IV. CHEMICAL RELEASE AND TRANSFER PROFILE

This section is designed to provide background information on the pollutant releases that are reported by this industry. The best source of comparative pollutant release information is the Toxic Release Inventory System (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act (EPCRA), TRI includes self-reported facility release and transfer data for over 600 toxic chemicals. Facilities within SIC Codes 20 through 39 (manufacturing industries) that have more than 10 employees, and that are above weight-based reporting thresholds are required to report TRI on-site releases and off-site transfers. The information presented within the sector notebooks is derived from the most recently available (1993) TRI reporting year (which then included 316 chemicals), and focuses primarily on the on-site releases reported by each sector. Because TRI requires consistent reporting regardless of sector, it is an excellent tool for drawing comparisons across industries.

Although this sector notebook does not present historical information regarding TRI chemical releases, please note that in general, toxic chemical releases have been declining. In fact, according to the 1993 Toxic Release Inventory Data Book, reported releases dropped by 43 percent between 1988 and 1993. Although on-site releases have decreased, the total amount of reported toxic waste has not declined because the amount of toxic chemicals transferred off-site has increased. Transfers have increased from 3.7 billion pounds in 1991 to 4.7 billion pounds in 1993. Better management practices have led to increases in off-site transfers of toxic chemicals for recycling. More detailed information can be obtained from EPA's annual Toxics Release Inventory Public Data Release book (which is available through the EPCRA Hotline at 800-535-0202), or directly from the Toxic Release Inventory System database (for user support call 202-260-1531).

Wherever possible, the sector notebooks present TRI data as the primary indicator of chemical release within each industrial category. TRI data provide the type, amount and media receptor of each chemical released or transferred. When other sources of pollutant release data have been obtained, these data have been included to augment the TRI information.

TRI Data Limitations

The reader should keep in mind the following limitations regarding TRI data. Within some sectors, the majority of facilities are not subject to TRI reporting because they are not considered manufacturing industries, or because they are below TRI reporting thresholds. Examples are the

mining, dry cleaning, printing, and transportation equipment cleaning sectors. For these sectors, release information from other sources has been included.

The TRI data presented here does not accurately portray the printing industry's toxic chemical outputs due to the small number of printing facilities that report under EPCRA §313. The 1992 TRI printing industry data is based on information from 374 facilities, yet the printing industry universe has been put at approximately 70,000 facilities by industry sources; the TRI data covers less than one percent of U.S. printers. Small facilities that do not report to TRI because they are below the reporting thresholds of chemical use and/or employment are also somewhat less likely to be subject to the same regulatory requirements as larger facilities. A comprehensive picture of the chemical releases and transfers for the printing industry will be difficult without a separate release and transfer profile of the non-TRI-reporting printing facilities.

The reader should also be aware that TRI "pounds released" data presented within the notebooks is not equivalent to a "risk" ranking for each industry. Weighting each pound of release equally does not factor in the relative toxicity of each chemical that is released. The Agency is in the process of developing an approach to assign toxicological weightings to each chemical released so that one can differentiate between pollutants with significant differences in toxicity. As a preliminary indicator of the environmental impact of the industry's most commonly released chemicals, the notebook briefly summarizes the toxicological properties of the top five chemicals (by weight) reported by each industry.

Definitions Associated with Section IV Data Tables

General Definitions

SIC Code -- is the Standard Industrial Classification (SIC) is a statistical classification standard used for all establishment-based Federal economic statistics. The SIC codes facilitate comparisons between facility and industry data.

TRI Facilities -- are manufacturing facilities that have 10 or more full-time employees and are above established chemical throughput thresholds. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20 through 39. Facilities must submit estimates for all chemicals that are on the EPA's defined list and are above throughput thresholds.

Data Table Column Heading Definitions

The following definitions are based upon standard definitions developed by EPA's Toxic Release Inventory Program. The categories below represent the possible pollutant destinations that can be reported.

RELEASES -- are an on-site discharge of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, releases at the facility to land, as well as contained disposal into underground injection wells.

Releases to Air (Point and Fugitive Air Emissions) -- Include all air emissions from industry activity. Point emission occur through confined air streams as found in stacks, ducts, or pipes. Fugitive emissions include losses from equipment leaks, or evaporative losses from impoundments, spills, or leaks.

Releases to Water (Surface Water Discharges) -- encompass any releases going directly to streams, rivers, lakes, oceans, or other bodies of water. Any estimates for stormwater runoff and non-point losses must also be included.

