI. PCS does not contain data for this facility, although they have a NPDES permit that expires in December 2006. EPA believes they began discharging to a POTW sometime after 1991.
NA – Not applicable. These facilities are indirect dischargers and do not have PCS permits.
NR – Not reported. This facility is a minor direct discharger with a PCS permit, but discharges are not reported in Envirofacts.

15.5.3 Wastewater Sources of Carbon Disulfide

At cellulose products manufacturing facilities, the main wastewater sources of carbon disulfide include railcar unloading, carbon disulfide storage, and air pollution control (Schmidtke, 2000).

Carbon disulfide gas is delivered to most cellulose products facilities by railcar. Unloading the railcar requires it to be filled with water or nitrogen to displace the carbon disulfide into the storage tank. Facilities using water displacement generate carbon-disulfide-saturated wastewater during railcar unloading, which is sent to the facility's wastewater treatment system. Facilities using nitrogen displacement do not produce the carbon-disulfide-saturated wastewater during railcar unloading. EPA determined that Spontex Inc. was the only facility of the eight listed in Table 15-10 that uses water displacement during carbon disulfide unloading as of 2000 (Schmidtke, 2000).

Carbon disulfide storage tanks are typically submerged under water in a concrete-lined pool. This allows any carbon disulfide leaks to collect in the bottom of the pool to avoid atmospheric releases. In addition to the underwater storage, the tanks have a water or nitrogen padding system to further prevent the contact with oxygen. The padding is in direct contact with the carbon disulfide to fill the headspace in the tank, creating wastewater saturated with carbon disulfide if a water padding system is used. The water padding in the storage tank is displaced into the water pool when the storage tanks are filled. Displaced water in the pool and water padding is sent to the wastewater treatment system. As of 2000, EPA determined that, of the facilities listed in Table 15-10, only Teepak L.L.C., 3M Corporation Tonawanda, Spontex Inc, and Nylogene Corporation use a water padding system (Schmidtke, 2000).

Gaseous by-products in the regeneration of cellulose, including hydrogen sulfide and carbon disulfide, are off-gassed from the process equipment. Pollutants in the vented gas can be removed using a wet gas scrubber, which uses an aqueous solution to remove the air pollutants. The wet scrubber removal efficiency for carbon disulfide is low but the scrubber effluent may contain some carbon disulfide (Schmidtke, 2000). Discharges reported by Innovia Films Inc. are due to wet scrubbing of the gaseous by-products (Martin, 2006).

15.5.4 Regenerated Cellulose Facilities Wastewater Treatment

Table 15-14 summarizes the wastewater treatment known to be used by cellulose products manufacturing facilities.

Table 15-14. Cellulose Products Facilities Wastewater Treatment

Product	Number of Facilities	Pretreatment Used by Indirect Dischargers	Treatment Used by Direct Dischargers
Cellophane	1	NA	Neutralization, settling, equalization, second neutralization, aeration, and clarification.
Food Casings	3	Neutralization, potential filtration and settling. Achieved CS_2 concentrations of 5-20 ppm.	Neutralization using lime, equalization, and clarification.
Cellulosic Sponges	4	Neutralization and oxidization	Equalization, aeration, and clarification.

Source: *Industry Profile of the Cellulose Products Manufacturing Facilities in the U.S.* (Schmidtke, 2000).

15.6 PMF Category Conclusions

- The high TWPE ranking for the PMF category is due primarily to carbon disulfide discharges from six cellulose products manufacturers. Excluding these discharges from the category reduces the combined PCS and TRI TWPE for 2002 by approximately 73 percent.

- One facility, Sealed Air Corporation Cryovac Division, reported discharges of dioxin and dioxin-like compounds to TRI in 2002 and 2003. The number of grams of dioxin and dioxin-like compounds discharges reported by the facility to TRI in 2004 are 91 percent less than was reported to TRI in 2002.

- The reduction of HAP emissions required by the NESHAP for the cellulose products manufacturing industry must be achieved no later than June 13, 2005. EPA predicted the NESHAP will likely reduce the amount of carbon disulfide wastewater discharges because facilities will convert from water to nitrogen displacement and padding systems. EPA also estimated that facilities will generate an additional 2.1 MGY from wet air pollution control. However, the wet air pollution control will not increase wastewater discharges of carbon disulfide because of their limited effectiveness for removing carbon disulfide. See 67 FR 40055 (June 11, 2002).

- Although wastewater discharges from cellulose products manufacturer are not covered by an existing ELG, permit writers are basing limitations on Part 463, Plastics Molding and Forming Point Source Category, and Part 414, Organic Chemicals, Plastics, and Synthetic Fibers. Neither Part 463 nor Part 414 includes limitations for carbon disulfide discharges.

- EPA identified that four of the eight facilities use water displacement during carbon disulfide unloading or water padding storage system in 2000 (Schmidtke, 2000). EPA believes using nitrogen displacement and padding instead of water will generate less carbon disulfide in the wastewater.

- Based on the 2006 annual review, EPA finds that national ELGS are not the best tools for establishing technology-based limits for this industrial category because most of the toxic and nonconventional pollutant discharges are from a few facilities in this industrial category. There are only eight facilities contributing the bulk of the TWPE for this category (four are direct discharges and two are indirect discharges) and EPA was not able to identify the discharge status of two facilities for the 2006 annual review. EPA will consider assisting permitting authorities in identifying pollutant control and pollution prevention technologies for the development of technology based effluent limitations based on BPJ on a facility-specific basis.

15.7 PMF References

ADEQ. 2000. Arkansas Department of Environmental Quality. National Pollution Discharge Elimination System Permit Application NPDES – AR0036544 – Viskase Corporation, Osceola, AR. Little Rock, AR. (Month, Day). DCN 02493.

Devro. Unknown. Product Availability. Available online at: http://www.devro.plc.uk/products/index.htm. Date accessed: June 22, 2005. DCN 02087.

IEPA. 2003. Illinois Environmental Protection Agency Division of Water Pollution Control. General NPDES Permit for Storm Water Discharges from Industrial Activities. Springfield, IL. DCN 02540.

Innovia Films. 2004. Company Profile. Available online at: http://www.innoviafilms.com/corporate/profile.htm. Date accessed: June 22, 2005. DCN 02088.

KDHE. 2006. Kansas Department of Health and Environment. Kansas Water Pollution Control Permit and Authorization to Discharge Under NPDES KS0003204 – Innovia Films, Tecumseh, KS. Topeka, KS. DCN 02581.

Martin, Tony. 2006. Telephone conversation with Tony Martin of Innovia Films Inc. and Jessica Wolford of Eastern Research Group, Inc. "Discussion of Carbon Disulfide Discharges for Innovia Films Inc. (KS0003204)." (April 27). DCN 03228.

Schmidtke, Karen and Thomas Holloway. 2000. *Industry Profile of the Cellulose Products Manufacturing Facilities in the U.S. Prepared for U.S. EPA National Emissions Standards for Hazardous Air Pollutants: Cellulose Products Manufacturing*. Cary, NC. (April 11). Docket EPA-HQ-OAR-2003-0193-0004.

Spontex. 2004. MAPA Spontex, Inc. Wiping Products. Available online at: http://www.spontexusa.com/products.cfm?PRTID=1. Date accessed: June 22, 2005. DCN 02092.

TDEC. 2002. Tennessee Department of Environment and Conservation. State of Tennessee National Pollutant Discharge Elimination System Permit NPDES TN0001457 – Viskase Corporation, Loudon, TN. Nashville, TN. DCN 02532.

TDEC. 2005. Tennessee Department of Environment and Conservation. State of Tennessee National Pollutant Discharge Elimination System Permit NPDES Permit TN0001571 – Spontex Inc., Columbia, TN. Nashville, TN. 2005. DCN 02533.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1984. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Plastics Molding and Forming Point Source Category*. EPA 440/1-84/069. Washington, DC. (December).

U.S. EPA. 1987. *Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemical, Plastics, and Synthetic Fibers Point Source Category - Final*. EPA 440-1-87-009. Washington, DC. (October).

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

U.S. EPA. 2005c. *Product and Product Group Discharges Subject to Effluent Limitations and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category - 40 CFR 414*. Washington, DC. DCN 01812.

