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EPA

Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry

Volume I

Chapter

7

POLLUTANTS SELECTED FOR REGULATION

Chapter 6 details the pollutants of concern for each subcategory and the methodology used in selecting the pollutants. As expected for the CWT industry, these pollutants of concern lists contain a broad spectrum of pollutants. EPA has, however, chosen not to regulate all of these parameters. This chapter details the pollutants of concern which were not selected for regulation under each technology option selected as the basis for the final limitations and standards and provides a justification for eliminating these pollutants (the technology options are detailed in Chapter 9). Additionally, Figures 7-1 and 7-2 illustrate the procedures used to select the regulated pollutants for direct and indirect dischargers.

TREATMENT CHEMICALS 7.1

EPA excluded all pollutants which may serve as treatment chemicals: aluminum, boron, calcium, chloride, fluoride, iron, magnesium, manganese, phosphorus, potassium, sodium, and sulfur. EPA eliminated these pollutants because regulation of these pollutants could interfere with their beneficial use as wastewater treatment additives.

NON-CONVENTIONAL BULK PARAMETERS 7.2

EPA excluded many non-conventional bulk parameters such as total dissolved solids (TDS), chemical oxygen demand (COD), organic carbon (TOC), nitrate/nitrite, SGT-HEM, total phenols, total phosphorus, and total sulfide. EPA excluded these parameters because it is more appropriate to target specific compounds of interest rather than a parameter which measures a variety of pollutants for this industry. The specific pollutants which comprise the bulk parameter may or may not be of concern to EPA.

POLLUTANTS NOT DETECTED AT TREATABLE LEVELS 7.3

EPA eliminated pollutants that were present below treatable concentrations in wastewater influent to the treatment system(s) selected as the basis for effluent limitations. EPA evaluated the data at each sampling episode separately. Section 10.4.3.1 describes this data editing criteria in greater detail and provides an example. Briefly, this procedure was nicknamed the "long-term average test" and was performed as follows. For a pollutant to be retained, the pollutant first had to be detected at any level in the influent samples at least 50 percent of the time during any sampling episode. The pollutant also had to be detected in the influent samples at treatable levels (ten times the baseline value[1]) in at least fifty percent of the samples; or b) the mean of the influent samples for the entire facility had to be greater than or equal to ten times the baseline value. EPA added the second condition to account for instances where a slug of pollutant was treated during the sampling episode. EPA added this condition since the CWT industry's waste receipts vary daily and EPA wanted to incorporate these variations in the calculations of long term averages and limitations. Pollutants excluded from regulation for the selected subcategory options because they were not detected at treatable levels are presented in Table 7-1.

[1]See Chapter 15 for a description of baseline values.

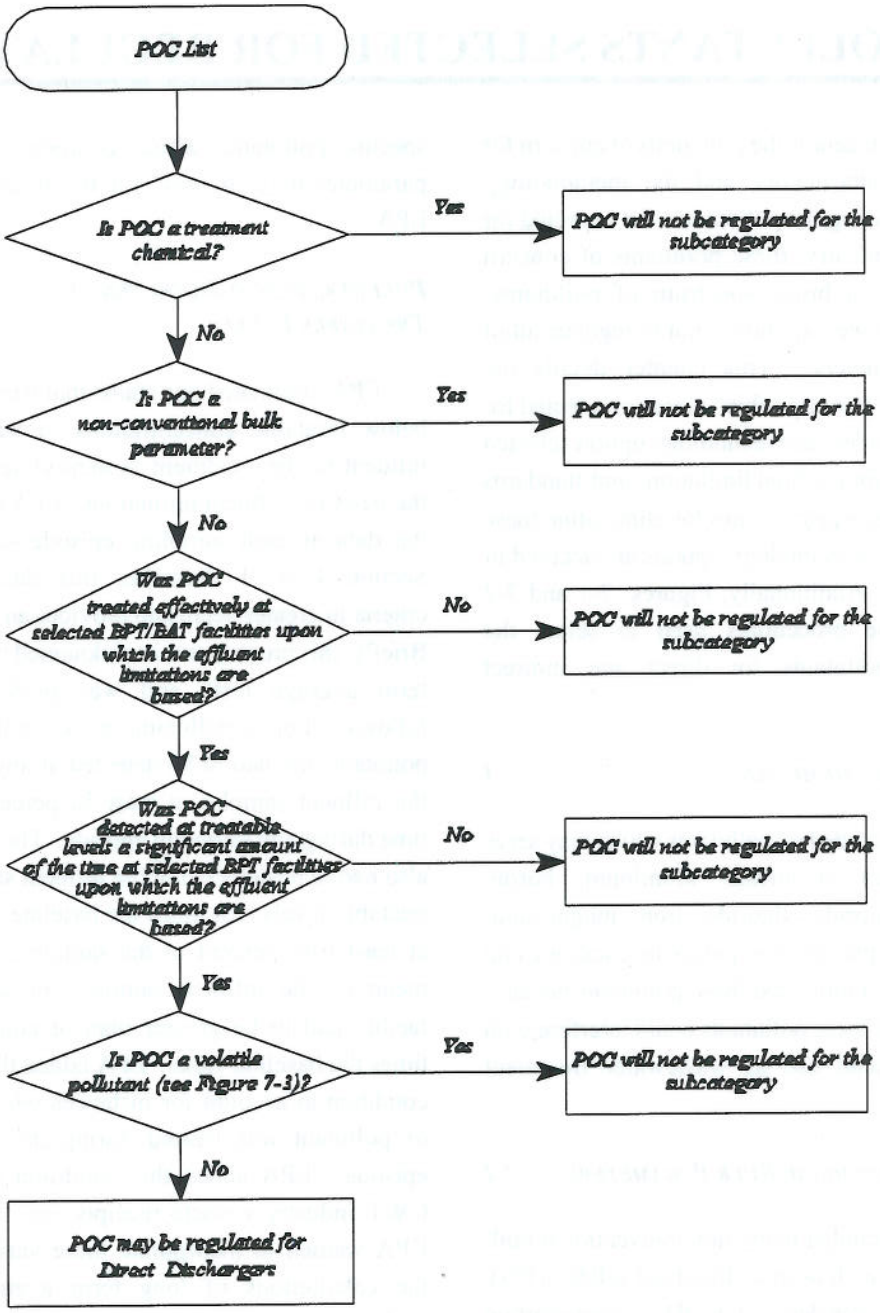

Figure 7-1. Selection of Pollutants That May Be Regulated for Direct Discharges for Each Subcategory

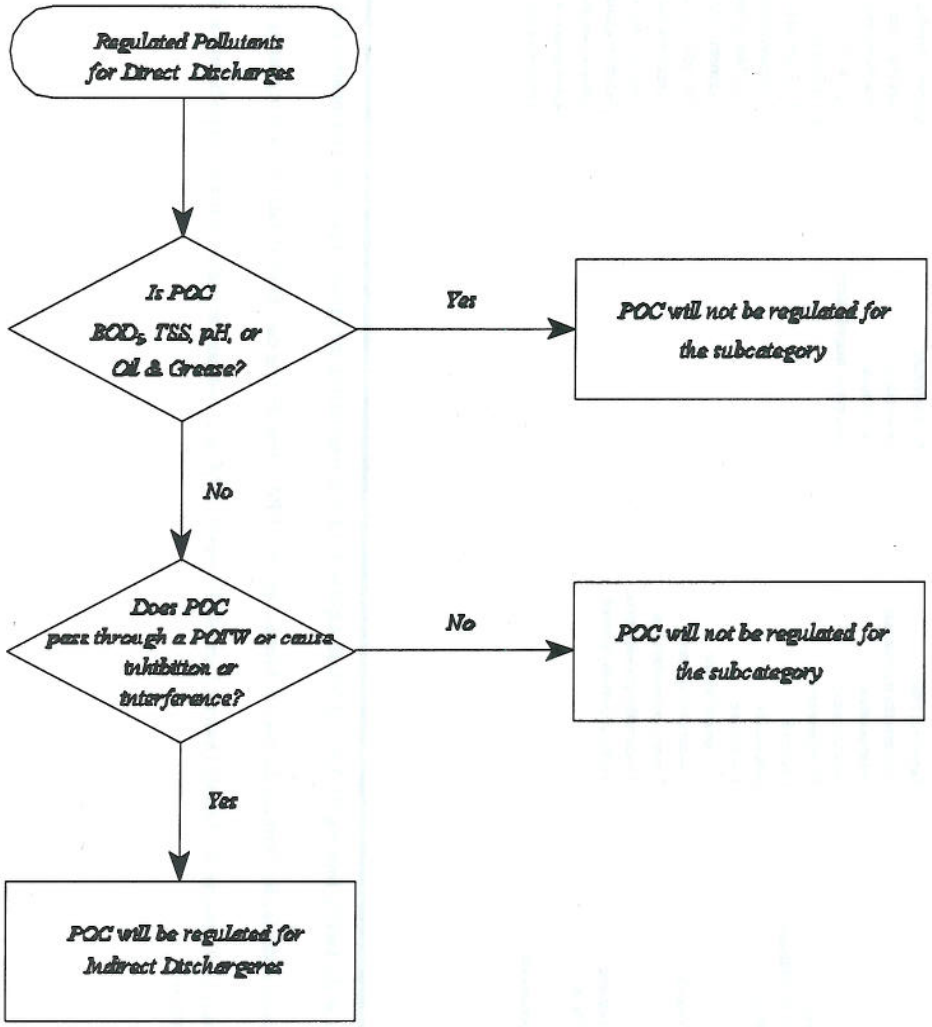

Figure 7-2. Selection of Pollutants to be Regulated for Indirect Discharges for Each Subcategory