Releases to Land -- includes disposal of toxic chemicals in waste to on-site landfills, land treated or incorporation into soil, surface impoundments, spills, leaks, or waste piles. These activities must occur within the facility's boundaries for inclusion in this category.

Underground Injection -- is a contained release of a fluid into a subsurface well for the purpose of waste disposal.

TRANSFERS -- is a transfer of toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, these quantities do not necessarily represent entry of the chemical into the environment.

Transfers to POTWs -- are wastewaters transferred through pipes or sewers to a publicly owned treatments works (POTW). Treatment and chemical removal depend on the chemical's nature and treatment methods used. Chemicals not treated or destroyed by the POTW are generally released to surface waters or landfilled within the sludge.

Transfers to Recycling -- are sent off-site for the purposes of regenerating or recovering still valuable materials. Once these chemicals have been recycled, they may be returned to the originating facility or sold commercially.

Transfers to Energy Recovery -- are wastes combusted off-site in industrial furnaces for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers to Treatment -- are wastes moved off-site for either neutralization, incineration, biological destruction, or physical separation. In some cases, the chemicals are not destroyed but prepared for further waste management.

Transfers to Disposal -- are wastes taken to another facility for disposal generally as a release to land or as an injection underground.

IV.A. EPA Toxic Release Inventory for the Printing and Publishing Industry

The total amount of TRI toxic chemicals generated by the printing industry is a gross profile of the types and relative amounts of chemical outputs from printing processes. Additional information which can be related back to possible compliance requirements is available from the distribution of chemical releases across specific media within the environment. The TRI data requires filers to separate the total releases for the printing industry for air, water, and land releases. This distribution across media can also be compared to the profile of other industry sectors.

The printing industry releases 99 percent of its total TRI poundage to the air, while the remaining one percent of releases are split between water and land disposal. This release profile differs significantly from other TRI industries which average approximately 60 percent to air, 30 percent to land, and 10 percent to water release respectively. Examining the printing industry's TRI reported toxic chemicals by chemical highlights the likely origins of the large air releases for the industry (see following table).

Of the top ten toxic chemicals in the list, the prevalence of volatile chemicals explains the air intensive toxic chemical loading of the printing industry. Of these ten toxic chemicals, seven are highly volatile. The four top toxic chemicals released, toluene, methyl ethyl ketone, xylene, and 1,1,1-trichloroethane, are all solvents of high volatility. By far the single largest toxic chemical used (released/transferred) by the printing industry is the solvent toluene; toluene comprises roughly 70 percent of the total chemicals released and transferred by the industry. Toluene is used

heavily in the gravure printing process as an ink solvent, but is also used throughout printing for cleaning purposes. Metals on the other hand are typically transferred off-site, as a component of hazardous wastes or discharged to the sewer.

Exhibit 14: 1993 Releases for Printing Facilities in TRI, by Number of Facilities Reporting (Releases reported in pounds/year)