Viskase. 2002. Viskase Companies, Inc. Viskase Casing Solutions Worldwide. Available online at: http://www.viskase.com/. Date accessed: June 22, 2005. DCN 02089.

16.0 PORCELAIN ENAMELING (40 CFR PART 466)

EPA selected the Porcelain Enameling Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FR 51050, August 29, 2005). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Porcelain Enameling Category. EPA's 2006 annual review builds on the 2005 annual review. As part of the 2006 annual review, EPA changed the classification of 174 of 188 facilities in the TRI 2002 and PCS 2002 databases from the Porcelain Enameling Category to the Metal Finishing Category (40 CFR Part 433). As a result of this change, EPA identified that the combined TRI and PCS 2002 TWPE for the Porcelain Enameling Category in the 2006 annual review is 99 percent less than the combined TWPE in the 2005 annual review. Consequently, the Porcelain Enameling Category is not identified as a hazard priority based on data available at this time.

16.1 <u>Porcelain Enameling Category Background</u>

This section provides background on the Porcelain Enameling Category including a brief profile of the porcelain enameling industry and background on 40 CFR Part 466.

16.1.1 Porcelain Enameling Industry Profile

The porcelain enameling industry includes facilities that prepare the surface of a basis metal and apply a substantially vitreous or glassy inorganic coating bonded to the basis metal by fusion at a temperature above 800°F (PEI, Unknown). The coatings can be applied by spraying, dipping, or flow coating (U.S. EPA, 1982). Some of the facilities classified in the seven SIC codes listed in Table 16-1 conduct porcelain enameling operations. The Porcelain Enameling Category ELGs apply to the wastewater dischargers from these operations. Most facilities classified in the seven SIC codes listed in Table 16-1 do not conduct porcelain enameling operations, but conduct metal finishing operations. The Metal Finishing Category ELGs apply to the wastewater discharges from nonporcelain-enameling metal finishing operations, such as electroplating, etching and chemical milling, machining, galvanizing, and painting (U.S. EPA, 1983) (see 40 CFR Part 433.10(b)). EPA reviewed information about facilities in the SIC codes listed in Table 16-1 that reported wastewater discharges to TRI and PCS, to determine whether they conduct porcelain enameling operations.

Table 16-1. Number of Facilities in Porcelain Enameling SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]
3431: Enameled Iron and Metal Sanitary Ware	80	1	4
3469: Metal Stamping, NEC	2,287	1	55
3479: Coating, Engraving, and Allied Services, NEC	5,255	8	102
3631: Household Cooking Equipment	97	0	6
3632: Household Refrigerators and Home and Farm Freezers	23	1	6
3633: Household Laundry Equipment	18	1	7
3639: Household Appliances, NEC	1,536	1	4
Total	**9,296**	**13**	**184**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include major dischargers only.
[b]Releases to water only.
NEC - Not elsewhere classified.

16.1.2 40 CFR Part 466

EPA first promulgated ELGs for the Porcelain Enameling Category on November 24, 1982 (47 FR 53184). All of the subcategories, except for Subpart D – Copper Basis Material, have BPT, BAT, NSPS, and PSES/PSNS limitations. Only NSPS and PSNS are established for the Copper Basis Material Subcategory. The priority pollutants chromium, lead, nickel, and zinc are regulated in all of the subcategories. This category consists of four subcategories, as shown in Table 16-2 with a description of the subcategories' applicability.

Table 16-2. Porcelain Enameling Category Subcategory Applicability

Subpart	Subcategory Title	Subcategory Applicability
A	Steel Basis Material	Porcelain enameling on steel basis material
B	Cast Iron Basis Material	Porcelain enameling on cast iron basis material
C	Aluminum Basis Material	Porcelain enameling on aluminum basis material
D	Copper Basis Material	Porcelain enameling on copper basis material

Source: *Porcelain Enameling Point Source Category - 40 CFR 466*; *Development Document for Effluent Limitations Guidelines and Standards for the Porcelain Enameling Point Source Category* (U.S. EPA, 1982).

16.2 <u>Porcelain Enameling Category 2005 Annual Review</u>

In 2005, EPA reviewed the Porcelain Enameling Category and determined that the majority of facilities identified by the SIC codes listed in Table 16-1 with data in the TRI and PCS databases did not perform porcelain enameling operations (U.S. EPA, 2005b; Wolford, 2005). As a result, instead of analyzing discharges from this category, the remainder of Section 16.0 focuses on identification of the facilities that are likely to have porcelain enameling operations that discharge wastewater subject to the Porcelain Enameling ELGs.

16.2.1 Porcelain Enameling Category 2005 Screening-Level Review

Table 16-3 presents the Porcelain Enameling Category TWPE calculated, using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 16-3. Porcelain Enameling Category 2005 Screening-Level Review Results

Point Source Category	PCS TWPE[a]	TRI TWPE[b]	Total TWPE
Porcelain Enameling	3,478	88,749	92,228

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

16.2.2 Porcelain Enameling Category 2005 Facility Classification Revisions

After the 2005 screening-level review, EPA conducted a detailed review of the category and determined that the Porcelain Enameling Category combined 2002 TRI and PCS TWPE discharges from many facilities that did not have porcelain enameling operations. EPA used information from individual company web sites (Wolford, 2005) and information provided by the main trade association for this industry, the Porcelain Enamel Institute, to determine which facilities were likely to conduct porcelain enameling operations (PEI, 2006). Facilities were assumed to have metal finishing operations, but not porcelain enameling operations, if their facility name contained any of the 46 metal finishing unit operations listed in 40 CFR Part 433.10(a) and they did not identify themselves as porcelain enamelers on their web site or manufacture products that could be porcelain enameled, such as kitchen appliances. EPA conducted additional review of facility web sites to determine if facilities performed metal finishing operations or porcelain enameling operations based on their products (Wolford, 2005). Table 16-4 presents the number of facilities in the seven SIC codes, separated into facilities likely to have porcelain enameling operations (Likely PE Facilities) and those with only metal finishing operations (Non-PE Facilities). The table includes only the facilities reporting wastewater discharges to TRI and facilities classified as major dischargers in PCS. EPA concluded that 92.6 percent of the facilities in the seven SIC codes are not likely to conduct porcelain enameling operations (U.S. EPA, 2005b).

Table 16-4. 2005 Annual Review Results: Number of Facilities in Porcelain Enameling SIC Codes

SIC Code	Likely Porcelain Enameling Facilities		Non-Porcelain Enameling Facilities	
	2002 PCS[a] Likely PE Facilities	2002 TRI[b] Likely PE Facilities	2002 PCS[a] Non-PE Facilities	2002 TRI[b] Non-PE Facilities
3431: Enameled Iron and Metal Sanitary Ware	1	4	0	0
3469: Metal Stamping, NEC	0	4	1	51
3479: Coating, Engraving, and Allied Services, NEC	0	0	8	102
3631: Household Cooking Equipment	0	6	0	0
3632: Household Refrigerators and Home and Farm Freezers	1	6	0	0
3633: Household Laundry Equipment	1	7	0	0
3639: Household Appliances, NEC	1	3	0	1
Total	**4[c]**	**30[c]**	**9**	**154**

Source: *Preliminary Review of Priority Categories of Industrial Dischargers* (U.S. EPA, 2005b); *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Releases to water only.
[c]There are 30 facilities likely to have porcelain enameling operations: 26 facilities report only to TRI, 1 facility reports only to PCS, and 3 facilities reported to TRI and PCS in 2002.
NEC - Not elsewhere classified.
PE – Porcelain Enameling.

16.2.3 Porcelain Enameling Category 2005 Revised Screening-Level Review

After identifying facilities likely to have porcelain enameling operations, EPA recalculated the category TWPE. Table 16-5 presents the recalculated TWPE. The table compares the number of facilities reporting discharges greater than zero, the pounds of pollutants discharged, and the estimated TWPE discharges for the facilities that are not likely to manufacture porcelain enameled products (Non-PE Facilities) and those that are (Likely PE Facilities). Approximately 42 percent of the TWPE for facilities in the porcelain enameling SIC codes is from facilities likely to have porcelain enameling operations (U.S. EPA, 2005b).