Table 7-1. Pollutants of Concern Not Detected at Treatable Levels

Metals Option 3	Metals Option 4	Oils Option 8	Oils Option 9	Organics Option 3/4
Oil and Grease [2]	Arsenic [1]	Germanium	Germanium	Arsenic
Total Cyanide	Beryllium	Lutetium	Lutetium	Barium
Gallium	Gallium	Silver	Silver	Iodine
Iodine	Indium	Tantalum	Tantalum	Lead
Iridium	Iodine	Aniline	Aniline	Titanium
Lithium	Lanthanum	Benzyl Alcohol	N-hexacosane	Bromodichloromethane
Strontium	Osmium	Diphenyl Ether	N-octacosane	Carbon Disulfide
Tantalum	Tantalum	N,n-dimethylformamide	O-toluidine	Chlorobenzene
Tellurium	Tellurium	N-hexacosane	1,4-dioxane	Hexachloroethane
Zirconium	Thallium	N-octacosane	2-isopropylnaphthalene	Isophorone
Benzoic Acid	Benzyl Alcohol	N-tetracosane		O+p Xylene
Benzyl Alcohol	Bis(2-ethylhexyl) Phthalate	O-cresol		1,1,2,2-tetrachloroethane
Bis(2-ethylhexyl) Phthalate	Carbon Disulfide	O-toluidine		1,2-dichlorobenzene
Chloroform	Hexanoic Acid	1,4-dioxane		1,3-dichloropropane
Dibromochloromethane	M-xylene	2,3-benzofluorene		2,4-dimethylphenol
Hexanoic Acid	Methylene Chloride	2,4-dimethylphenol		3,4,6-trichloroguaiacol
M-xylene	Phenol	2-isopropylnaphthalene		3,6-dichlorocatechol
Methylene Chloride	Toluene	3,6-dimethylphenanthrene		4,5,6-trichloroguaiacol
Phenol	1,1,1-trichloroethane	4-chloro-3-methylphenol		4,5-dichloroguaiacol
Pyridine	1,1-dichloroethene			4-chloro-3-methylphenol
Toluene	1,4-dioxane			5-chloroguaiacol
Trichloroethene	4-methyl-2-pentanone			6-chlorovanillin
1,1,1-trichloroethane				
1,1-dichloroethene				
1,4-dioxane				
2-butanone				
2-propanone				
4-methyl-2-pentanone				

[1] While arsenic was not detected at treatable levels at the facility forming the basis of Metals Option 4, EPA is transferring data from single stage precipitation and regulating arsenic for Metals Option 4.

[2] While oil and grease was not detected at treatable levels at the facility forming the basis of Metals Option 3, EPA is transferring data from Metals Option 4 regulating oil & grease for Metals Option 3.

BOD_5 (carbonaceous) and D-COD were also pollutants of concern for Metals Options 3 and 4. However, EPA does not have any data for these two pollutants at the sample points used in determining if analytes were found at treatable levels.

POLLUTANTS NOT TREATED 7.4

EPA excluded all pollutants for which the selected technology option was ineffective (i.e., pollutant concentrations remained the same or increased across the treatment system). For the organics subcategory, the selected treatment technology did not effectively treat chromium, lithium, nickel, and tin. For the oils subcategory, phenol in option 8 and 2-propane in options 8 and 9 were not effectively treated. For the metals subcategory, all pollutants of concern at treatable levels were effectively treated.

VOLATILE POLLUTANTS 7.5

EPA detected volatile organic pollutants in the waste receipts of all three subcategories. For this rule, EPA defines a volatile pollutant as a pollutant which has a Henry's Law constant in excess of 10^{-4} atm m^3 mol^{-1}. For each subcategory, Table 7-2 lists the organic pollutants (those analyzed using method 1624 or 1625) and ammonia with their Henry's Law constant. For pollutants in the oils subcategory, the solubility in water was reported in addition to the Henry's Law constant to determine whether volatile pollutants remained in the oil-phase or volatilized from the aqueous phase. If no data were available on the Henry's Law constant or solubility for a particular pollutant, then the pollutant was assigned an average pollutant group value. Pollutant groups were developed by combining pollutants with similar structures. If no data were available for any pollutant in the group, then all pollutants in the group were not considered volatile. The assignment of pollutant groups is discussed in more detail in Section 7.6.2.

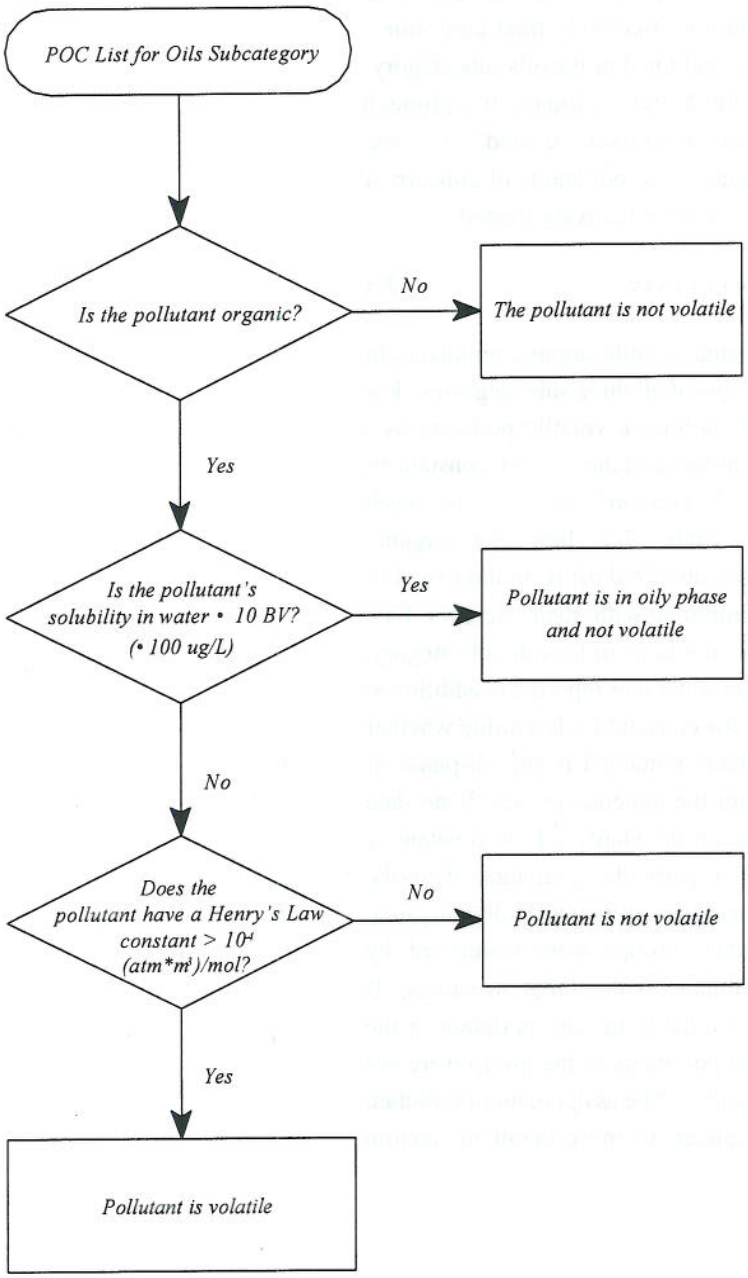

Figure 7-3. Determination of Volatile Pollutants for Oils Subcategory

Table 7-2. Volatile Pollutant Properties By Subcategory

Organic Pollutant	CAS #	Method	Subcategory			Henry's Law Constant $\frac{atm \cdot m^3}{mol}$	Solubility (mg/L)	Solubility Ref. and Temp.	Pollutant Group	Volatile ?	Volatile for Oils?
			Metals	Oils	Organics						
1-methylfluorene	1730-37-6	1625		X		4.26E-03	1.81E+04			yes	yes
1-methylphenanthrene	832-64-9	1625		X		>E-04	1.21E+03		Group DD	yes	yes
1,1-dichloroethane	75-34-3	1624	X		X	5.50E-03				yes	
1,1-dichloroethene	75-35-4	1624		X	X	1.90E-01	2.10E+02	25		yes	yes
1,1,1-trichloroethane	71-55-6	1624	X	X	X	3.00E-02	4.40E+03	20		yes	yes
1,1,1,2-tetrachloroethane	630-20-6	1624			X	3.00E-02				yes	
1,1,2-trichloroethane	79-00-5	1624			X	1.20E-03				yes	
1,2-dibromoethane	106-93-4	1624			X	2.00E-02				yes	
1,2-dichlorobenzene	95-50-1	1625		X		1.94E-02				yes	yes
1,2-dichloroethane	107-06-2	1624		X	X	9.14E-04	8.69E+03	20		yes	yes
1,2,3-trichloropropane	96-18-4	1624			X	2.10E-04				yes	
1,2,4-trichorobenzene	120-82-1	1625		X		2.30E-03	1.90E+01	22		yes	yes
1,4-dichlorobenzene	106-46-7	1625		X		3.10E-03	7.90E+01	25		yes	yes
2-butanone	78-93-3	1624	X	X	X	2.70E-05	2.75E+05			no	no
2-methylnaphthalene	91-57-6	1625		X		7.98E-04	2.60E+01	25		yes	yes
2-propanone	67-64-1	1624	X	X	X	2.10E-05				no	no
2,3-benzofluorene	243-17-4	1625		X		>E-04	1.21E+03		Group DD	yes	yes
2,3-dichloroaniline	608-27-5	1625			X	<E-04				no	
2,4-dimethylphenol	105-67-9	1625		X		1.70E-05				yes	yes
2,3,4,6-tetrachlorophenol	58-90-2	1625			X	3.00E-04				yes	
2,4,5-trichlorophenol	95-95-4	1625			X	2.20E-04				yes	
2,4,6-trichlorophenol	88-06-2	1625			X	4.00E-06				no	
3,4-dichlorophenol	95-77-2	1625			X	>10E-4					
3,4,5-trichlorocatechol	56961-20-7	1625			X	>E-04				yes	
3,5-dichlorophenol	591-35-5	1625			X	>10E-4					
3,6-dimethylphenanthrene	1576-67-6	1625		X		>E-04	1.21E+03		Group DD	yes	yes