CHEMICAL NAME	# REPORTING CHEMICAL	FUGITIVE AIR	POINT AIR	WATER DISCHARGES	UNDERGROUND INJECTION	LAND DISPOSAL	TOTAL RELEASES	AVG. RELEASE PER FACILITY
TOLUENE	104	15,158,	13,295,	185	0	500	28,454,8	273,604
GLYCOL ETHERS	66	684,589	711,528	255	0	0	1,396,37	21,157
METHYL ETHYL	50	579,621	959,265	0	0	0	1,538,88	30,778
XYLENE (MIXED	45	741,467	839,616	105	0	0	1,581,18	35,138
1,1,1-	37	1,085,8	340,447	0	0	7,476	1,433,74	38,750
NITRIC ACID	30	6,320	7,285	0	0	0	13,605	454
SULFURIC ACID	28	1,032	2,533	0	0	0	3,565	127
ZINC COMPOUNDS	27	750	777	10	0	0	1,537	57
ACETONE	26	343,897	287,530	5	0	0	631,432	24,286
METHANOL	26	164,933	136,103	0	0	0	301,036	11,578
COPPER COMPOUNDS	24	250	1,000	23	0	0	1,273	53
BARIUM COMPOUNDS	22	1,371	1,464	0	0	0	2,835	129
COPPER	19	5	0	9	0	0	14	1
TETRACHLOROETHYL	16	27,948	79,692	0	0	0	107,640	6,728
METHYL ISOBUTYL	14	75,997	187,089	0	0	0	263,086	18,792
DICHLOROMETHANE	13	50,359	123,003	0	0	0	173,362	13,336
ETHYLENE GLYCOL	13	75,680	31,003	0	0	0	106,683	8,206
N-BUTYL ALCOHOL	11	36,182	22,224	0	0	0	58,406	5,310
AMMONIA	10	11,760	64,403	0	0	0	76,163	7,616
1,2,4-	7	89,733	4,870	0	0	1,083	95,686	13,669
DIBUTYL	5	0	18,300	0	0	0	18,300	3,660
ISOPROPYL	5	38,864	44,056	0	0	0	82,920	16,584
ETHYLBENZENE	4	6,691	44,516	0	0	0	51,207	12,802
2-METHOXYETHANOL	4	11,493	19,176	0	0	0	30,669	7,667
TRICHLOROETHYLEN	3	62,689	0	0	0	0	62,689	20,896
DI(2-ETHYLHEXYL)	2	0	8,057	0	0	0	8,057	4,029
HYDROQUINONE	2	695	0	0	0	0	695	348
NICKEL	2	0	0	0	0	0	0	0
BENZENE	1	0	0	0	0	0	0	0
CHROMIUM	1	0	250	0	0	0	250	250
CYCLOHEXANE	1	0	0	0	0	0	0	0
FORMALDEHYDE	1	160	500	0	0	0	660	660
FREON 113	1	10,691	0	0	0	0	10,691	10,691
HYDROCHLORIC	1	5	0	0	0	0	5	5
LEAD	1	0	0	0	0	98	98	98
MANGANESE	1	5	0	0	0	0	5	5
NAPHTHALENE	1	19,484	2,408	0	0	0	21,892	21,892
O-XYLENE	1	881	848	0	0	0	1,729	1,729
PHENOL	1	2,200	720	0	0	0	2,920	2,920

Exhibit 15: 1993 Transfers for Printing Facilities in TRI, by Number of Facilities Reporting
(Transfers reported in pounds/year)

CHEMICAL NAME	# REPORTING CHEMICAL	POTW DISCHARGES	DISPOSAL	RECYCLING	TREATMENT	ENERGY RECOVERY	TOTAL TRANSFERS	AVG. TRANSFER PER FACILITY
TOLUENE	104	10,637	2,159	3,552,	60,841	1,705,	5,331,8	51,268
GLYCOL ETHERS	66	212,203	4,200	81,810	39,034	640,34	977,594	14,812
METHYL ETHYL KETONE	50	5	18,050	254,76	60,032	806,13	1,138,9	22,780
XYLENE (MIXED	45	39	21,748	165,61	5,735	227,41	420,547	9,345
1,1,1-	37	5	12,365	49,680	12,274	116,97	191,296	5,170
NITRIC ACID	30	68,984	0	0	28,825	0	97,809	3,260
SULFURIC ACID	28	11	0	0	340	0	351	13
ZINC COMPOUNDS	27	557	22,813	4,671	9,155	20,275	57,471	2,129
ACETONE	26	1	9,555	129,47	15,516	110,18	264,736	10,182
METHANOL	26	21,042	2,755	3,885	10	68,800	96,879	3,726
COPPER COMPOUNDS	24	2,385	3,205	395,34	12,410	50	413,395	17,225
BARIUM COMPOUNDS	22	26	64,390	4,051	1,942	566	70,975	3,226
COPPER	19	1,234	9,124	373,82	14,192	0	398,377	20,967
TETRACHLOROETHYLENE	16	0	0	199,62	36,038	1,617	237,275	14,830
METHYL ISOBUTYL	14	0	500	30,532	23,635	48,912	103,579	7,399
DICHLOROMETHANE	13	0	0	0	7,919	250	8,169	628
ETHYLENE GLYCOL	13	22,726	0	0	2,020	0	24,746	1,904
N-BUTYL ALCOHOL	11	2,060	0	12,492	4,937	44,275	63,764	5,797
AMMONIA	10	300	5	250	6,327	0	6,882	688
1,2,4-	7	0	0	0	13,400	12,688	28,890	4,127
DIBUTYL PHTHALATE	5	0	4,100	0	3,101	15,600	22,801	4,560
ISOPROPYL ALCOHOL	5	250	0	11,850	0	20,850	32,950	6,590
ETHYLBENZENE	4	0	0	0	500	6,730	7,230	1,808
2-METHOXYETHANOL	4	0	0	0	0	93,409	93,409	23,352
TRICHLOROETHYLENE	3	0	0	9,000	0	0	9,000	3,000
DI(2-ETHYLHEXYL)	2	0	8,500	0	0	0	8,500	4,250
HYDROQUINONE	2	0	0	9,700	0	0	9,700	4,850
NICKEL	2	4	1,760	10,759	0	0	12,523	6,262
BENZENE	1	0	0	0	0	0	0	0
CHROMIUM COMPOUNDS	1	2,200	3,600	0	2,255	0	8,055	8,055
CYCLOHEXANE	1	0	0	0	0	0	0	0
FORMALDEHYDE	1	0	0	0	0	0	0	0
FREON 113	1	0	0	0	0	0	0	0
HYDROCHLORIC ACID	1	0	0	0	0	0	0	0
LEAD	1	0	0	62,770	0	0	62,770	62,770
MANGANESE COMPOUNDS	1	0	250	0	0	0	250	250
NAPHTHALENE	1	0	0	916	0	0	916	916
O-XYLENE	1	0	0	0	0	0	0	0
PHENOL	1	0	0	0	0	0	0	0
PHOSPHORIC ACID	1	0	0	0	0	0	0	0
2-ETHOXYETHANOL	1	0	0	0	0	3,000	3,000	3,000
TOTAL	318	344,669	189,07	5,363,	360,438	3,943,	10,204,	32,090