Table 16-5. Porcelain Enameling Category 2005 Revised Screening-Level Review Results

	Number of Facilities Reporting TWPE Greater Than Zero	Total Pounds Discharged	TWPE
2002 Total		**46,479,576**	**92,228**
2002 TRI Non-PE Facilities[a]	154	406,178	49,395
2002 PCS Non-PE Facilities[b]	9	22,710,347	3,450
2002 Total Non-PE Facilities		**23,116,525**	**52,845**
2002 TRI Likely PE Facilities[a]	30	576,059	39,348
2002 PCS Likely PE Facilities[b]	4	38,322	28
2002 Total Likely PE Facilities	30[c]	**614,381**	**39,376**

Source: *Preliminary Review of Priority Categories of Industrial Dischargers* (U.S. EPA, 2005b); *TRIReleases2002_v2*; *PCSLoads2002_v2*.
[a]Discharges include transfers to POTWs and account for POTW removals.
[b]Dischargers include major dischargers only.
[c]There are 30 facilities likely to have porcelain enameling operations: 26 facilities report only to TRI, 1 facility reports only to PCS, and 3 facilities reported to TRI and PCS in 2002.
PE – Porcelain Enameling.

16.3 Potential New Subcategories for the Porcelain Enameling Category

EPA did not identify any potential new subcategories for the Porcelain Enameling Category.

16.4 Porcelain Enameling Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Porcelain Enameling Category. As shown in Table 16-5, during the 2005 annual review, EPA identified 30 facilities that could have operations subject to the Porcelain Enameling Category ELGs (U.S. EPA, 2005b). Of these 30 facilities, 26 report only to TRI, one reported only to PCS, and three reported to TRI and PCS in 2002 (U.S. EPA, 2005b). For the 2006 annual review, EPA further investigated the operations conducted at these facilities. In its comments on the *Preliminary Review of Priority Categories of Industrial Dischargers* (U.S. EPA, 2005b), the Porcelain Enamel Institute provided additional information about some of the facilities likely to perform porcelain enameling operations (PEI, 2005). The Porcelain Enamel Institute confirmed that 13 facilities reporting to TRI in 2002 and 2 facilities with 2002 discharge data in PCS have porcelain enameling operations. In addition, the Porcelain Enamel Institute identified the remaining facilities, 17 facilities reporting to TRI in 2002 and 2 facilities reporting to PCS in 2002, as facilities that do not have porcelain enameling operations. The Porcelain Enamel Institute identified one facility, Vitco Inc., reporting to TRI in 2002 that EPA had identified as not likely to have porcelain enameling operations. (PEI, 2005) Additional information about the facilities with porcelain enameling operations was provided by the Porcelain Enamel Institute during a meeting with EPA in March 2006 (Johnston, 2006). Table 16-6 lists EPA's findings about the 31 facilities identified in the 2006 screening-level review as likely to have porcelain enameling operations. EPA determined that only 14 of these facilities have porcelain enameling operations, and 2 of these facilities closed after 2003.

Table 16-6. 2006 Screening-Level Review Results: Classification of Facilities in Porcelain Enameling and Metal Finishing Categories

Facility	Location	Data Sources	Applicable Category	Additional Facility Information, where Available
American Standard Inc.	Salem, OH	TRI	Porcelain Enameling	Manufactures bathroom fixtures.
American Trim Superior Metal Prods. Div.	Wapakoneta, OH	TRI	Metal Finishing	
Briggs Industries Incorporated	Knoxville, TN	PCS	Porcelain Enameling	Mostly porcelain enameling operations.
Electrolux Home Prods.	Springfield, TN	TRI	Porcelain Enameling	Powdered enamel and wet-process enamel, painting, and washing operations. Estimate 90% of wastewater is from metal finishing operations.
Electrolux Home Prods.	Webster City, IA	TRI	Metal Finishing	
Electrolux Home Prods.	Jefferson, IA	TRI	Metal Finishing	
Eljer Plumbingware Inc.	Salem, OH	TRI	Metal Finishing	Facility has closed.
GE Appliances	Louisville, KY	TRI	Metal Finishing	
GE Co.	Decatur, AL	TRI	Metal Finishing	
GE Co. GEA BPO L.L.C.	Bloomington, IN	TRI	Metal Finishing	
Hanson Porcelain Co. Inc.	Lynchburg, VA	TRI	Porcelain Enameling	Custom porcelain enameling facility. Majority of wastewater is from porcelain enameling.
Kohler Co.	Kohler, WI	TRI	Metal Finishing	
Kohler Co.	Searcy, AR	TRI	Metal Finishing	
Kohler Co. Cast Iron Div.	Kohler, WI	TRI	Porcelain Enameling	Porcelain enameling process does not produce wastewater. Majority of facility's wastewater is from metal finishing operations.
Maytag Appliances	Searcy, AR	TRI	Metal Finishing	
Maytag Appliances Amana Refrigeration Prods.	Amana, IA	TRI & PCS	Metal Finishing	
Maytag Florence Ops.	Florence, SC	TRI	Porcelain Enameling	Facility has closed.

Table 16-6 (Continued)

Facility	Location	Data Sources	Applicable Category	Additional Facility Information, where Available
Maytag Herrin Laundry Prods.	Herrin, IL	TRI & PCS	Metal Finishing	
Maytag Newton Laundry	Newton, IA	TRI	Porcelain Enameling	Facility is in the process of closing. Previously, wastewater was 90% from metal finishing operations.
Maytag P#1 Cleveland	Cleveland, TN	TRI	Porcelain Enameling	Produces home cooking ranges and ovens. Estimate 90% of wastewater is from metal finishing operations.
Maytag P#3 Cleveland	Cleveland, TN	TRI	Porcelain Enameling	Estimate 95% of wastewater is from metal finishing operations.
Roper Corp.	Lafayette, GA	TRI	Porcelain Enameling	Produces home cooking ranges and ovens. Estimate 90% of wastewater is from metal finishing operations.
State Inds. Inc.	Ashland City, TN	TRI & PCS	Porcelain Enameling	Produces approximately 14,000 hot water heaters per day with enameled interiors. Estimate 50% of wastewater is from metal finishing operations.
Vitco Inc.	Nappanee, IN	TRI	Porcelain Enameling	Custom porcelain enameling facility. Majority of wastewater is from porcelain enameling.
W.C. Wood Co. Inc.	Ottawa, OH	TRI	Metal Finishing	
Whirlpool Corp.	Evansville, IN	TRI	Metal Finishing	
Whirlpool Corp.	Fort Smith, AR	TRI	Metal Finishing	
Whirlpool Corp.	Findlay, OH	TRI	Metal Finishing	
Whirlpool Corp. Clyde	Clyde, OH	TRI	Porcelain Enameling	Estimate 90% of wastewater is from metal finishing operations.
Whirlpool Corp. Marion Div.	Marion, OH	TRI	Metal Finishing	
Whirlpool Corp. Tulsa	Tulsa, OK	TRI	Porcelain Enameling	Estimate 85% of wastewater is from metal finishing operations.

Source: "Comments of the Porcelain Enamel Institute" (PEI, 2005); "Meeting Minutes of EPA and Porcelain Enamel Institute (PEI) Discussion of PEI Comments on the Preliminary 2006 Effluent Guidelines Plan (29 March 2006)" (Johnston, 2006).

As a result of the 2006 screening-level review, EPA determined that the Porcelain Enameling Category ranked 44th of 49 categories in combined 2002 TRI and PCS TWPE. Table 16-7 presents the TRI and PCS discharges associated with the 14 facilities with porcelain enameling operations listed in Table 16-6. TRI and PCS discharges from these 14 facilities, including the two facilities that closed after 2003, represented 412 combined TWPE from *TRIReleases2002_v4* and *PCSLoads2002_v4*.

Table 16-7. Porcelain Enameling Category 2006 Screening-Level Review Results

Data Source	Number of Facilities Reporting TWPE Greater than Zero	Total Pounds Discharged	TWPE
2002 PCS[a]	2	22,943	17.1
2002 TRI[b]	13	286,436	398.3
2003 TRI[b]	12[c]	70,743	362.6
2002 Category Total		**309,378**	**412.4**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Vitco Inc. did not report to TRI in 2003.

16.5 Porcelain Enameling Category Conclusions

- The high TWPE ranking for the Porcelain Enameling Category in the 2005 annual review was due to including discharges from facilities without porcelain enameling operations. These facilities have the same SIC code as facilities that produce porcelain enameled products, but they only have metal finishing operations.