Table 7-2. Volatile Pollutant Properties By Subcategory

Organic Pollutant	CAS #	Method	Subcategory			Henry's Law Constant $\frac{atm \cdot m^3}{mol}$	Solubility (mg/L)	Solubility Ref. and Temp.	Pollutant Group	Volatile ?	Volatile for Oils?
			Metals	Oils	Organics						
4-chloro-3-methylphenol	59-50-7	1625		X		2.50E-06	3.85E+03	20		no	no
4-chlorophenol	106-48-9	1625			X	2.88E-03				yes	
4-methyl-2-pentanone	108-10-1	1624	X	X	X	3.80E-04	1.91E+04			yes	yes
Acenaphthene	83-32-9	1625		X		9.10E-05	3.42E+00	25		no	no
Acetophenone	98-86-2	1625			X	<E-04	5.50E+03			no	
Alpha-terpineol	988-55-5	1625		X		6.90E-05				no	no
Ammonia-N	7664-41-7	350.2	X	X	X					yes	yes
Aniline	62-53-3	1625			X	<E-04			Group J	no	
Anthracene	120-12-7	1625		X		8.60E-05	1.29E+00	25		no	no
Benzene	71-43-2	1624		X	X	5.50E-03	1.78E+03	20		yes	yes
Benzo (a) anthracene	56-55-3	1625		X		1.00E-06	1.00E-02	24		no	no
Benzoic acid	65-85-0	1625	X	X	X	7.00E-08	2.90E+03	20		no	no
Benzyl alcohol	100-51-6	1625		X		1.10E+00	3.50E+04	20		yes	yes
Biphenyl	92-52-4	1625		X		4.80E-04	7.50E+00	25		yes	yes
Bis(2-ethylhexyl)phthalate	117-81-7	1625		X		3.00E-07	1.30E+00	25		no	no
Butyl benzyl phthalate	85-68-7	1625		X		8.30E-06	2.90E+00			no	no
Carbazole	86-74-8	1625		X		<E-04			Group J	no	no
Carbon disulfide	75-15-0	1624	X	X		1.20E-02	2.90E+03	20		yes	yes
Chlorobenzene	108-90-7	1624		X		3.58E-03	4.88E+02	25		yes	yes
Chloroform	67-66-3	1624	X	X	X	2.88E-03	9.30E+03	25		yes	yes
Chrysene	218-01-9	1625		X		1.50E-06	6.00E-03	25		no	no
Dibenzofuran	132-64-9	1625		X		>E-04	1.00E+01			no	no
Dibenzothiophene	132-65-0	1625		X		4.40E-04	soluble		Group II	no	no
Dibromochloromethane	124-48-1	1624	X			>E-04				yes	
Diethyl phthalate	132-65-0	1625		X		1.20E-06	8.96E+02			no	no
Dimethyl sulfone	67-71-0	1625			X	>E-04	very soluble			no	

Table 7-2. Volatile Pollutant Properties By Subcategory

Organic Pollutant	CAS #	Method	Subcategory			Henry's Law Constant $\frac{atm \cdot m^3}{mol}$	Solubility (mg/L)	Solubility Ref. and Temp.	Pollutant Group	Volatile ?	Volatile for Oils?
			Metals	Oils	Organics						
Diphenyl ether	101-84-8	1625		X		6.60E-03	2.10E+01	25		yes	yes
Ethyl benzene	100-41-4	1624		X		6.60E-03	1.52E+02	20		yes	yes
Ethylenethiourea	96-45-7	1625			X	>E-04			Group I	no	
Fluoranthene	206-44-0	1625		X		6.50E-06	2.65E-01	25		no	no
Fluorene	86-73-7	1625		X		6.40E-05	1.90E+00	25		no	no
Hexanoic Acid	142-62-1	1625		X	X	1.90E+00	1.10E+04			yes	yes
Methylene chloride	75-09-2	1624		X	X	2.30E-03	1.67E+04	25		yes	yes
m-Xylene	108-38-3	1624		X	X	1.10E-02	2.00E+02			yes	yes
m+p-Xylene	179601-23-1	1624		X		7.00E-03	9.80E+02	20		yes	yes
Naphthalene	91-20-3	1625		X		4.60E-04	3.00E+01	25		yes	yes
N-decane	124-18-5	1625		X		7.14E+00	9.00E-03			yes	no
n-Docosane	629-97-0	1625		X		>E-04	4.78E-03		Group CC	yes	no
n-Dodecane	112-40-3	1625		X		>E-04	4.78E-03		Group CC	yes	no
n-Eicosane	112-95-8	1625		X		>E-04	4.78E-03		Group CC	yes	no
n-Hexadecane	544-76-3	1625		X		>E-04	9.00E-04	25		yes	no
n-Octadecane	593-45-3	1625		X		>E-04	7.00E-03	25		yes	no
n-Tetracosane	646-31-1	1625		X		>E-04	4.78E-03		Group CC	yes	no
n-Tetradecane	629-59-4	1625		X		>E-04	2.20E-03	25		yes	no
n,n-Dimethylformamide	68-12-2	1625	X	X	X	<E-04				no	no
o-Cresol	95-48-7	1625		X	X	1.60E-06	3.10E+04			no	no
o-Xylene	95-47-6	1625		X		7.00E-03				yes	yes
o+p-Xylene	136777-61-2	1624		X		7.00E-03	1.87E+02	20		yes	yes
p-Cresol	106-44-5	1625		X	X	9.60E-07	2.40E+04	40		no	no
p-Cymene	99-87-6	1625		X		>E-04	3.40E+02			yes	yes
Pentachlorophenol	87-86-5	1625			X	2.80E-06				no	
Pentamethylbenzene	700-12-9	1625		X		>E-04	4.96E+02		Group K	yes	yes

Table 7-2. Volatile Pollutant Properties By Subcategory

Organic Pollutant	CAS #	Method	Subcategory			Henry's Law Constant $\frac{atm \cdot m^3}{mol}$	Solubility (mg/L)	Solubility Ref. and Temp.	Pollutant Group	Volatile ?	Volatile for Oils?
			Metals	Oils	Organics						
Phenanthrene	85-01-8	1625		X		2.26E-04	8.16E-01	21		yes	yes
Phenol	108-95-2	1625		X	X	4.54E-07	8.00E+04	25		no	no
Pyrene	129-00-0	1625		X		5.10E-06	1.60E-01	26		no	no
Pyridine	110-86-1	1625	X	X	X	2.10E-06	3.88E+05			no	no
Styrene	100-42-5	1625		X		2.80E-03	3.00E+02	20		yes	yes
Tetrachloroethene	127-18-4	1624		X	X	1.53E-03	1.50E+02	25		yes	yes
Tetrachloromethane	56-23-5	1624			X	2.90E-02				yes	
Toluene	108-88-3	1624		X	X	6.66E-03	5.15E+02	20		yes	yes
Trans-1,2-dichloroethene	156-60-5	1624			X	5.30E-03				yes	
Trichloroethene	79-01-6	1624	X	X	X	9.10E-03	1.10E+03	25		yes	yes
Tripropyleneglycol methyl ether	20324-33-8	1625		X		>E-04			Group GG	no	no
Vinyl chloride	75-01-4	1624			X	2.80E-02				yes	

As shown in Table 7-2, volatile pollutants were regularly detected at treatable levels in waste receipts from CWT facilities, particularly in the oils and organics subcategory. An "X" in a subcategory column indicates that the analyte was detected at treated levels and not previously eliminated in sections 7.2 through 7.4. However, treatment technologies currently used at many of these facilities, while removing the pollutants from the wastewater, do not "treat" the volatiles. The volatile pollutants are simply transferred to the air. For example, in the metals subcategory, wastewater treatment technologies are generally based on chemical precipitation, and the removal of volatile pollutants from wastewater following treatment with chemical precipitation is due to volatilization. Some CWT facilities recognize that volatilization may be occurring and have installed air stripping systems equipped with emissions control to effectively remove the pollutants from both the water and the air.

EPA evaluated various wastewater treatment technologies during the development of this rule. These technologies were considered because of their efficacy in removing pollutants from wastewater. Since EPA is concerned about removing pollutants from all environmental media, EPA also evaluated wastewater treatment trains for the oils and organics subcategories which included air stripping with emissions control.