Source: U.S. EPA, Toxic Release Inventory Database,

The TRI database contains a detailed compilation of self-reported, facility-specific chemical releases. The top reporting facilities for this sector are listed below. Facilities that have reported only the SIC codes covered under this notebook appear in Exhibit 16.

Exhibit 16: Top 10 TRI Releasing Printing Facilities [c]

Rank	Facility	Total TRI Releases in Pounds
1	Ringier America Inc. - Corinth, MS	2,734,080
2	R. R. Donnelley & Sons Co. - Warsaw, IN	2,304,148
3	Quebecor Printing Inc. - Glen Burnie, MD	1,991,284
4	Quebecor Printing Inc. - Memphis, TN	1,741,875
5	Quebecor Printing Inc. - Dickson, TN	1,666,416
6	Brown Printing Co. - Franklin, KY	1,643,881
7	R. R. Donnelley Printing - Lynchburg, VA	1,431,502
8	Quebecor Printing Inc. - Providence, RI	1,366,140
9	R. R. Donnelley & Sons Co. - Gallatin, TN	1,193,120
10	Quebecor Printing Inc. - Mount Morris, IL	1,190,988

Source: U.S. EPA, Toxic Release Inventory Database, 1993.

IV.B. Summary of Selected Chemicals Released

The brief descriptions provided below were taken from the *1993 Toxics Release Inventory Public Data Release* (EPA, 1994), and the Hazardous Substances Data Bank (HSDB), accessed via TOXNET. TOXNET is a computer system run by the National Library of Medicine. It includes a number of toxicological databases managed by EPA, National Cancer Institute, and the National Institute for Occupational Safety and Health.[d] HSDB contains chemical-specific information on manufacturing and use,

[c] Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

[d] Databases included in TOXNET are: CCRIS (Chemical Carcinogenesis Research Information System), DART (Developmental and Reproductive Toxicity Database), DBIR (Directory of Biotechnology Information Resources), EMICBACK (Environmental Mutagen Information Center Backfile), GENE-TOX (Genetic Toxicology), HSDB (Hazardous Substances Data Bank), IRIS (Integrated Risk Information System), RTECS (Registry of Toxic Effects of Chemical Substances), and TRI (Toxic Release Inventory).

chemical and physical properties, safety and handling, toxicity and biomedical effects, pharmacology, environmental fate and exposure potential, exposure standards and regulations, monitoring and analysis methods, and additional references. The information contained below is based upon exposure assumptions that have been conducted using standard scientific procedures. The effects listed below must be taken in context of these exposure assumptions that are more fully explained within the full chemical profiles in HSDB. For more information on TOXNET, contact the TOXNET help line at 800-231-3766.

Toluene (CAS: 108-88-3)

Toxicity. Inhalation or ingestion of toluene can cause headaches, confusion, weakness, and memory loss. Toluene may also affect the way the kidneys and liver function.

Reactions of toluene (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Some studies have shown that unborn animals were harmed when high levels of toluene were inhaled by their mothers, although the same effects were not seen when the mothers were fed large quantities of toluene. Note that these results may reflect similar difficulties in humans.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases of toluene to land and water will evaporate. Toluene may also be degraded by microorganisms. Once volatilized, toluene in the lower atmosphere will react with other atmospheric components contributing to the formation of ground-level ozone and other air pollutants.