- Review of the Porcelain Enameling Category determined that only 14 facilities with discharges reported in TRI and/or PCS have porcelain enameling operations, including three that have closed or are in the process of closing.

- The 14 facilities with discharges subject to the Porcelain Enameling Category ELGs account for approximately 412 TWPE using combined TRI and PCS data from 2002.

- Improvements to porcelain enameling technology have reduced or eliminated the use of water in the process. For example, powder enameling is a water-free dry enameling process and the amount of cleaning, generating wastewater, has reduced due to new porcelain enamel glass compositions (Waggener, 2006).

- EPA is not identifying the Porcelain Enameling Category as a hazard priority based on data available at this time.

16.6 Porcelain Enameling Category References

Hackler, Cullen. 2006. Porcelain Enamel Institute. Email to Carey Johnston, U.S. EPA, from Cullen Hackler, Porcelain Enamel Institute. "Porcelain Enameling Industry Information." (July 7). DCN 03230.

Johnston, Carey. 2006. U.S. EPA. Memorandum to Public Record for the Effluent Guidelines Program Plan 2005/2006. "Meeting Minutes of EPA and Porcelain Enamel Institute (PEI) Discussion of PEI Comments on the Preliminary 2006 Effluent Guidelines Plan (29 March 2006)." (March 29). DCN 03229.

PEI. 2005. Porcelain Enamel Institute. *Comments of the Porcelain Enamel Institute*. Docket EPA-HQ-OW-2004-0032-1072. (November).

PEI. 2006. Porcelain Enamel Institute. Available online at: http://www.porcelainenamel.com.

PEI. Unknown. Porcelain Enamel Institute. *Properties of Porcelain Enamel, Appearance Properties, Data Bulletin PEI 501*. Available online at: http://www.porcelainenamel.com/pei501.htm. DCN 02091.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1982. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Porcelain Enameling Point Source Category*. EPA-440/1-82/072. Washington, DC.

U.S. EPA. 1983. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Metal Finishing Point Source Category*. EPA-440/1-83/091. Washington, DC.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Priority Categories of Industrial Dischargers*. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

Wolford, Jessica. 2005. Eastern Research Group, Inc. Memorandum to 2006 Effluent Guidelines Program Plan Docket. "Identification of Facilities for the Porcelain Enameling Point Source Category." (July 14). DCN 02195.

17.0 RUBBER MANUFACTURING (40 CFR PART 428)

EPA selected the Rubber Manufacturing Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review, particularly discharges of sodium nitrite reported to TRI in 2002 (U.S. EPA, 2005b) (see Table V-1, 70 FR 51050, August 29, 2005). This section summarizes the 2005 annual review and also describes the results of EPA's 2006 annual review of the discharges associated with the Rubber Manufacturing Category. EPA's 2006 annual review builds on the 2005 annual review. After corrections to the TRI and PCS databases based on more detailed review and data collection, the Rubber Manufacturing Category is no longer one of the top categories in terms of TWPE.

17.1 Rubber Manufacturing Category Background

This subsection provides a brief background on the Rubber Manufacturing Category including a brief profile of the rubber manufacturing industry and background on 40 CFR Part 428.

17.1.1 Rubber Manufacturing Industry Profile

The rubber manufacturing industry includes facilities that manufacture natural, synthetic, and reclaimed rubber. Manufactured rubber becomes finished goods through a variety of methods, such as molding, extruding, and fabricating (U.S. EPA, 1974a; U.S. EPA, 1974b). Because the U.S. Economic Census reports data by NAICS code, and TRI and PCS report data by SIC code, EPA reclassified the 2002 U.S. Economic Census data by equivalent SIC code. The facilities in SIC code 3069 do not translate directly to a NAICS code, and EPA could not determine the number of facilities in the 2002 U.S. Economic Census for SIC code 3069. Table 17-1 lists the seven SIC codes with operations in the Rubber Manufacturing Category.

Rubber manufacturing facilities discharge directly to surface water as well as to POTWs. Table 17-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of facilities reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting thresholds.

Table 17-1. Number of Facilities in Rubber Manufacturing SIC Codes

SIC Code	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
2822: Synthetic Rubber (Vulcanizable Elastomers)	157	18	34	35
3011: Tires and Inner Tubes	158	23	72	69
3021: Rubber and Plastics Footwear	62	0	5	6
3052: Rubber and Plastics Hose and Belting	260	4	72	68
3053: Gaskets, Packing, and Sealing Devices	614	4	58	56
3061: Molded, Extruded, and Lathe-Cut Mechanical Rubber Goods	608	19	70	69
3069: Fabricated Rubber Products, NEC	NA[c]	47	216	201
Total	**>1,859**	**118**	**527**	**504**

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2; TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.
[c]Poor bridging between NAICS and SIC codes. Numbers of facilities could not be determined.
NA – Not applicable.
NEC - Not elsewhere classified.

Table 17-2. Rubber Manufacturing Category Facilities by Type of Discharge Reported in TRI 2002

SIC Code	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
2822: Synthetic Rubber (Vulcanizable Elastomers)	7	11	0	15
3011: Tires and Inner Tubes	8	17	25	22
3021: Rubber and Plastics Footwear	0	1	0	4
3052: Rubber and Plastics Hose and Belting	3	20	14	35
3053: Gaskets, Packing, and Sealing Devices	1	11	3	43
3061: Molded, Extruded, and Lathe-Cut Mechanical Rubber Goods	5	17	8	40
3069: Fabricated Rubber Products, NEC	9	49	10	148

Source: *TRIReleases2002_v4*.
NEC – Not elsewhere classified.

17.1.2 40 CFR Part 428

EPA first promulgated ELGs for the Rubber Manufacturing Category (40 CFR Part 428) on February 21, 1974 (39 FR 6662). All 11 subcategories have BPT, BAT, NSPS, and PSNS limitations. The priority pollutants lead, chromium, and zinc are all regulated in at least one subcategory. Table 17-3 presents the subcategories, the related SIC codes, and descriptions of the subcategories' applicability (U.S. EPA, 1974a; U.S. EPA, 1974b).

Table 17-3. Rubber Manufacturing Category Subcategory Applicability

<table>
<tr><th>Sub-part</th><th>Subcategory Title</th><th>Related SIC Code(s)</th><th>Subcategory Applicability</th></tr>
<tr><td>A</td><td>Tire and Inner Tube Plants</td><td>3011: Tires and Inner Tubes</td><td>Pneumatic tire and inner tube</td></tr>
<tr><td>B</td><td>Emulsion Crumb Rubber</td><td>2822: Synthetic Rubber (Vulcanizable Elastomers)</td><td>Emulsion crumb rubber
excludes acrylonitrile butadiene rubber</td></tr>
<tr><td>C</td><td>Solution Crumb Rubber</td><td>2822: Synthetic Rubber (Vulcanizable Elastomers)</td><td>Crumb rubber</td></tr>
<tr><td>D</td><td>Latex Rubber</td><td>2822: Synthetic Rubber (Vulcanizable Elastomers)</td><td>Latex rubber</td></tr>
<tr><td>E</td><td>Small-Sized General Molded, Extruded, and Fabricated Rubber Plants</td><td rowspan="3">3021: Rubber and Plastics Footwear
3052: Rubber and Plastics Hose and Belting
3053: Gaskets, Packing, and Sealing Devices
3061: Molded, Extruded, and Lathe-Cut Mechanical Goods
3069: Fabricated Rubber Products, NEC</td><td rowspan="3">Molded, extruded, and fabricated rubber; foam rubber backing; rubber cement-dipped goods; and retreaded tires
Excludes latex-based products and textiles subject to 40 CFR Part 410</td></tr>
<tr><td>F</td><td>Medium-Sized General Molded, Extruded, and Fabricated Rubber Plants</td></tr>
<tr><td>G</td><td>Large-Sized General Molded, Extruded, and Fabricated Rubber Plants</td></tr>
<tr><td>H</td><td>Wet Digestion Reclaimed Rubber</td><td>3069: Fabricated Rubber Products, NEC</td><td>Wet digestion reclaimed rubber</td></tr>
<tr><td>I</td><td>Pan, Dry Digestion, and Mechanical Reclaimed Rubber</td><td>3069: Fabricated Rubber Products, NEC</td><td>Reclaimed rubber
Excludes wet digestion</td></tr>
<tr><td>J</td><td>Latex-Dipped, Latex-Extruded, and Latex-Molded Rubber</td><td>3069: Fabricated Rubber Products, NEC</td><td>Latex-dipped, latex-extruded, and latex-molded rubber
Excludes textiles subject to 40 CFR Part 410</td></tr>
<tr><td>K</td><td>Latex Foam</td><td>3069: Fabricated Rubber Products, NEC</td><td>Latex foam
Excludes textiles subject to 40 CFR Part 410</td></tr>
</table>

Source: *Rubber Manufacturing Point Source Category - 40 CFR 428*; *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Fabricated and Reclaimed Rubber Segment of the Rubber Processing Point Source Category* (U.S. EPA, 1974a); *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Tire and Synthetic Segment of the Rubber Processing Point Source Category* (U.S. EPA, 1974b).
NEC - Not elsewhere classified.