EPA did not regulate any predominantly volatile parameters. The non-regulated volatile parameters for the metals, organics, and oils subcategory options that were not already excluded as detailed in Sections 7.1, 7.2, 7.3, and 7.4 are presented in Table 7-3. Unlike the metals and the organics subcategories, for the oils subcategory, volatilization can not be predicted using the Henry's Law constant only. Henry's Law constants are established for pollutants in an aqueous phase only. For other non-aqueous single phase or two-phase systems (such as oil-water), other volatilization constants apply. Estimating these constants in oil-water mixtures can lead to engineering calculations which are generally based on empirical data. EPA chose an approach which is depicted in Figure 7-3 and discussed below. First, EPA reviewed water solubility data to estimate whether the organic pollutants would be primarily in an oil phase or aqueous phase. For pollutants which have a solubility less than ten times the baseline value (the same edit used to determine pollutants of concern and pollutants at treatable levels), EPA assumed that the amount of pollutants in the aqueous phase would be negligible and that all of the pollutant would be primarily in an oil phase. For pollutants which have a solubility greater than ten times the baseline value, EPA assumed that the amount of pollutant in the oil phase would be negligible and that all of the pollutant would be primarily in an aqueous phase. For pollutants determined to be in an aqueous phase, EPA then reviewed the Henry's law constant in the same manner as the other two subcategories. For pollutants determined to be in an oil phase, EPA assumed that volatilization would be negligible (regardless of their volatility in the aqueous phase) and has not categorized them as volatile pollutants.

Even though EPA has not regulated volatile pollutants through this rulemaking, EPA encourages all facilities which accept waste receipts containing volatile pollutants to incorporate air stripping with overhead recovery into their wastewater treatment systems. EPA also notes that CWT facilities determined to be major sources of hazardous air pollutants are subject to maximum achievable control technology (MACT) as promulgated for off-site waste and recovery operations on July 1, 1996 (61 FR 34140) as 40 CFR Part 63.

Table 7-3. Non-Regulated Volatile Pollutants by Subcategory and Option

Metals Option 3	***Metals Option 4***	***Organics Option 4***	***Oils Option 8***	***Oils Option 9***
Ammonia-N	Ammonia-N	1,1,1,2-tetrachloroethane	1-methylfluorene	1-methylfluorene
Carbon disulfide	Chloroform	1,1,1-trichloroethane	1-methylphenanthrene	1-methylphenanthrene
4-methyl-2-pentanone	Dibromochloromethane	1,1,2-trichloroethane	1,1,1-trichloroethane	1,1,1-trichloroethane
	n,n-Dimethylformamide	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloroethene
	Trichloroethene	1,1-dichloroethene	1,2-dichlorobenzene	1,2-dichlorobenzene
		1,2,3-trichloropropane	1,2-dichloroethane	1,2-dichloroethane
		1,2-dibromoethane	1,2,4-trichlorobenzene	1,2,4-trichlorobenzene
		1,2-dichloroethane	1,4-dichlorobenzene	1,4-dichlorobenzene
		2,3,4,6-tetrachlorophenol	2-methylnapthalene	2-methylnapthalene
		2,4,5-trichlorophenol	4-methyl-2-pentanone	2,3-benzofluorene
		3,4-dichlorphenol	Ammonia-N	2,4-dimethylphenol
		3,4,5-trichlorocatechol	Benzene	3,6-dimethylphenanthrene
		3,5-dichlorphenol	Biphenyl	4-methyl-2-pentanone
		4-chlorophenol	Carbon disulfide	Ammonia-N
		4-methyl-2-pentanone	Chlorobenzene	Benzene
		Ammonia-N	Chloroform	Benzyl alcohol
		Benzene	Dibenzofuran	Biphenyl
		Chloroform	Dibenzothiopene	Carbon disulfide
		Dimethyl sulfone	Ethyl benzene	Chlorobenzene
		Ethylenethiourea	Hexanoic Acid	Chloroform
		Hexanoic Acid	Methylene chloride	Dibenzofuran
		Methylene chloride	m-Xylene	Dibenzothiopene
		m-Xylene	m+p-Xylene	Diphenyl ether
		Tetrachloroethene	Naphthalene	Ethyl benzene
		Tetrachloromethane	o-Xylene	Hexanoic Acid
		Toluene	o+p-Xylene	Methylene chloride
		Trans-1,2-dichloroethene	p-Cymene	m-Xylene
		Trichloroethene	Pentamethylbenzene	m+p-Xylene
		Vinyl chloride	Phenanthrene	Naphthalene
			Styrene	o-Xylene
			Tetrachloroethene	o+p-Xylene
			Toluene	p-Cymene
			Trichloroethene	Pentamethylbenzene
			Tripropyleneglycol methyl ether	Phenanthrene
				Styrene
				Tetrachloroethene
				Toluene
				Trichloroethene
				Tripropyleneglycol methyl ether

Pollutants Selected for Pretreatment Standards and Pretreatment Standards for New Sources (Indirect Dischargers) 7.6

Background 7.6.1

Unlike direct dischargers whose wastewater will receive no further treatment once it leaves the facility, indirect dischargers send their wastewater to POTWs for further treatment. EPA establishes pretreatment standards for those BAT pollutants that pass through POTWs. Therefore, for indirect dischargers, before establishing pretreatment standards, EPA examines whether the pollutants discharged by the industry "pass through" POTWs to waters of the U.S. or interfere with POTW operations or sludge disposal practices. Generally, to determine if pollutants pass through POTWs, EPA compares the percentage of the pollutant removed by well-operated POTWs achieving secondary treatment with the percentage of the pollutant removed by facilities meeting BAT effluent limitations. A pollutant is determined to "pass through" POTWs when the median percentage removed by well-operated POTWs is less than the median percentage removed by direct dischargers complying with BAT effluent limitations. In this manner, EPA can ensure that the combined treatment at indirect discharging facilities and POTWs is at least equivalent to that obtained through treatment by direct dischargers.

This approach to the definition of pass-through satisfies two competing objectives set by Congress: (1) that standards for indirect dischargers be equivalent to standards for direct dischargers, and (2) that the treatment capability and performance of POTWs be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. Rather than compare the mass or concentration of pollutants discharged by POTWs with the mass or concentration of pollutants discharged by BAT facilities, EPA compares the percentage of the pollutants removed by BAT facilities to the POTW removals. EPA takes this approach because a comparison of the mass or concentration of pollutants in POTW effluents with pollutants in BAT facility effluents would not take into account the mass of pollutants discharged to the POTW from other industrial and non-industrial sources, nor the dilution of the pollutants in the POTW to lower concentrations from the addition of large amounts of other industrial and non-industrial water.

In selecting the regulated pollutants under the pretreatment standards, EPA starts with the toxic and non-conventional pollutants regulated for direct dischargers under BAT. For this analysis, EPA does not include the four regulated BPT conventional parameters, BOD_5, total suspended solids (TSS), oil and grease (measured as HEM), and pH because POTWs are designed to treat these parameters. Therefore, for this rulemaking, EPA evaluated 31 pollutants for metals option 4, 51 pollutants for oils option 9, and 23 pollutants for Organics Option 4 for PSES and PSNS regulation. The following sections describe the methodology used in determining median percent removals for the BAT technologies, median percent removals for "well-operated" POTWs, and the results of EPA's pass-through analysis.

Determination of Percent Removals for Well-Operated POTWs 7.6.2

The primary source of the POTW percent removal data was the "Fate of Priority Pollutants in Publicly Owned Treatment Works" (EPA 440/1-82/303, September 1982), commonly referred to as the "50-POTW Study". However, the 50-POTW Study did not contain data for all pollutants for which the pass-through analysis was required. Therefore, EPA obtained additional data from EPA's National Risk Management Research Laboratory's (NRMRL) Treatability Database (formerly called the Risk Reduction Engineering Laboratory (RREL)

Treatability Database). These sources and their uses are discussed below.

The 50-POTW Study presents data on the performance of 50 well-operated POTWs that employ secondary biological treatment in removing pollutants.

At the time of the 50-POTW sampling program, which spanned approximately 2 ½ years (July 1978 to November 1980), EPA collected samples at selected POTWs across the U.S. The samples were subsequently analyzed by either EPA or EPA-contract laboratories. These samples were analyzed for 3 conventional, 16 non-conventional, and 126 priority toxic pollutants using test procedures (analytical methods) specified by the Agency or in use at the laboratories. Laboratories typically reported the analytical method used along with the test results. However, for those cases in which the laboratory specified no analytical method, EPA was able to identify the method based on the nature of the results and knowledge of the methods available at the time.

Each laboratory reported results for the pollutants for which it tested. If the laboratory found a pollutant to be present, the laboratory reported a result. If the laboratory found the pollutant not to be present, the laboratory reported either that the pollutant was "not detected" or a value with a "less than" sign (<) indicating that the pollutant was below that value. The value reported along with the "less than" sign was the lowest level to which the laboratory believed it could reliably measure. EPA subsequently established these lowest levels as the minimum levels of quantitation (MLs). In some instances, different laboratories reported different MLs for the same pollutant using the same analytical method.

Because of the variety of reporting protocols among the 50-POTW Study laboratories (pages 27 to 30, 50-POTW Study), EPA reviewed the percent removal calculations used in the pass-through analysis for previous industry studies, including those performed when developing the CWT proposal and effluent guidelines for Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing, Landfills, and Commercial Hazardous Waste Combustors. EPA found that, for 11 parameters, different analytical minimum levels were reported for different rulemaking studies (9 of the 25 metals, cyanide, and one of the 42 organics).

To provide consistency for data analylsis and establishment of removal efficiencies, EPA reviewed the 50-POTW Study, standardized the reported MLs for use in the CWT final rules and other ruflemaking efforts.