Physical Properties. Toluene is a volatile organic chemical.

Glycol Ethers

Data on ethylene glycol mono-n-butyl ether (2-butoxyethanol) are used to represent all glycol ethers because it is the most commonly used glycol ether in printing.

Ethylene Glycol Mono-n-Butyl Ether (2-Butoxyethanol)

Toxicity. Exposure to moderate concentrations of 2-butoxyethanol may cause central nervous system depression, including headaches, drowsiness, weakness, slurred speech, stuttering, staggering, tremors, blurred vision, and personality changes. These symptoms are such that a patient, in the absence of an accurate occupational history, may be treated for schizophrenia or narcolepsy. Other symptoms of moderate poisoning include nausea; vomiting; diarrhea; blood toxicity; abdominal and lumbar pain; and lesions in the brain, lung, liver, meninges and heart. Exposure to higher concentrations may lead to skin, respiratory, and eye irritation; kidney and liver damage; and coma.

It appears that 2-butoxyethanol is one of the few materials to which humans are more resistant than experimental animals. This appears to be at least partly due to the fact that humans are more resistant to the chemical's red blood cell-destroying properties than are most lab animals.

Environmental fate. The chemical 2-butoxyethanol is highly mobile in soils and should not accumulate in organic matter contained in sediments and suspended solids. Limited monitoring data has shown that it can leach to ground water. Hydrolysis, direct photolysis, volatilization, adsorption, and bioconcentration are not important fate processes for 2-butoxyethanol. Biodegradation is likely to be the most important removal mechanism of 2-butoxyethanol from aerobic soil and water. In the atmosphere, it reacts with photochemically produced hydroxyl radicals with an estimated half-life of 17 hours.

Methyl Ethyl Ketone (CAS: 78-93-3)

Toxicity. Breathing moderate amounts of methyl ethyl ketone (MEK) for short periods of time can cause adverse effects on the nervous system ranging from headaches, dizziness, nausea, and numbness in the fingers and toes to unconsciousness. Its vapors are irritating to the skin, eyes, nose, and throat and can damage the eyes. Repeated exposure to moderate to high amounts may cause liver and kidney effects.

Environmental Fate. MEK is a flammable liquid. Most of the MEK released to the environment will end up in the atmosphere. MEK can contribute to the formation of air pollutants in the lower atmosphere. It can be degraded by microorganisms living in water and soil.

1,1,1-Trichloroethane (CAS: 71-55-6)

Toxicity. Repeated contact of 1,1,1-trichloroethane (TCE) with skin may cause serious skin cracking and infection. Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations.

Exposure to high concentrations of TCE causes reversible mild liver and kidney dysfunction, central nervous system depression, gait disturbances, stupor, coma, respiratory depression, and even death. Exposure to lower concentrations of TCE leads to light-headedness, throat irritation, headache, disequilibrium, impaired coordination, drowsiness, convulsions and mild changes in perception.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Releases of TCE to surface water or land will almost entirely volatilize. Releases to air may be transported long distances and may partially return to earth in rain. In the lower atmosphere, TCE degrades very slowly by photooxidation and slowly diffuses to the upper atmosphere where photodegradation is rapid.

Any TCE that does not evaporate from soils leaches to groundwater. Degradation in soils and water is slow. TCE does not hydrolyze in water, nor does it significantly bioconcentrate in aquatic organisms.

Xylene (Mixed Isomers) (CAS: 1330-20-7)

Toxicity. Xylenes are rapidly absorbed into the body after inhalation, ingestion, or skin contact. Short-term exposure of humans to high levels of xylenes can cause irritation of the skin, eyes, nose, and throat, difficulty in breathing, impaired lung function, impaired memory, and possible changes in the liver and kidneys. Both short- and long-term exposure to high concentrations can cause effects such as headaches, dizziness, confusion, and lack of muscle coordination. Reactions of xylenes (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases to land and water will quickly evaporate, although some degradation by microorganisms will occur.

Xylenes are moderately mobile in soils and may leach into groundwater, where they may persist for several years.

Xylenes are volatile organic chemicals. As such, xylenes in the lower atmosphere will react with other atmospheric components, contributing to the formation of ground-level ozone and other air pollutants.

IV.C. Other Data Sources

The toxic chemical release data obtained from TRI allows for a comparison across years and industry sectors. Reported chemicals are limited however to the 316 reported chemicals. The EPA Office of Air Quality Planning and Standards has compiled air pollutant emmission factors for determining the total air emissions of priority pollutants (e.g., total hydrocarbons, SO_X, NOx, CO, particulates, etc.) from various industry sectors including printing facilities.