17.2 Rubber Manufacturing Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Rubber Manufacturing Category including the screening-level review and category-specific review.

17.2.1 Rubber Manufacturing Category 2005 Screening-Level Review

Table 17-4 presents the Rubber Manufacturing Category TWPE calculated, using *TRIReleases2002_v2* and *PCSLoads2002_v2*.

Table 17-4. Rubber Manufacturing Category 2005 Screening-Level Review Results

Rank	Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
9	Rubber Manufacturing	2,386	173,304	175,690

Sources: *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTW and account for POTW removals.

17.2.2 Rubber Manufacturing Category 2005 Pollutants of Concern

Table 17-5 shows the five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the five chemicals with the highest TWPE in *PCSLoads2002_v2*. The top five pollutants account for approximately 99 percent of the Rubber Manufacturing Category's 2002 combined TWPE.

17.3 Potential New Subcategories for the Rubber Manufacturing Category

EPA did not identify any potential new subcategories for the Rubber Manufacturing Category.

Table 17-5. 2005 Annual Review: Rubber Manufacturing Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI [b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Sodium Nitrite	Pollutants are not in the top five PCS 2002 reported pollutants			12	316,929	118,320
PACs				4	500	50,293
1,3-Butadiene				4	250	1,208
Zinc and Zinc Compounds				166	22,121	1,037
Chlorine				4	1,534	781
Benzidine	1	0.24	677	Pollutants are not in the top five TRI 2002 reported pollutants.		
Arsenic	2	115	446			
Acrylonitrile	3	141	320			
Copper	8	266	169			
Vanadium	1	4,710	165			
Rubber Manufacturing Category Total	**20[c]**	**9,530,447**	**2,386**	**220[c]**	**1,082,214**	**173,304**

Source: *PCSLoads2002_v2; TRIReleases2002_v2*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

17.4 Rubber Manufacturing Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Rubber Manufacturing Category. EPA obtained additional data and identified:

- Errors in how PCS loads were estimated for one facility; and
- Changes in estimates of TWPE for sodium nitrite.

After EPA made the changes identified during the 2006 annual review, the TWPE in the TRI and PCS databases is less than 5,000 TWPE for the entire category.

17.4.1 Rubber Manufacturing Category Facility Discharge Revisions

EPA contacted Michelin North America's Ardmore Plant, which reported PACs to TRI in 2002 as discharges to surface water. The facility indicated that the PACs were not released to surface water, but were actually transferred to a landfill. Michelin North America's Ardmore Plant plans to make a correction to previously submitted TRI reports (Dryden, 2005). To accurately reflect the actual discharges, EPA deleted the discharges of PACs reported to TRI in 2002 by this facility, resulting in a decrease of 6,747 pounds of PACs.

17.4.2 Rubber Manufacturing Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF and POTW removal values used for sodium nitrite, the TWF for nitrate compounds, and the POTW removal for chlorine in the TRI and PCS databases. During the 2006 annual review, EAD revised the TWF and POTW percent removal values used for sodium nitrite in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373), and the POTW removal is now 90 percent (formerly 1.85 percent). According to facilities EPA contacted, rubber facilities that use a molten salt curing process may discharge sodium nitrite. The molten salt, which can contain sodium nitrite, is removed from the rubber products using a water wash that is discharged (Dryden, 2005; Hines, 2005; Hough, 2005; Rader, 2005). EAD also revised the TWF for nitrate compounds to better reflect the pollutant's properties. The TWF that EAD applies for nitrate compounds is now 0.000747 (formerly 0.000062). Additionally, EAD revised the POTW removal values used for chlorine in the TRI database to better reflect the water chemistry of chlorine. The POTW removal is now 100 percent (formerly 1.87 percent). Table 17-6 presents the loads before and after corrections to the sodium nitrite TWF and POTW percent removal, nitrate compounds TWF, and chlorine POTW percent removal for the Rubber Manufacturing Category. Based on the changes described above, the sodium nitrite TWPE dropped by 99 percent and is no longer a pollutant of concern.

Table 17-6. Impact of Changes to TWF and POTW Percent Removal for the Rubber Manufacturing Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	12	118,320	22
TRI 2002	Nitrate Compounds	20	43	521
TRI 2002	Chlorine	4	781	406

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*.

17.4.3 Rubber Manufacturing Category 2006 Screening-Level Review

The results of the 2006 screening-level review are the TRI and PCS rankings after the revisions described in Section 4.2. This accounts for methodology changes described in Section 4.2 and changes made based on contacts to facilities. For the Rubber Manufacturing Category, the most significant changes are also described in Sections 17.4.1 and 17.4.2. Table 17-7 shows the 2006 screening-level TWPE estimated for the Rubber Manufacturing Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 17-7. Rubber Manufacturing Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Rubber Manufacturing	2,350	5,104	4,395

Sources: *PCSLoads2002_v4; TRIReleases2002_v4; TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTW and account for POTW removals.

17.4.4 Rubber Manufacturing Category 2006 Pollutants of Concern

Table 17-8 presents the pollutants of concern for the Rubber Manufacturing Category as part of the 2006 annual review. Sodium nitrite is no longer a top pollutant of concern due to the decrease in TWF and increase in POTW percent removal. With the revised TWPE, the Rubber Manufacturing Category is no longer ranked high in terms of TWPE.

17.5 Rubber Manufacturing Category Conclusions

- The high TWPE ranking for the Rubber Manufacturing Category in the 2005 annual review was due to discharges of sodium nitrite reported to TRI. EPA changed the sodium nitrite TWF and POTW percent removal to better reflect the chemistry in water, and therefore sodium nitrite is no longer a top pollutant of concern

- After EPA revised the TRI and PCS databases, the facilities with discharges subject to the Rubber Manufacturing ELGS account for 7,454 TWPE using combined TRI and PCS data from 2002.

- EPA is not identifying the Rubber Manufacturing Category as a hazard based on data available at this time.

Table 17-8. 2006 Annual Review: Rubber Manufacturing Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
1,3-Butadiene	These pollutants are not reported in the top five PCS 2002 reported pollutants.			4	250	1,208	2	65	316
Zinc and Zinc Compounds				164	21,870	1,025	154	18,401	863
Lead and Lead Compounds				48	249	558	47	258	579
Nitrate Compounds				20	697,523	521	18	625,824	467
Chlorine				4	798	406	2	555	283
Benzidine	1	0.24	667	These pollutants are not in the top five TRI 2002 reported pollutants.			These pollutants are not in the top five TRI 2003 reported pollutants.		
Arsenic	1	115	466						
Acrylonitrile	2	141	320						
Copper	7	266	169						
Vanadium	1	4,710	165						
Rubber Manufacturing Category Total	**20[c]**	**9,530,447**	**2,350**	**218[c]**	**770,616**	**5,104**	**203[c]**	**727,211**	**4,395**

Source: *PCSLoads2002_v4; TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include major dischargers only.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

17.6 Rubber Manufacturing Category References

Dryden, Bob. 2005. Telephone conversation with Bob Dryden of GDX Automotive, New Haven, MO, and Jessica Wolford of Eastern Research Group, Inc. "Clarification of Manufacturing Process and Pollutant Discharges." (June 13). DCN 02071.

Hines, John. 2005. Telephone conversation with John Hines of Avon Automotive, Cadillac, MI, and Jessica Wolford of Eastern Research Group, Inc. "Clarification of Manufacturing Process and Pollutant Discharges." (June 9). DCN 02070.