In using the 50-POTW Study data to estimate percent removals, EPA has established data editing criteria for determining pollutant percent removals. Some of the editing criteria are based on differences between POTW and industry BAT treatment system influent concentrations. For many toxic pollutants, POTW influent concentrations were much lower than those of BAT treatment systems. For many pollutants, particularly organic pollutants, the effluent concentrations from both POTW and BAT treatment systems, were below the level that could be found or measured. As noted in the 50-POTW Study, analytical laboratories reported pollutant concentrations below the analytical minimum level (ML), qualitatively, as "not detected" or "trace," and reported a measured value above this level. Subsequent rulemaking studies such as the 1987 OCPSF study used the analytical method ML established in 40 CFR Part 136 for laboratory data reported below the analytical ML. Use of the ML may overestimate the effluent concentration and underestimate the percent removal. Because the data collected for evaluating POTW percent removals included both effluent and influent levels that were close to the analytical ML, EPA devised hierarchal data editing criteria to exclude data with low influent concentration levels, thereby minimizing the possibility that low POTW removals might simply reflect low

influent concentrations instead of being a true measure of treatment effectiveness.

EPA has generally used hierarchic data editing criteria for the pollutants in the 50-POTW Study. For the final CWT rule, the editing criteria include the following:

1) substitute the standardized pollutant-specific analytical ML for values reported as "not detected," "trace," "less than [followed by a number]," or a number" less than the standardized analytical ML,
2) retain pollutant influent and corresponding effluent values if the average pollutant influent level is greater than or equal to 10 times the pollutant ML (10xML), and
3) if none of the average pollutant influent concentrations are at least 10 times the ML, then retain average influent values greater than or equal to two times the ML (2xML) along with the corresponding average effluent values. (EPA used 2xML for the final rule, instead of the 20 µg/l criterion used at proposal because it more accurately reflects the pollutant-specific data than using a fixed numerical cut-off. For the majority of pollutants 2xML is 20 µg/l. Therefore, this correction does not affect the percent removal estimates for most organic pollutants. However, it affects the metal pollutants because their MLs range from 0.2 to 5,000 µg/l.)

EPA then calculates each POTW percent removal for each pollutant based on its average influent and its average effluent values. The national POTW percent removal used for each pollutant in the pass-through test is the median value of all the POTW pollutant specific percent removals.

Additionally, due to the large number of pollutants of concern for the CWT industry, EPA also used data from the National Risk Management Research Laboratory (NRMRL) Treatability Database to augment the POTW database for the pollutants which the 50-POTW Study did not cover. This database provides information, by pollutant, on removals obtained by various treatment technologies. The database provides the user with the specific data source and the industry from which the wastewater was generated. For each pollutant of concern EPA considered for this rule not found in the 50-POTW database, EPA used data from the NRMRL database, using only treatment technologies representative of typical POTW secondary treatment operations (activated sludge, activated sludge with filtration, aerated lagoons). EPA further edited these files to include information pertaining only to domestic or industrial wastewater. EPA used pilot-scale and full-scale data only, and eliminated bench-scale data and data from less reliable references.

EPA selected the final percent removal for each pollutant based on a data hierarchy, which was related to the quality of the data source. The following data source hierarchy was used for selecting a percent removal for a pollutant: 1) if available, the median percent removal from the 50-POTW Study was chosen using all POTWs data with influent levels greater than or equal to 10 times the pollutant ML, 2) if not available, the median percent removal from the 50-POTW Study was chosen using all POTWs data with influent levels greater than 2 times the pollutant ML, 3) if not available, the average percent removal from the NRMRL Treatability Database was chosen using only domestic wastewater, 4) if not available, the average percent removal from the NRMRL Treatability Database was chosen using domestic and industrial wastewater, and finally 5) a pollutant was assigned an average group percent removal, or "generic" removal if no other data was available. Pollutant groups were developed by combining pollutants with similar chemical structures (a complete list of pollutants and pollutant groupings are available in Appendix A). EPA calculated the average group percent removal by using all pollutants in the group with selected percent removals from either

the 50-POTW Study or the NRMRL Treatability Database. EPA then averaged percent removals together to determine the average group percent removal. Pollutant groups and generic removals used in the pass-through analysis are presented in Table 7-4. Only groups A (metals), J (anilines), and CC (n-paraffins) are presented in Table 7-4 since these are the only groups for which EPA assigned an average group percent removal in its pass-through analysis. The final POTW percent removal assigned to each pollutant is presented in Table 7-5, along with the source and data hierarchy of each removal.

Table 7-4. CWT Pass-Through Analysis Generic POTW Percent Removals

Pollutant	CAS NO.	% Removal	Source
Group A: Metals			
Barium	7440-39-3	55.15	50 POTW - 2 X ML
Beryllium	7440-41-7	61.23	RREL 5 - (IND WW)
Cadmium	7440-43-9	90.05	50 POTW - 10 X ML
Chromium	7440-47-3	80.33	50 POTW - 10 X ML
Cobalt	7440-48-4	10.19	50 POTW - 2 X ML
Copper	7440-50-8	84.20	50 POTW - 10 X ML
Iridium	7439-88-5	74.00	RREL 5 - (ALL WW)
Lead	7439-92-1	77.45	50 POTW - 10 X ML
Lithium	7439-93-2	26.00	RREL 5 - (ALL WW)
Mercury	7439-97-6	90.16	50 POTW - 10 X ML
Molybdenum	7439-98-7	18.93	50 POTW - 10 X ML
Nickel	7440-02-0	51.44	50 POTW - 10 X ML
Silver	7440-22-4	88.28	50 POTW - 10 X ML
Strontium	7440-24-6	14.83	RREL 5 - (DOM WW)
Thallium	7440-28-0	53.80	RREL 5 - (ALL WW)
Tin	7440-31-5	42.63	50 POTW - 2 X ML
Titanium	7440-32-6	91.82	50 POTW - 10 X ML
Vanadium	7440-62-2	8.28	50 POTW - 2 X ML
Yttrium	7440-65-5	21.04	50 POTW - 2 X ML
Zinc	7440-66-6	79.14	50 POTW - 10 X ML
Zirconium	7440-17-7		Average Group Removal
Average Group Removal		55.95	

Pollutant	CAS NO.	% Removal	Source
Group J: Anilines			
Aniline	62-53-3	93.41	RREL 5 - (ALL WW)
Carbazole	86-74-8		Average Group Removal
Average Group Removal		93.41	

Pollutant	CAS NO.	% Removal	Source
Group CC: n-Paraffins			
n-Decane	124-18-5	9.00	RREL 5 - (ALL WW)
n-Docosane	629-97-0	88.00	RREL 5 - (ALL WW)
n-Dodecane	112-40-3	95.05	RREL 5 - (ALL WW)
n-Eicosane	112-95-8	92.40	RREL 5 - (ALL WW)
n-Hexacosane	630-01-3		Average Group Removal
n-Hexadecane	544-76-3		Average Group Removal
n-Octacosane	630-02-4		Average Group Removal
n-Octadecane	593-45-3		Average Group Removal
n-Tetracosane	646-31-1		Average Group Removal
n-Tetradecane	629-59-4		Average Group Removal
Average Group Removal		71.11	

Table 7-5. Final POTW Percent Removals

Pollutant	Metals	Oils	Organics	CAS NO.	Percent Removal	Source
CLASSICAL						
Ammonia as N	X	X	X	766-41-7	38.94	50 POTW - 10 X ML
Hexavalent Chromium	X			18540-29-9	5.68	RREL 5 - (ALL WW)
Total Cyanide	X	X	X	57-12-5	70.44	50 POTW - 10 X ML
METALS						
Antimony	X	X	X	7440-36-0	66.78	50 POTW - 2 X ML
Arsenic		X		7440-38-2	65.77	50 POTW - 2 X ML
Barium		X		7440-39-3	55.15	50 POTW - 2 X ML
Beryllium	X			7440-41-7	61.23	RREL 5 - (ALL WW)
Cadmium	X	X		7440-43-9	90.05	50 POTW - 10 X ML
Chromium	X	X		7440-47-3	80.33	50 POTW - 10 X ML
Cobalt	X	X	X	7440-48-4	10.19	50 POTW - 2 X ML
Copper	X	X	X	7440-50-8	84.20	50 POTW - 10 X ML
Iridium	X			7439-88-5	74.00	RREL 5 - (ALL WW)
Lanthanium	X			7439-91-0	54.44	Generic Removal-Group A
Lead	X	X		7439-92-1	77.45	50 POTW - 10 X ML
Lithium	X			7439-93-2	26.00	RREL 5 - (ALL WW)
Mercury	X	X		7439-97-6	90.16	50 POTW - 10 X ML
Molybdenum	X	X	X	7439-98-7	18.93	50 POTW - 10 X ML
Nickel	X	X		7440-02-0	51.44	50 POTW - 10 X ML
Osmium	X			7440-04-2	48.00	RREL 5 - (ALL WW)
Selenium	X	X		7782-49-2	34.33	RREL 5 - (DOM WW)
Silicon	X	X	X	7440-21-3	27.29	RREL 5 - (ALL WW)
Silver	X			7440-22-4	88.28	50 POTW - 10 X ML
Strontium	X	X	X	7440-24-6	14.83	RREL 5 - (DOM WW)
Thallium	X			7440-28-0	53.80	RREL 5 - (ALL WW)
Tin	X	X		7440-31-5	42.63	50 POTW - 2 X ML
Titanium	X	X		7440-32-6	91.82	50 POTW - 10 X ML
Vanadium	X			7440-62-2	8.28	50 POTW - 2 X ML
Yttrium	X			7440-65-5	21.04	RREL 5 - (ALL WW)
Zinc	X	X	X	7440-66-6	79.14	50 POTW - 10 X ML
Zirconium	X			7440-67-7	54.44	Generic Removal-Group A
ORGANICS						
2-butanone	X	X	X	78-93-3	96.60	RREL 5 - (ALL WW)
2-propanone	X		X	67-64-1	83.75	RREL 5 - (ALL WW)
2,3-dichloroaniline			X	608-27-5	41.00	RREL 5 - (ALL WW)
2,4,6-trichlorophenol			X	88-06-2	28.00	RREL 5 - (ALL WW)
4-chloro-3-methylphenol		X		59-50-7	63.00	RREL 5 - (IND WW)
Acenaphthene		X		83-32-9	98.29	50 POTW - 10 X ML
Acetophenone			X	98-86-2	95.34	RREL 5 - (ALL WW)