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. With the exception of volatile organic compounds (VOCs), there is little overlap with the TRI chemicals reported above. Exhibit 17 summarizes annual releases of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 microns or less (PM10), total particulates (PT), sulfur dioxide (SO_2), and volatile organic compounds (VOCs).

Exhibit 17: Pollutant Releases (short tons/year)

Industry Sector	CO	NO2	PM10	PT	SO2	VOC
Metal Mining	5,391	28,583	39,359	140,052	84,222	1,283
Nonmetal Mining	4,525	28,804	59,305	167,948	24,129	1,736
Lumber and Wood Production	123,756	42,658	14,135	63,761	9,419	41,423
Furniture and Fixtures	2,069	2,981	2,165	3,178	1,606	59,426
Pulp and Paper	624,291	394,448	35,579	113,571	541,002	96,875
Printing	**8,463**	**4,915**	**399**	**1,031**	**1,728**	**101,537**
Inorganic Chemicals	166,147	103,575	4,107	39,062	182,189	52,091
Organic Chemicals	146,947	236,826	26,493	44,860	132,459	201,888
Petroleum Refining	419,311	380,641	18,787	36,877	648,155	369,058
Rubber and Misc. Plastics	2,090	11,914	2,407	5,355	29,364	140,741
Stone, Clay and Concrete	58,043	338,482	74,623	171,853	339,216	30,262
Iron and Steel	1,518,642	138,985	42,368	83,017	238,268	82,292
Nonferrous Metals	448,758	55,658	20,074	22,490	373,007	27,375
Fabricated Metals	3,851	16,424	1,185	3,136	4,019	102,186
Computer and Office Equipment	24	0	0	0	0	0
Electronics and Other Electrical Equipment and Components	367	1,129	207	293	453	4,854
Motor Vehicles, Bodies, Parts and Accessories	35,303	23,725	2,406	12,853	25,462	101,275
Dry Cleaning	101	179	3	28	152	7,310

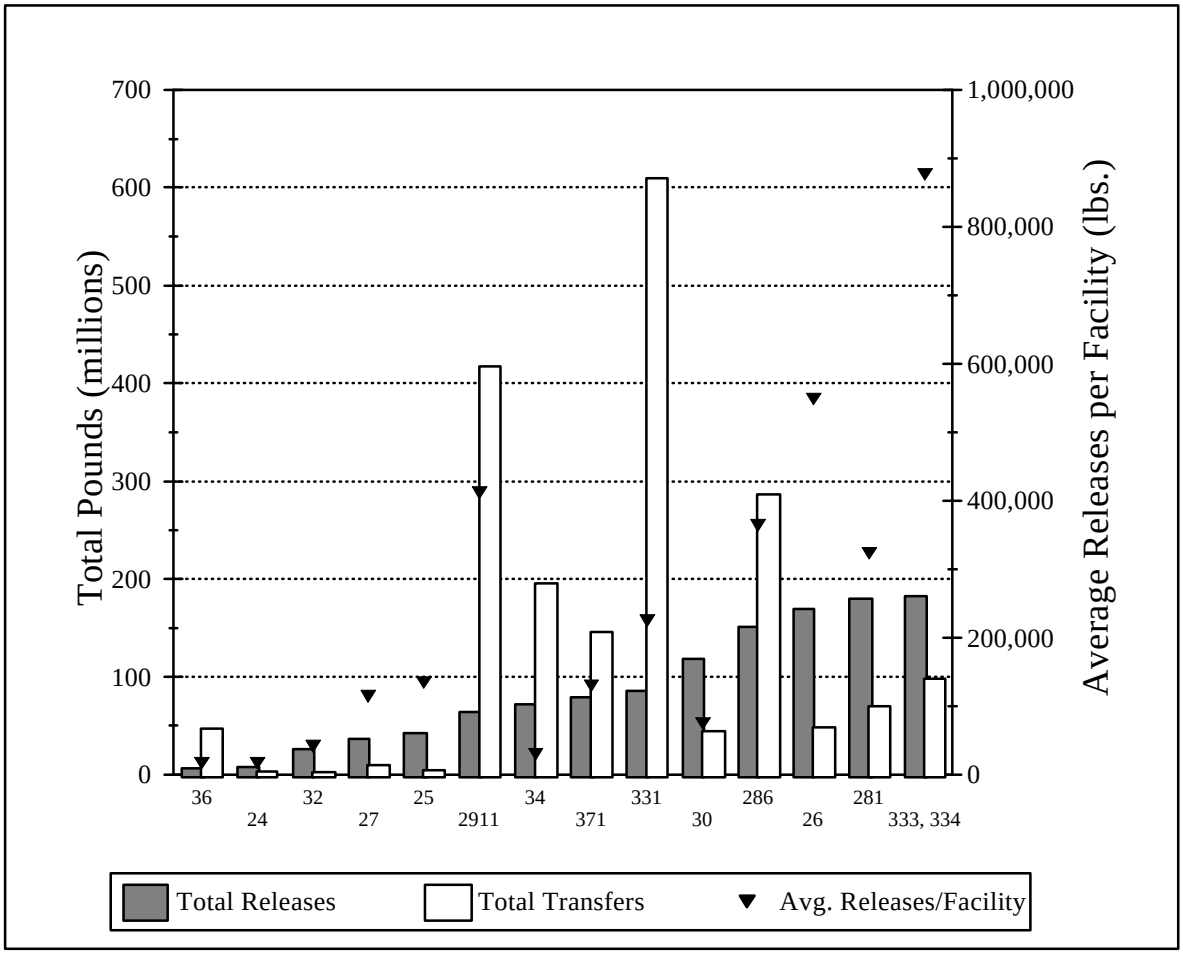
Source: U.S. EPA Office of Air and Radiation, AIRS Database, May 1995.