Hough, Mike. 2005. Telephone conversation with Mike Hough of GDX Automotive, Wabash, IN, and Jessica Wolford of Eastern Research Group, Inc. "Clarification of Manufacturing Process and Pollutant Discharges." (June 22). DCN 02072.

Johnston, Carey. 2006. U.S. EPA. Memorandum to Public Record for the Effluent Guidelines Program Plan 2005/2006. "November 10, 2005, Meeting Between EPA and Rubber Manufacturers." (February 8). DCN 03227.

Rader, Stacey. 2005. Telephone conversation with Stacey Rader of Cooper Standard Automotive, Bowling Green, OH, and Jessica Wolford of Eastern Research Group, Inc. "Clarification of Manufacturing Process and Pollutant Discharges." (June 20). DCN 02069.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1974a. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Fabricated and Reclaimed Rubber Segment of the Rubber Processing Point Source Category*. EPA-440/1-74/030-a. Washington, DC.

U.S. EPA. 1974b. *Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Tire and Synthetic Rubber Segment of the Rubber Processing Point Source Category*. EPA-440/1-74-013-a. Washington, DC.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.

18.0 TEXTILE MILLS (40 CFR PART 410)

EPA selected the Textile Mills (Textiles) Category for additional data collection and analysis because of the high TWPE identified in the 2005 screening-level review (see Table V-1, 70 FR 51050, August 29, 2005). The 2004 Plan summarizes the results of EPA's previous reviews of this industry (U.S. EPA, 2004). This section summarizes the 2005 annual review and also describes EPA's 2006 annual review of the discharges associated with the Textiles Category (U.S. EPA, 2005b). EPA's 2006 annual review builds on the 2005 annual review. EPA identified facilities contributing the most TWPE as part of the 2006 annual review.

18.1 Textile Mills Point Source Category Background

This subsection provides background on the Textiles Category including a brief industry profile of the textiles industry and background on 40 CFR Part 410.

18.1.1 Textiles Industry Profile

The Textiles Category includes facilities that manufacture and process textile materials, such as carpets, broad woven fabrics, and knitwear. It also includes facilities using wet processes, such as scouring, dyeing, finishing, printing, and coating, that discharge contact wastewater. These facilities are classified under SIC major group 22: Textile Mill Products. EPA is considering adding three SIC codes from major group 23: Apparel and Other Finished Products Made from Fabrics and Other Similar Materials as potential new subcategories of the Textiles Category, as discussed in Section 18.4. Table 18-1 lists the SIC major groups with operations in the Textiles Category.

Table 18-1. Number of Facilities in Textiles SIC Major Groups

SIC Major Group	2002 U.S. Economic Census	2002 PCS[a]	2002 TRI[b]	2003 TRI[b]
22: Textile Mill Products	14,519	145	284	289
Potential New Subcategories				
23: Apparel and Other Finished Products Made from Fabrics and Other Similar Materials	27,295	0	16	16

Source: U.S. Economic Census, 2002 (U.S. Census, 2002); *PCSLoads2002_v2*; *TRIReleases2002_v2*; *TRIReleases2003_v2*.
[a]Major and minor dischargers.
[b]Releases to any media.

Textile manufacturers discharge directly to surface water as well as to POTWs. Table 18-2 presents the types of discharges reported by facilities in the 2002 TRI database. The majority of mills reporting to TRI reported no water discharges, but facilities may be discharging pollutants in wastewater at levels below the TRI-reporting threshold.

Table 18-2. Textiles Category Facilities by Type of Discharge Reported in TRI 2002

SIC Major Group	Reported Only Direct Discharges	Reported Only Indirect Discharges	Reported Both Direct and Indirect Discharges	Reported No Water Discharges
22: Textile Mill Products	15	64	8	183
Potential New Subcategories				
23: Apparel and Other Finished Products Made from Fabrics and Other Similar Materials	1	4	0	11

Source: *TRIReleases2002_v4.*

18.1.2 40 CFR Part 410

EPA first promulgated ELGs for the Textiles Category (40 CFR Part 410) on September 2, 1982 (47 FR 38819). There are nine subcategories, all of which have BPT, BAT, and NSPS limitations. Some subcategories also have PSES and PSNS limitations. Table 18-3 lists the nine subcategories, their related SIC codes, and applicability. Table 18-4 lists the regulated pollutants for the subcategories. Section 5.4.5 of the 2004 TSD provides more information on the regulatory background for the Textiles Category (U.S. EPA, 2004).

Table 18-3. Applicability of Subcategories in the Textiles Category

Subpart	Subpart Name	Applicable SIC Code(s)	Subpart Applicability
A	Wool Scouring	2299	Wool scouring, topmaking, and general cleaning of raw wool
B	Wool Finishing	2231	Wool finishers, including carbonizing, fulling, dyeing, bleaching, rinsing, fireproofing, and other such similar processes
C	Low Water Use Processing	2211, 2221, 2231, 2241, 2253, 2254, 2259, 2273, 2281, 2282, 2284, 2295, 2296, 2298	Yarn manufacture, yarn texturizing, unfinished fabric manufacture, fabric coating, fabric laminating, tire cord and fabric dipping, and carpet tufting and carpet backing
D	Woven Fabrics Finishing	2261, 2262	Woven fabric finishers, which may include any or all of the following unit operations: desizing, bleaching, mercerizing, dyeing, printing, resin treatment, water proofing, flame proofing, soil repellency application and a special finish application
E	Knit Fabric Finishing	2251, 2252, 2257, 2258	Knit fabric finishers, which may include any or all of the following unit operations: bleaching, mercerizing, dyeing, printing, resin treatment, water proofing, flame proofing, soil repellency application and a special finish application
F	Carpet Finishing	2273	Carpet mills, which may include any or all of the following unit operations: bleaching, scouring, carbonizing, fulling, dyeing, printing, resin treatment, waterproofing, flameproofing, soil repellency, looping, and backing with foamed and unfoamed latex and jute
G	Stock & Yarn Finishing	2269	Stock or yarn dyeing or finishing, which may include any or all of the following unit operations and processes: cleaning, scouring, bleaching, mercerizing, dyeing and special finishing
H	Nonwoven Manufacturing	2297	Facilities that primarily manufacture nonwoven textile products of wool, cotton, or synthetics, singly or as blends, by mechanical, thermal, and/or adhesive bonding procedures
I	Felted Fabric Processing	2299	Facilities that primarily manufacture nonwoven products by employing fulling and felting operations as a means of achieving fiber bonding

Source: *Textile Mills Point Source Category - 40 CFR 410*; *Development Document for Effluent Limitations Guidelines and Standards for the Textile Mills Point Source Category* (U.S. EPA, 1979).

Table 18-4. Pollutants Regulated by Existing Textiles ELGs

Subpart	Subcategory	BPT	BAT	NSPS
A	Wool Scouring[a]	BOD_5, COD, TSS, Oil & Grease, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
B	Wool Finishing[a]	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
C	Low Water Use Processing	BOD_5, COD, TSS, pH	COD	BOD_5, COD, TSS, pH
D	Woven Fabrics Finishing[a]	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
E	Knit Fabric Finishing[a]	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
F	Carpet Finishing[a]	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
G	Stock & Yarn Finishing[a]	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
H	Nonwoven Manufacturing	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH
I	Felted Fabric Processing	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH	COD, Sulfide, Phenols, Total Chromium	BOD_5, COD, TSS, Sulfide, Phenols, Total Chromium, pH

Source: *Textile Mills Point Source Category – 40 CFR Part 410*.
[a]Subcategories with wet processing.

18.2 Textiles Category 2005 Annual Review

This subsection discusses EPA's 2005 annual review of the Textiles Category including the screening-level review and category-specific review.

18.2.1 Textiles Category 2005 Screening-Level Review

Table 18-5 presents the Textiles Category TWPE, using *TRIReleases2002_v2* and *PCSLoads2002_v2*. Table 18-5 includes discharges from facilities in SIC codes EPA determined are potential new subcategories of the Textiles Category. The estimated TWPE from *PCSLoads2002_v2* far exceeds the TWPE from *TRIReleases2002_v2*.