Table 7-5. Final POTW Percent Removals

Pollutant	Metals	Oils	Organics	CAS NO.	Percent Removal	Source
Alpha-terpineol		X		988-55-5	94.40	RREL 5 - (IND WW)
Aniline			X	62-53-3	93.41	RREL 5 - (ALL WW)
Anthracene		X		120-12-7	95.56	50 POTW - 10 X ML
Benzo (a) anthracine		X		56-55-3	97.50	RREL 5 - (DOM WW)
Benzoic Acid	X	X	X	65-85-0	80.50	RREL 5 - (IND WW)
Bis(2-ethylhexyl) phthalate		X		117-81-7	59.78	50 POTW - 10 X ML
Butyl benzyl phthalate		X		85-68-7	94.33	50 POTW - 10 X ML
Carbazole		X		86-74-8	62.00	Generic Removal-Group J
Chrysene		X		218-01-9	96.90	RREL 5 - (DOM WW)
Diethyl phthalate		X		84-66-2	59.73	50 POTW - 2X ML
Fluoranthene		X		206-44-0	42.46	50 POTW - 2X ML
Fluorene		X		86-73-7	69.85	50 POTW - 2X ML
n-Decane		X		124-18-5	9.00	RREL 5 - (IND WW)
n-Docosane		X		629-97-0	88.00	RREL 5 - (IND WW)
n-Dodecane		X		112-40-3	95.05	RREL 5 - (IND WW)
n-Eicosane		X		112-95-8	92.40	RREL 5 - (IND WW)
n-Hexadecane		X		544-76-3	71.11	Generic Removal-Group CC
n-Octadecane		X		593-45-3	71.11	Generic Removal-Group CC
n-Tetracosane		X		646-31-1	71.11	Generic Removal-Group CC
n-Tetradecane		X		629-59-4	71.11	Generic Removal-Group CC
n,n-Dimethylformamide	X	X	X	68-12-2	84.75	RREL 5 - (IND WW)
o-Cresol		X	X	95-48-7	52.50	RREL 5 - (IND WW)
p-Cresol		X	X	106-44-5	71.67	RREL 5 - (IND WW)
Pentachlorophenol			X	87-86-5	35.92	50 POTW - 2X ML
Phenol		X	X	108-95-2	95.25	50 POTW - 10 X ML
Pyrene		X		129-00-0	83.90	RREL 5 - (DOM WW)
Pyridine	X	X	X	110-86-1	95.40	RREL 5 - (IND WW)

Methodology for Determining Treatment Technology Percent Removals 7.6.3

EPA calculated treatment percent removals for each subcategory BAT option with the data used to determine the long-term averages. Therefore, the data used to calculate BAT treatment percent removals included the influent and effluent data for pollutants that were detected in the influent at treatable levels, excluding data for pollutants which were not treated by the technology, and excluding data that were associated with process upsets. In one sampling episode, EPA had only one effluent measurement and multiple influent measurements. In this one case, EPA kept only the influent measurements from the same day as the effluent measurement.

After the data were edited, EPA used the following methodology to calculate percent removal:

1) For each pollutant and each sampled facility, EPA averaged the influent data and effluent data to give an average influent concentration and an average effluent concentration, respectively.

2) EPA calculated percent removals for each pollutant and each sampling episode from the average influent and average effluent concentrations using the following equation:

$$\% \text{ Removal} = \frac{(\text{Avg Influent} - \text{Avg Effluent})}{\text{Average Influent}} \times 100$$

3) EPA calculated the BAT median percent removal for each pollutant for each option from the facility-specific percent removals.

Section 10.4.3.2 discusses this in greater detail and provides and example.

Pass-Through Analysis Results 7.6.4

The results of the Pass-Through Analysis are presented in Tables 7-6 through 7-8 by subcategory and treatment option.

Pass-Through Analysis Results for the Metals Subcategory 7.6.4.1

For metals subcategory option 4, pass-through results are presented in Table 7-6. All non-conventional pollutants analyzed passed through, and all metals passed through with the exception of zirconium. However, for organic pollutants analyzed, only benzoic acid passed through. All pollutants that passed through may be regulated under PSES and PSNS.

Table 7-6. Final Pass-Through Results For Metals Subcategory Option 4

Pollutant Parameter	Option 4 Removal (%)	Median POTW Removal (%)	Pass-Through
CLASSICALS			
Hexavalent Chromium	98.01	5.68	yes
Total Cyanide	99.30	70.44	yes
METALS			
Antimony	94.30	66.78	yes
Arsenic	91.74	65.77	yes
Cadmium	99.97	90.05	yes
Chromium	99.91	80.33	yes
Cobalt	98.47	10.19	yes
Copper	99.91	84.20	yes
Iridium	99.69	74.00	yes
Lead	99.95	77.45	yes
Lithium	66.83	26.00	yes
Mercury	98.38	90.16	yes
Molybdenum	26.40	18.93	yes
Nickel	99.59	51.44	yes
Selenium	57.54	34.33	yes
Silicon	98.58	27.29	yes
Silver	99.62	88.28	yes
Strontium	95.89	14.83	yes
Tin	99.94	42.63	yes
Titanium	99.84	91.82	yes
Vanadium	99.46	8.28	yes
Yttrium	95.39	21.04	yes
Zinc	99.93	79.14	yes
Zirconium	42.13	54.97	no
ORGANICS			
2-Butanone	74.72	96.60	no
2-Propanone	65.62	83.75	no
Benzoic Acid	82.99	80.50	yes
n,n-Dimethylformamide	54.81	84.75	no
Pyridine	48.49	95.40	no

Pass-Through Analysis Results for the Oils Subcategory 7.6.4.2

The final pass-through analysis results for the oils subcategory options 8 and 9 are presented in Table 7-7. Several metals and organic pollutants passed through, and therefore may be regulated under PSES and PSNS.

Table 7-7. Final Pass-Through Results For Oils Subcategory Options 8 and 9

Pollutant Parameter	Option 8 Removal (%)	Option 9 Removal (%)	Median POTW Removal (%)	Pass-Through
CLASSICALS				
Total Cyanide	64.38	64.38	70.44	no
METALS				
Antimony	87.99	87.99	66.78	yes
Arsenic	57.64	57.64	65.77	no
Barium	91.91	91.91	55.15	yes
Cadmium	88.07	88.07	90.05	no
Chromium	80.54	86.24	80.33	yes
Cobalt	52.20	52.20	10.19	yes
Copper	91.09	90.02	84.20	yes
Lead	92.64	88.26	77.45	yes
Mercury	77.43	77.43	90.16	no
Molybdenum	53.73	53.73	18.93	yes
Nickel	41.24	41.24	51.44	no
Selenium	36.94	36.94	34.33	yes
Silicon	54.16	54.16	27.29	yes
Strontium	50.68	50.68	14.83	yes
Tin	90.77	90.77	42.63	yes
Titanium	89.99	89.99	91.82	no
Zinc	80.33	83.48	79.14	yes
ORGANICS				
2-Butanone	15.41	15.41	96.60	no
4-chloro-3-methylphenol*	-	27.48	63.00	no
Acenapthene	96.75	96.75	98.29	no
Alpha-terpineol	94.77	94.77	94.40	yes
Anthracene	97.07	96.67	95.56	yes
Benzo (a) anthracene	94.38	95.69	97.50	no
Benzoic acid	6.54	19.32	80.50	no
Bis(2-ethylhexyl)phthalate	93.22	93.66	59.78	yes
Butyl benzyl phthalate	92.19	92.19	94.33	no
Carbazole	81.09	81.09	62.00	yes
Chrysene	96.93	97.22	96.90	yes
Diethyl phthalate	77.01	63.97	59.73	yes
Fluoranthene	96.24	95.21	42.46	yes

Fluorene	95.32	92.86	69.85	yes
n-Decane	97.36	94.98	9.00	yes
n-Docosane	97.25	96.87	88.00	yes
n-Dodecane	94.14	96.50	95.05	no for 8/ yes for 9
n-Eicosane	95.88	95.54	92.40	yes
n-Hexadecane	97.38	96.53	71.11	yes
n-Octadecane	97.32	97.20	71.11	yes
n-Tetradecane	97.26	96.85	71.11	yes
o-cresol*	-	21.08	52.50	no
p-cresol*	-	34.88	71.67	no
Phenol	53.68	14.88	95.25	no
Pyrene	97.10	97.63	83.90	yes
Pyridine	21.45	21.45	95.40	no

* Not applicable for option 8

Pass-Through Analysis Results for the Organics Subcategory 7.6.4.3

The results of the pass-through analysis for the organics subcategory option 4 is presented in Table 7-8. Several metals and organic pollutants passed through, and therefore may be regulated under PSES and PSNS.