IV.D. Comparison of Toxic Release Inventory Between Selected Industries

The following information is presented as a comparison of pollutant release and transfer data cross industrial categories. It is provided to give a general sense as to the relative scale of releases and transfers within each sector profiled under this project. Please note that the following figure and table do not contain releases and transfers for industrial categories that are not included in this project, and thus cannot be used to draw conclusions regarding the total release and transfer amounts that are reported to TRI. Similar information is available within the annual TRI Public Data Release Book.

Exhibit 18 is a graphical representation of a summary of the 1993 TRI data for the Printing and Publishing and the other sectors profiled in separate notebooks. The bar graph presents the total TRI releases and total transfers on the left axis and the triangle points show the average releases per facility on the right axis. Industry sectors are presented in the order of increasing total TRI releases. The graph is based on the data shown in Exhibit 19 and is meant to facilitate comparisons between the relative amounts of releases, transfers, and releases per facility both within and between these sectors. The reader should note, however, that differences in the proportion of facilities captured by TRI exist between industry sectors. This can be a factor of poor SIC matching and relative differences in the number of facilities reporting to TRI from the various sectors. In the case of Printing and Publishing, the 1993 TRI data presented here covers 318 facilities. These facilities listed SIC 2711-2789 (Printing and Publishing) as a primary SIC code.

Exhibit 18: Summary of 1993 TRI Data:
Releases and Transfers by Industry



SIC Range	Industry Sector	SIC Range	Industry Sector	SIC Range	Industry Sector
36	Electronic Equipment and Components	2911	Petroleum Refining	286	Organic Chemical Mfg.
24	Lumber and Wood Products	34	Fabricated Metals	26	Pulp and Paper
32	Stone, Clay, and Concrete	371	Motor Vehicles, Bodies, Parts, and Accessories	281	Inorganic Chemical Mfg.
27	Printing	331	Iron and Steel	333,334	Nonferrous Metals
25	Wood Furniture and Fixtures	30	Rubber and Misc. Plastics		