Table 18-5. Textiles Category 2005 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	Total TWPE
Textiles Category	124,085	32,765	156,850

Source: *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a); *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

18.2.2 Textiles Category 2005 Pollutants of Concern

Table 18-6 shows the top five pollutants with the highest TWPE in *TRIReleases2002_v2*, as well as the top five pollutants with the highest TWPE in *PCSLoads2002_v2*. Sulfide contributed 59 percent of the category PCS TWPE in 2002, while chlorine contributed approximately 25 percent of the TRI TWPE in 2002.

Table 18-6. 2005 Annual Review: Textiles Category Pollutants of Concern

Pollutant	2002 PCS[a] Number of Facilities Reporting Pollutant	2002 PCS[a] Total Pounds Released	2002 PCS[a] TWPE	2002 TRI[b] Number of Facilities Reporting Pollutant	2002 TRI[b] Total Pounds Released	2002 TRI[b] TWPE
Sulfide	66	26,013	72,874	Pollutant is not in the top five TRI 2002 reported pollutants.		
Chlorine	32	59,576	30,334	4	25,316	12,890
Arsenic	5	3,989	16,123	Pollutants are not in the top five TRI 2002 reported pollutants.		
Toxaphene	1	0.046	1,393			
Copper and Copper Compounds	33	1,854	1,177	10	909	577
Sodium Nitrite	Pollutants are not in the top five PCS 2002 reported pollutants.			2	44,711	16,692
Chlorine Dioxide				1	4,613	738
Naphthalene				1	22,000	349
Textiles Category Total	**74[c]**	**77,500,000**	**124,085**	**90[c]**	**311,615**	**32,765**

Source: *PCSLoads2002_v2*; *TRIReleases2002_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

18.3 Potential New Subcategories for the Textiles Category

EPA reviewed industries with SIC codes not clearly subject to existing ELGs. EPA concluded the processes, operations, wastewaters, and pollutants discharged by facilities in the SIC codes listed in Table 18-7 are similar to those of the Textiles Category. These SIC codes fall under the major SIC major group 23: Apparel and Other Finished Products Made from Fabrics and Similar Materials. Some apparel manufacturing activities may be similar to textile mill processes, such as bleaching, dyeing, printing, and other finish applications. Table 18-7 shows the total TRI and PCS combined TWPE for each SIC code that is a potential new subcategory. As shown in the table, the discharges for the potential new subcategory SIC codes contribute a negligible percentage to the total Textiles Category TWPE.

Table 18-7. Pollutant Loadings From Potential New Subcategories for the Textile Category

SIC Code	2005 Annual Review Combined TRI and PCS TWPE	Percentage of Total Category TWPE
2322: Men's & Boys Underwear & Nightwear	2.55	0.002
2396: Automotive Trimmings, Apparel	0.12	<0.001
2399: Fabricated Textile Products, NEC	0.08	<0.001

Source: *TRIReleases2002_v2*; *PCSLoads2002_v2*.
NEC - Not elsewhere classified.

18.4 Textiles Category 2006 Annual Review

Following EPA's 2005 annual review, EPA continued to review the accuracy of the data in the PCS and TRI databases for the Textiles Category. EPA obtained additional data and identified changes in estimates of TWPE for sodium nitrite and chlorine.

18.4.1 Textiles Category TWF and POTW Percent Removal Revisions

As described in Table 4-1 in Section 4.2, during its 2006 annual review, EAD revised the TWF and POTW percent removal values for sodium nitrite and the POTW percent removal value for chlorine in the TRI and PCS databases to better reflect the pollutant's properties. The TWF that EAD applies for sodium nitrite is now 0.0032 (formerly 0.373), and the POTW percent removal is now 90 percent (formerly 1.95 percent). The POTW percent removal that EAD applies for chlorine is now 100 percent (formerly 1.87 percent). Table 18-8 presents the loads before and after corrections to the sodium nitrite TWF and POTW percent removal and the chlorine POTW percent removal for the Textiles Category.

Table 18-8. Impact of Changes to TWF and POTW Percent Removal for the Textiles Category

Database	Pollutant	Number of Facilities Reporting Discharges	TWPE from 2005 Review	TWPE from 2006 Review
TRI 2002	Sodium Nitrite	2	16,692	2.96
TRI 2002	Chlorine	4	12,890	552

Sources: *TRIReleases2002_v2*; *TRIReleases2002_v4*.

18.4.2 Textiles Category 2006 Screening-Level Review

The results of the 2006 screening-level review are the TRI and PCS rankings after the revisions described in Section 4.2. This accounts for methodology changes described in Section 4.2. For the Textiles Category, the most significant changes are also described in Section 16.4.1. Table 18-9 shows the 2006 screening-level TWPE estimated for the Textiles Category from the 2002 and 2003 TRI and 2002 PCS databases.

Table 18-9. Textiles Category 2006 Screening-Level Review Results

Point Source Category	2002 PCS TWPE[a]	2002 TRI TWPE[b]	2003 TRI TWPE[b]
Textiles	123,494	3,709	3,447

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.

18.4.3 Textiles Category Pollutants of Concern

Table 18-10 presents the pollutants of concern for the Textiles Category based on the 2006 annual review.

Table 18-10. 2006 Annual Review: Textiles Category Pollutants of Concern

Pollutant	2002 PCS[a]			2002 TRI[b]			2003 TRI[b]		
	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE	Number of Facilities Reporting Pollutant	Total Pounds Released	TWPE
Sulfide	39	26,013	72,874	Pollutant is not in the top five TRI 2002 reported pollutants.					
Chlorine	23	59,576	30,334	4	1,085	552	3	1,019	519
Arsenic	2	3,989	16,123	Pollutants are not in the top five TRI 2002 reported pollutants.					
Toxaphene	1	0.046	1,393						
Copper and Copper Compounds	25	1,854	1,177	10	909	577	11	1,124	713
Chlorine Dioxide	Pollutants are not in the top five PCS 2002 reported pollutants.			1	4,613	738	1	4,515	722
Naphthalene				1	22,000	349	1	11,000	175
Chromium and Chromium Compounds				9	4,464	338	9	3,175	240
Textiles Category Total	**69[c]**	**77,497,564**	**123,494**	**92[c]**	**243,597**	**3,709**	**92[c]**	**451,147**	**3,447**

Source: *PCSLoads2002_v4*; *TRIReleases2002_v4*; *TRIReleases2003_v2*.
[a]Discharges include only major dischargers.
[b]Discharges include transfers to POTWs and account for POTW removals.
[c]Number of facilities reporting TWPE greater than zero.

18.4.4 Textiles Category Sulfide Discharges

EPA reviewed the sulfide discharges from textile mills reporting to PCS in 2002. Part 410 regulates discharges of sulfide from textile mills, and 39 textile mills report sulfide discharges to PCS. Table 18-11 lists the 15 mills that contribute the most sulfide TWPE for the category. Together, they account for 90 percent of the sulfide TWPE in PCS for textile mills.

Table 18-11. Top Facilities Reporting Sulfide Discharges in *PCSLoads2002_v4*

Facility Name	Location	2002 Flow (MGY)	Pounds of Sulfide	Sulfide TWPE
Mohawk Industries	Lyerly, GA	569	4,841	13,561
Galey & Lord/Society Hill	Society Hill, SC	1,371	3,837	10,749
Chargeurs Wool (USA), Inc.	Jamestown, SC	75	3,300	9,245
Avondale Mills	Sylacauga, AL	535	1,699	4,761
Kenyon Industries	Shannock, RI	129	1,604	4,493
Eflex LLC Eflex WWTP	Lawndale, NC	48	1,511	4,233
Cramerton Eagle Road	Cramerton, NC	371	1,293	3,622
Gold Mills, Inc	Pine Grove, PA	132	1,141	3,197
King America Fishing	Dover, GA	476	901	2,525
Rabun Apparel, Inc.	Rabun Gap, GA	505	765	2,143
Westpoint Stevens	Clemson, SC	635	690	1,933
Plains Cotton Cooperative Association	New Braunfels, TX	128	545	1,526
Jockey International	Carlisle, KY	58	530	1,486
Interface Fabrics Group Finish	East Douglas, MA	65	421	1,180
Velcorex	Orangeburg, SC	218	314	880

Source: *PCSLoads2002_v4.*

For the four facilities with the largest sulfide discharges, EPA obtained detailed PCS data, including concentrations, for 2002 to 2006. Together, these four facilities account for more than 50 percent of the category's sulfide TWPE. Table 18-12 lists EPA's findings from PCS concentration data. Concentration data were available for two of these four facilities. One mill reported detecting sulfide in 8 of 14 samples (57 percent). The other mill reported detecting sulfide in 8 of 48 samples (17 percent).