Table 7-8. Final Pass-Through Results For Organics Subcategory Option 4

Pollutant Parameter	Option 4 Removal (%)	Median POTW Removal (%)	Pass-Through
CLASSICALS			
Total Cyanide	33.46	70.44	no
METALS			
Antimony	33.27	66.78	no
Cobalt	17.31	10.19	yes
Copper	38.04	84.20	no
Molybdenum	57.10	18.93	yes
Silicon	4.71	88.28	no
Strontium	59.51	14.83	yes
Zinc	60.51	79.14	no
ORGANICS			
2-butanone	69.20	96.60	no
2-propanone	68.57	83.75	no
2,3-dichloroaniline	80.45	41.00	yes
2,4,6-trichlorophenol	45.16	28.00	yes
Acetophenone	92.44	95.34	no
Aniline	92.88	93.41	no
Benzoic Acid	94.29	80.50	yes
n,n-Dimethylformamide	89.26	84.75	yes
o-Cresol	98.39	52.50	yes
p-Cresol	85.38	71.67	yes
Pentachlorophenol	23.19	35.92	no
Phenol	87.08	95.25	no
Pyridine	61.69	95.40	no

FINAL LIST OF POLLUTANTS SELECTED FOR REGULATION 7.7

Direct Dischargers 7.7.1

After EPA eliminated pollutants of concern which were treatment chemicals, non-conventional bulk parameters, not detected at treatable levels, not treated, or volatile, EPA still had a lengthy list of pollutants which could be regulated -- particularly in the oils subcategory. EPA further eliminated pollutants that were identified during screening, but not analyzed in a quantitative manner[2]. These pollutants are indium, iridium, lanthanum, lithium, osmium, silicon, strontium, and zirconium. EPA also eliminated pollutants that are not toxic as quantified by their toxic weighting factor (TWF)[3]. A single pollutant, yttrium, has a TWF of zero and was, therefore, eliminated. EPA also eliminated pollutants that were removed by the proposed treatment technologies, but whose removal was not optimal. EPA eliminated pollutants that were removed by less than 30% with the proposed technology options for the organics subcategory and by less than 50% with the proposed technology options for the metals and oils subcategories. These pollutants are listed in Table 7-9.

Table 7-9. Pollutants Eliminated Due to Non-Optimal Performance

Metals Option 4	Metals Option 3	Oils Option 8	Oils Option 9	Organics Option 4
BOD_5	Molybdenum	BOD_5	BOD_5	Cobalt
Molybdenum		Nickel	Nickel	Pentachlorophenol
Pyridine		Selenium	Selenium	
		Benzoic Acid	Benzoic Acid	
		p-Cresol[4]	o-Cresol	
		Pyridine	p-Cresol	
		2-butanone	Phenol	
			Pyridine	
			2-butanone	
			4-methyl-2-pentanone	

EPA also eliminated those pollutants for which the treatment technology forming the basis of the option is not a standard method of treatment. For example, chemical precipitation systems are not designed to remove BOD_5. Table 7-10 lists these pollutants for each subcategory and option.

[2]Analyses for these pollutants were not subject to the quality assurance/quality control (QA/QC) procedures required by analytical Method 1620.

[3]Toxic weighting factors are derived from chronic aquatic life criteria and human health criteria established for the consumption of fish. Toxic weighting factors can be used to compare the toxicity of one pollutant relative to another and are normalized based on the toxicity of copper. TWFs are discussed in detail in the Cost Effectiveness Analysis Document.

[4]Removals for this pollutant for option 8 were greater than 50%. However, since removals for this pollutant for option 9 (the BAT selected option) were less than 50%, for consistency, they were similarly eliminated for option 8.

Table 7-10. Pollutants Eliminated Since Technology Basis is Not Standard Method of Treatment

Metals Option 4	Metals Option 3	Oils Option 8/9	Organics Option 3/4
BOD_5	BOD_5	Total Cyanide	Total Cyanide
Boron	n,n-Dimethylformamide		
2-butanone			
2-propanone			
benzoic acid			
n,n-Dimethylformamide			

For the metals subcategory, 2 pollutants, beryllium and thallium, remained for metals option 3, but has been eliminated for metals option 4. For consistency, EPA eliminated these two pollutants. EPA also eliminated hexavalent chromium because it has regulated total chromium. EPA's final list of regulated pollutants for direct dischargers in the metals subcategory is based on these additional edits.

For the organics subcategory, EPA eliminated benzoic acid because of its low and highly variable recovery using EPA Methods 625 and 1625. EPA also eliminated n,n-dimethylformamide because there is no approved method for this pollutant. EPA's final list of regulated pollutants for direct discharges in the organics subcategory is based on these additional edits.

For the oils subcategory, EPA eliminated alpha terpineol. EPA only has data from a single episode that passed its data editing criteria (see Chapter 10) upon which to develop limits for alpha terpineol. EPA subsequently eliminated this data because the effluent samples also contained high levels of phenol (alpha terpineol measurements can be affected by high phenol levels). Further, two pollutants, n-tetracosane and n,n-dimethylformamide remained for one oil option, but had been eliminated for the other. For consistency, EPA eliminated these two pollutants.

Also, for the organic pollutants in the oils subcategory, EPA further reduced the number of regulated pollutants as detailed in the following paragraphs. EPA selected this approach based on comments to the 1995 proposal. This approach uses the same methodology as proposed in 1999. However this analysis reflects corrections to the CWT sampling analytical database.

EPA organized the remaining organic pollutants in the oils subcategory into pollutant groups. As described in Section 7.6.2, pollutant groups were developed by combining pollutants of similar structures. The remaining list of organic pollutants in the oils subcategory are in four pollutant groups: n-paraffins, polyaromatic hydrocarbons, phthalates, and anilines. EPA reviewed the influent characterization data from the oils subcategory facilities (including the additional data collected at non-hazardous oils facilities) to determine which pollutants in each structural group are generally detected together. If pollutants in a structural group are always detected together, then EPA can establish some (or one) pollutants in each group as indicator pollutants. Since the effectiveness of the treatment technologies which form the basis of the proposed oils subcategory limitations is similar for pollutants in each group, EPA can be confident that regulation of the group indicator pollutant(s) will ensure control of all the group pollutants. This approach allows EPA to reduce the list of regulated pollutants for the oils subcategory substantially. Tables 7-11, 7-12, and 7-13 summarize the data for each structural group with more than one pollutant remaining. In these tables, an "X" indicates the pollutant was detected at the sampled facility while a

"blank" indicates the pollutant was not detected at the sampled facility.

At the time of the 1999 proposal, EPA selected n-decane and n-octadecane from the n-paraffins group. Data for n-paraffins continue to show that while n-decane is usually detected in combination with other n-paraffins, it does not respond to treatment in a similar manner as other n-paraffins. Therefore, no other n-paraffins in this group can be used as an indicator of n-decane. At the time of the proposal, EPA selected n-octadecane because the data showed that it would be an appropriate indicator for the remainder of the n-paraffins. With one exception, this remains accurate. The one exception is n-hexadecane. EPA analysis now shows that n-octadecane was detected in 13 of the facilities sampled and that n-hexadecane was detected in these same 13 facilities and one other. The additional detection represents a single grab sample. In EPA's view, a single grab sample does not warrant the regulation of an additional or different pollutant. Consequently, EPA continues to select n-octadecane along with n-decane from the n-paraffins group.

At the time of the 1999 proposal, EPA's data showed that either fluoranthene or pyrene would be an appropriate indicator for the polyaromatic hydrocarbon group and EPA selected fluoranthene. With one exception, this remains accurate. The one exception is pyrene. EPA analysis now shows that fluroanthene was detected in six of the facilities sampled and that pyrene was detected in these same six facilities and one other. The additional detection represents a single grab sample. In EPA's view, a single grab sample does not warrant the regulation of a different pollutant. Consequently, EPA continues to select fluroanthene from the polyaromatic group.

At the time of the 1999 proposal, EPA's data showed that bis(2-ethylhexyl)phthalate and butyl benzyl phthalate should be selected for the phthalate group. This remains accurate. Consequently, EPA selected both of these compounds from the phthalate group.

Finally, carbazole is the only pollutant remaining from the aniline group. Therefore, EPA selected carbazole from the aniline group.

EPA's final list of regulated pollutants for direct dischargers in the oils subcategory is based on these additional edits/selections.

Table 7-14 shows the final list of pollutants selected for regulation in all subcategories for direct dischargers.

Table 7-11. Frequency of Detection[5] of n-Paraffins in CWT Oils Subcategory Wastes

Pollutant	Facility																		Total Number of Detects at Combined Facilities
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
n-Decane	X		X	X	X	X	X	X	X		X	X				X			29/39
n-Docosane	X		X	X	X	X	X	X	X			X	X	X		X			24/39
n-Dodecane	X	X	X	X	X	X	X	X				X	X	X		X		X	30/39
n-Eicosane	X	X	X	X	X	X	X	X	X			X	X			X		X	32/39
n-Hexadecane	X	X	X	X	X	X	X	X	X			X	X	X		X		X	33/39
n-Octadecane	X	X	X	X	X	X	X	X	X			X	X	X		X	X		32/39
n-Tetradecane	X	X	X	X	X	X	X	X	X			X	X	X		X	X		33/39

X = Pollutant was detected at the sampled facility

"blank = Pollutant was not detected at the sampled facility

[5]For some facilities, the data represent daily composite samples collected over two to five days, while for other facilities the data represent grab samples collected on one to five days.

Table 7-12. Frequency of Detection[6] of Polyaromatic Hydrocarbons in CWT Oils Subcategory Wastes

Pollutant	Facility																	Total Number of Detects at Combined Facilities
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
Acenaphthene						X	X	X	X										8/39
Anthracene					X	X	X	X	X										12/39
Benzo(a)anthracene					X	X	X	X											12/39
Chrysene					X	X	X	X											12/39
Fluoranthene					X	X	X	X	X										15/39
Fluorene					X	X	X	X	X										11/39
Pyrene					X	X	X	X	X					X				X	16/39

X = Pollutant was detected at the sampled facility

"blank = Pollutant was not detected at the sampled facility

[6]For some facilities, the data represent composite samples collected over two to five days, while for other facilities the data represent grab samples collected on one to five days.