Table 18-12. Concentration Data Available for Top Four Facilities Reporting Sulfide Discharges in *PCSLoads2002* for the Textiles Category

Facility Name	Location	Date Range	Concentration Data Summary: Range (mg/L)	Concentration Data Summary: Number Detected	Concentration Data Summary: Total Number Data Points
Mohawk Industries	Lyerly, GA	9/30/02 – 1/31/06	NA[a]	NA[a]	NA[a]
Galey & Lord/Society Hill	Society Hill, SC	5/31/02 – 2/28/06	<0.038 – 2.1	8	48
Chargeurs Wool (USA), Inc.	Jamestown, SC	12/31/02 – 1/31/05	<1.0 – 6	7	14
Avondale Mills	Sylacauga, AL	4/30/02 – 1/31/06	NA[a]	NA[a]	NA[a]

Source: Envirofacts; *PCSLoads2002_v4*.
[a]Only quantity data are available in PCS.
NA – Not available.

18.4.5 Textiles Category Chlorine Discharges

EPA reviewed the chlorine discharges from textile mills reporting to PCS in 2002. Part 410 does not regulate discharges of chlorine from textile mills; however, 32 textile mills report chlorine discharges to PCS (9 report discharges greater than zero). Table 18-13 lists the 23 mills with chlorine discharges greater than zero in *PCSLoads2002_v4*. One facility, Burlington Industries in Cordova, NC, accounts for 87 percent of the category chlorine TWPE.

EPA obtained detailed PCS data for the Burlington Industries Cordova, NC mill, as well as its NPDES permit (NCDENR, 2004). Table 18-14 summarizes the chlorine concentrations, as reported in PCS for 2002, and the chlorine limitations in the Burlington permit. The chlorine concentrations appear to be misreported as mg/L for certain months, instead of µg/L, which is a consistent pattern for data from the years 2000 through 2005. As a result, EPA will verify these chlorine discharges as part of its 2007 review of industrial discharges with existing regulations and correct the PCS database accordingly. Also, the permitted chlorine limitation of 28 µg/L is a daily maximum value that took effect in March 2006, and the facility's current discharges of chlorine are likely lower than the values for 2002 summarized in Table 18-14.

Table 18-13. Facilities With Largest Chlorine Discharges in *PCSLoads2002_v4*

Facility Name	Location	Pounds of Chlorine	Chlorine TWPE
Burlington Industries Richmond	Cordova, NC	51,606	26,276
Pharr Yarns Inc.	McAdenville, NC	1,679	855
Cramerton Eagle Road WWTP	Cramerton, NC	1,575	802
Interface Fabrics Group S Inc. IF	Elkin, NC	1,267	645
Springs Industries/Grace Complex	Lancaster, SC	785	400
Burlington Industries LCC	Hurt, VA	671	342
Spring Industries, Inc.	Griffin, GA	486	247
Glen Touch Yarn Company LLC	Altamahaw, NC	401	204
Rabun Apparel, Inc.	Rabun Gap, GA	253	129
Chargeurs Wool (USA) Inc.	Jamestown, SC	192	98
Westpoint Stevens/Clemson Plant	Clemson, SC	181	92
Dan River Inc. – Schoolfield	Danville, VA	177	90
Lees Carpets	Glasgow, VA	89	45
Mohawk Industries/Rocky River Plant	Calhoun Falls, SC	67	34
BBA Fiberweb/Bethune	Bethune, SC	64	33
Burlington Industries BM	Clarksville, VA	28	14
West Pt Stevens Inc Wagram Plant	Wagram, VA	21	11
Deroyal Textiles	Camden, NC	15	8
Kawashima Textile USA Inc.	Lugoff, SC	14	7
Guilford Mills Inc. Gulford E Mills	Kenansville, SC	2	1
Schneider Mills Inc. Schneider Mills	Taylorsville, NC	2	1
Cone Mills Corp. Cliffside Plant	Cliffside, NC	1	0
CCX Fiberglass Products Division	Walterboro, SC	1	0

Source: *PCSLoads2002_v4.*

Table 18-14. Chlorine Limitations and PCS Concentration Data for Burlington Industries Cordova, NC Textile Mill

Outfall	Chlorine Limit (ug/L)	Flow Limit (MGD)	Concentrations As Reported in PCS			Units in PCS	Date
			Mean	Minimum	Maximum		
001: Wastewater treatment plant effluent	28 (Daily Maximum, Effective March 2006)	1.2	73.3	40	80	mg/L	1/31/2002
			56.7	40	80	ug/L	2/28/2002
			66.7	60	80	mg/L	3/31/2002
			74.3	60	80	ug/L	4/30/2002
			64.3	40	80	mg/L	5/31/2002
			68.3	60	80	ug/L	6/30/2002
			62.7	40	80	mg/L	7/31/2002
			65.8	50	80	mg/L	8/31/2002
			50.8	30	80	mg/L	9/30/2002
			52.7	40	70	ug/L	10/31/2002
			54.2	50	60	ug/L	11/30/2002
			50.8	40	60	mg/L	12/31/2002
002: Cooling water	28 (Daily Maximum, Effective March 2006)	Monitoring Only	20.0	20	20	mg/L	1/31/2002
			10.0	10	10	mg/L	2/28/2002
			20.0	20	20	ug/L	3/31/2002
			40.0	40	40	ug/L	4/30/2002
			20.0	20	20	ug/L	5/31/2002
			20.0	20	20	ug/L	6/30/2002
			20.0	20	20	mg/L	7/31/2002
			20.0	20	20	mg/L	8/31/2002
			30.0	30	30	ug/L	9/30/2002
			20.0	20	20	ug/L	10/31/2002
			20.0	20	20	ug/L	11/30/2002
			10.0	10	10	ug/L	12/31/2002

Source: Envirofacts; Permit to Discharge Wastewater Under the National Pollution Discharge Elimination System NPDES NC0043320 – Burlington Industries, Inc., Cordova, NC (NCDENR, 2004).

18.5 Textiles Category Conclusions

- The Textiles Category was selected for additional review because of high TWPE in the PCS databases.

- Discharges of sulfide account for 59 percent of the category PCS TWPE. EPA reviewed PCS concentration data for sulfide discharges from the four textile mills with the highest TWPE, but only two had concentration data available. At these two mills, the data show concentrations ranging from levels below laboratory detection limits to 6 mg/L. For PCS data from 2002 to 2005, sulfide was detected above sample detection limits only 57 and 17 percent of the time.

- Discharges of chlorine account for 25 percent of the category PCS TWPE, and one facility accounts for 87 percent of the category chlorine TWPE: Burlington Industries in Cordova, NC. EPA reviewed the Burlington facility's permit and detailed PCS data and identified a likely error in the units in which chlorine concentrations are reported in PCS.

- EPA had incomplete data available for a full analysis. Specifically, further EPA review of this category will include acquiring additional concentration data from PCS for sulfide discharges, reviewing sulfide permit limitations, comparing current discharge concentrations and production-normalized loads, and considering if additional wastewater treatment would control sulfide discharges.

18.6 Textiles Category References

NCDENR. 2004. North Carolina Department of Environment and Natural Resources. Permit to Discharge Wastewater Under the National Pollution Discharge Elimination System NPDES NC0043320 – Burlington Industries, Inc., Cordova, NC. Raleigh, NC. (August 9). DCN 03980.

U.S. Census. 2002. U.S. Economic Census. Available online at: http://www.census.gov/econ/census02.

U.S. EPA. 1979. *Development Document for Effluent Limitations Guidelines and Standards for the Textile Mills Point Source Category*. EPA-440/1-79/022b. Washington, DC.

U.S. EPA. 1996. *Preliminary Study of the Textile Mills Category*. Washington, DC. EPA-HQ-OW-2003-0074-0616. DCN 00484.

U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan.* EPA-821-R-04-014. Washington, DC. (August). DCN 01088.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source*

Categories for Effluent Limitations and Standards. EPA-821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. *Preliminary Review of Prioritized Categories of Industrial Discharger*s. EPA-821-B-05-004. Washington, DC. (August). DCN 02175.