Table 7-13. Frequency of Detection[7] of Phthalates in CWT Oils Subcategory Wastes

Pollutant	Facility																	Total Number of Detects at Combined Facilities
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
Bis(2-ethylhexyl)phthalate	X		X		X	X	X	X				X		X		X		X	18/39
Butylbenzylphthalate		X				X	X	X											7/39
Diethylphthalate					X	X	X												10/39

X = Pollutant was detected at the sampled facility

"blank = Pollutant was not detected at the sampled facility

[7]For some facilities, the data represent composite samples collected over two to five days, while for other facilities the data represent grab samples collected on one to five days.

Table 7-14. Final List of Regulated Pollutants for Direct Discharging CWTs

Metals Subcategory Option 4 (BPT, BAT)	Metals Subcategory Option 3 (NSPS)	Oils Subcategory Option 9 BPT, BAT, NSPS	Organics Subcategory Option 4 BPT, BAT, NSPS
TSS	TSS	Oil and Grease	BOD_5
Oil and Grease	Oil and Grease	TSS	TSS
Antimony	Antimony	Antimony	Antimony
Arsenic	Arsenic	Arsenic	Copper
Cadmium	Cadmium	Barium	Molybdenum
Chromium	Chromium	Cadmium	Zinc
Cobalt	Cobalt	Chromium	Acetophenone
Copper	Copper	Cobalt	Aniline
Lead	Lead	Copper	o-Cresol
Mercury	Mercury	Lead	p-Cresol
Nickel	Nickel	Mercury	pH
pH	pH	Molybdenum	Phenol
Selenium	Selenium	pH	Pyridine
Silver	Silver	Tin	2-butanone
Tin	Tin	Titanium	2-propanone
Titanium	Titanium	Zinc	2,3-dichloroaniline
Total cyanide	Total cyanide	Bis(2-ethylhexyl)phthalate	2,4,6-trichlorophenol
Vanadium	Vanadium	Butylbenzyl phthalate	
Zinc	Zinc	Carbazole	
		Fluoranthene	
		N-decane	
		N-octadecane	

Indirect Dischargers 7.7.2

Consideration of Indicator Parameters for the Oils Subcategory

As detailed in the 1999 proposal, EPA looked at various ways to reduce the costs of this rule (particularly the costs to small businesses) while ensuring proper treatment of off-site wastes. One of the options considered by EPA and discussed in the 1999 proposal was providing an alternative compliance-monitoring regime for indirect discharging facilities in the oils subcategory. Under this alternative monitoring approach, facilities could choose to (1) monitor for all regulated pollutants, or (2) monitor for the conventional parameters, metal parameters, and monitor for the regulated organic pollutants in this subcategory using an indicator parameter such as hexane extractable material (HEM) or silica gel treated-hexane extractable material (SGT-HEM). The 1999 proposal further noted that EPA was conducting a study to determine which organic pollutants are measured by SGT-HEM and HEM and solicited comment on the use of indicator parameters.

Many commenters responded to EPA's request with essentially an equivalent number opposing and favoring the use of indicator parameters. The commenters that supported its use cited the decreased analytical costs and the wide range of organic compounds that can be measured with these analyses. Commenters that did not support the use of SGT-HEM or HEM as indicator pollutants raised a number of concerns including the following:

- these measurements are non-specific and highly subject to interferences;
- no direct and quantified correlation has ever been developed between HEM (or

SGT-HEM) and specific organic pollutants;

- there is no evidence that regulating HEM or SGT-HEM would result in adequate regulation of toxics;
- the determination has not been made that the organic pollutants of interest are measured by either HEM or SGT-HEM; and
- SGT-HEM does not measure all of the regulated pollutants, particularly polyaromatic hydrocarbons (PAHs).

None of the commenters suggested possible alternative indicator parameters.

During its development of proposed effluent limitations guidelines and pretreatment standards for the industrial laundries point source category, EPA evaluated the suitability of SGT-HEM and HEM as indicator parameters for that rulemaking. EPA presented the results of its study in a Notice of Data Availability on December 23, 1998 (63 FR 71054). In the study, EPA attempted to identify compounds present in HEM/SGT-HEM extracts from industrial laundry wastewaters using gas chromatography/mass spectroscopy (GC/MS) in order to determine which pollutants of concern might be components of, and therefore measured by, HEM or SGT-HEM. However, EPA was only able to identify approximately two percent of the constituents present in the waste stream. Most of these constituents identified were alkanes. In general, the data from this study also do not support the use of SGT-HEM as an appropriate indicator parameter for the organic pollutants present in CWT wastewaters since few of these pollutants were identified in the HEM/SGT-HEM extract.

As part of its consideration of the use of an indicator parameter for this rule, EPA again reviewed the data from the industrial laundries study as well as the data collected here. EPA statistically analyzed the relationship between seven organic pollutants and SGT-HEM or HEM. EPA's data show general trends of increasing concentrations of HEM and SGT-HEM with increasing concentrations of organic pollutants. However, the data demonstrate substantial variability and, despite this general trend, EPA noted that the non-detected values for organics were associated with just about every level of HEM and SGT-HEM and conversely, that high levels of some organic pollutants were associated with low levels of HEM/SGT-HEM. As a result, EPA cannot demonstrate that establishing a numerical limit for SGT-HEM or HEM would provide consistent control of the organic pollutants by the model treatment technologies.

Therefore, while EPA is cognizant of the cost savings that can be achieved in some instances by using indicator parameters, EPA has rejected this alternative monitoring approach for CWT wastewaters.

Final List of Regulatory Parameters for Indirect Discharging CWT Facilities

As detailed in Section 7.6, all pollutants regulated for direct dischargers which pass-through well-operated POTWs are regulated for indirect dischargers. Table 7-15 shows the final list of regulated pollutants for indirect dischargers selected by EPA.

Table 7-15. Final List of Regulated Pollutants for Indirect Discharging CWT Facilities

Metals Subcategory Option 4 PSES/PSNS	Oils Subcategory Option 8 (PSES) Option 9 (PSNS)	Organics Subcategory Option 3 PSES, PSNS
Antimony	Antimony	Molybdenum
Arsenic	Barium	o-Cresol
Cadmium	Chromium	p-Cresol
Chromium	Cobalt	2,3-dichloroaniline
Cobalt	Copper	2,4,6-trichlorophenol
Copper	Lead	
Lead	Molybdenum	
Mercury	Tin	
Nickel	Zinc	
Selenium	Bis(2-ethylhexyl)phthalate	
Silver	Carbazole	
Tin	Fluoranthene	
Titanium	N-decane	
Total cyanide	N-octadecane	
Vanadium		
Zinc		

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

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Office of Water (4303T)
1200 Pennsylvania Avenue, NW
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SECTION 12

REGULATED POLLUTANTS

This section describes the selection of pollutants being regulated by the revised effluent limitations guidelines and standards for current Subpart A (cokemaking) and Subpart B (sintering), and the newly promulgated effluent limitations guidelines and standards for new Subpart M (other operations). Regulated pollutants are pollutants for which EPA establishes numerical effluent limitations and standards. EPA selected pollutants for regulation based on the following factors: applicable Clean Water Act provisions regarding the pollutants subject to each statutory level; the pollutants of concern (POCs) identified for each subcategory and segment; and cotreatment of compatible wastewater from different manufacturing operations. This section describes the methodology and rationale EPA used to select the subset of regulated pollutant parameters from the list of pollutants of concern.

12.1 Regulated Pollutant Selection Methodology for Direct Dischargers

The list of POCs for each subcategory represents those pollutants that are present at treatable concentrations in a significant percentage of untreated wastewater samples from that subcategory; the selection of POCs for each subcategory is presented in Section 7 of this document. Effluent monitoring for all POCs is not necessary to ensure that iron and steel wastewater pollution is adequately controlled, since many of the pollutants originate from similar sources, have similar treatabilities, are removed by similar mechanisms, and are treated to similar concentrations. Therefore, it may be sufficient to monitor for one pollutant as a surrogate or indicator of several others.

From the POC list for each regulated subcategory, EPA selected a subset of pollutants for establishing numerical effluent limitations. EPA considered the following factors in selecting regulated pollutants from the list of POCs for each subcategory:

- The pollutant was detected in the untreated wastewater at the BAT facility/facilities at treatable levels in a significant number of samples. This was the same methodology applied in calculating long-term averages (LTAs) and is discussed in Section 14.

- The pollutant is not used as a treatment chemical in the selected treatment technology option. EPA excluded all pollutants that may serve as treatment chemicals: aluminum, boron, fluoride, iron, magnesium, manganese, and sulfate (several other pollutants are commonly used as treatment chemicals but were already excluded as POCs). EPA eliminated these pollutants because regulation of these pollutants could interfere with their beneficial use as wastewater treatment additives.

- The pollutant is not considered a nonconventional bulk parameter. EPA excluded many nonconventional bulk parameters, such as chemical

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Entire Document (PDF) (5.7 MB, 1,045 pages)

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Accessible Document

- Cover, Table of Contents, Sections 1-5 (PDF) (1. 2MB, 126 pages)
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- Appendix A and B (PDF) (437 K. 31 pages)
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- Appendix C (PDF) (Tables are not 508 Accessible. 349 K. 250 pages)
  - Data Used for Data Editing Criteria for Pollutants of Concern
- Appendix D and E (PDF) (766 K. 23 pages)
  - Episode-specific Long-term Averages for Pollutants of Concern
  - Attachments for Section 14

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