Exhibit 19: Toxics Release Inventory Data for Selected Industries

Industry Sector	SIC Range	# TRI Facilities	1993 TRI Releases		1993 TRI Transfers		Total Releases + Transfers (million lbs.)	Average Releases + Transfers per Facility (pounds)
			Total Releases (million lbs.)	Average Releases per Facility (pounds)	Total Transfers (million lbs.)	Average Transfers per Facility (pounds)		
Stone, Clay, and Concrete	32	634	26.6	42,000	2.2	4,000	28.8	46,000
Lumber and Wood Products	24	491	8.4	17,000	3.5	7,000	11.9	24,000
Furniture and Fixtures	25	313	42.2	135,000	4.2	13,000	46.4	148,000
Printing	**2711-2789**	**318**	**36.5**	**115,000**	**10.2**	**32,000**	**46.7**	**147,000**
Electronic Equip. and Components	36	406	6.7	17,000	47.1	116,000	53.7	133,000
Rubber and Misc. Plastics	30	1,579	118.4	75,000	45	29,000	163.4	104,000
Motor Vehicles, Bodies, Parts, and Accessories	371	609	79.3	130,000	145.5	239,000	224.8	369,000
Pulp and Paper	2611-2631	309	169.7	549,000	48.4	157,000	218.1	706,000
Inorganic Chem. Mfg.	2812-2819	555	179.6	324,000	70	126,000	249.7	450,000
Petroleum Refining	2911	156	64.3	412,000	417.5	2,676,000	481.9	3,088,000
Fabricated Metals	34	2,363	72	30,000	195.7	83,000	267.7	123,000
Iron and Steel	331	381	85.8	225,000	609.5	1,600,000	695.3	1,825,000
Nonferrous Metals	333, 334	208	182.5	877,000	98.2	472,000	280.7	1,349,000
Organic Chemical Mfg.	2861-2869	417	151.6	364,000	286.7	688,000	438.4	1,052,000
Metal Mining	10	Industry sector not subject to TRI reporting.						
Nonmetal Mining	14	Industry sector not subject to TRI reporting.						
Dry Cleaning	7216	Industry sector not subject to TRI reporting.						

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Industries have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

In order to encourage these approaches, this section provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the printing and publishing industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. When possible, this section provides information from real activities that can, or are being implemented by this sector -- including a discussion of associated costs, time frames, and expected rates of return. This section also provides the context (in terms of type of industry and/or type of process affected) in which the pollution prevention technique can effectively be used.

V.A. Pollution Prevention Opportunities for the Printing and Publishing Industry

Printers use various chemicals throughout their facilities. The payoff from many of the possible changes in the printing process or product choice is unlikely to have a significant effect on a facility's overall emissions profile because these chemicals and chemical formulations are often used in relatively small quantities. Instead, pollution prevention for printers involves a longer-term reorientation of production staff and management priorities so that opportunities are recognized and acted upon as they arise. For example, a one-time pollution prevention audit may not identify novel press technologies capable of reducing VOC emissions if the purchase is not likely to occur for several years, but the practice of on-going pollution prevention auditing, once established, will identify when the time and conditions are right.

This section is structured according to the steps within pre-press, press and post-press operations. Pollution prevention opportunities for specific printing processes (e.g., lithography) are presented separately wherever warranted.

V.A.1. Pre-press - Image Making Operations

Image making most frequently involves typesetting and photodeveloping. Typical wastestreams include: photographic chemicals, paper and films, silver, and solid wastes. Pollution prevention opportunities include:

- Implementing operational and work practice changes that can extend the life of chemical baths, reduce the amount of chemicals used and reduce wastewater generation;
- Using chemical substitutes, such as non-silver photographic films (under development);
- Replacing the sometimes repetitive steps of photographing, editing, re-shooting, and the photodeveloping process with electronic imaging (including the capability to edit images on a computer)
- Developing inventory control programs that offer the advantage of reducing spoilage of photodeveloping chemicals and supplies such as paper and film.

V.A.2. Pre-press - Plate Making/Screen Making Operations

Typical wastestreams include: outdated material and chemicals, damaged or used plates and screens, wastewaters containing acids, alkalis, solvents, plate coatings, developers, screen emulsions, and rinse water. Pollution prevention opportunities include:

- Changing operational and work practices to reduce chemical use including recovery and recycling of spent chemicals and heavy metals, which require steps to reduce contamination of chemical baths; counter-current washing; and filtration of screen making wastewaters to remove particulates;
- Recycling plates and plate materials to the manufacturer or a metal recoverer;
- Researching and commercializing of other major changes in printing plate development, primarily related to alternative chemistries. For example, using water-developed lithographic plates and film instead of solvent processing may eliminate the need for pretreatment of wastewaters if they are being discharged to the sewer;
- Replacing ferrocyanide bleaches with iron-EDTA bleaches which eliminate certain treatment and disposal requirements;
- Reducing environmental releases related to plate-making and screen-making through new techniques. For example, laser plate

making using non-silver plates is under commercial development and could replace chemical development of plates;

- Reducing wastewater through new technologies such as "washless" processing systems. While still expensive to install, these systems can reduce wastewater by as much as 97 percent.

V.A.3. Press Operations

During printing, the image is transferred to a substrate of paper or some other material. Typical wastestreams include: inks, substrate, cleaning solutions, and in the case of lithography, fountain solutions. Pollution prevention opportunities include:

- Improving housekeeping and better operating practices, such as covering reservoirs and containers, scheduling jobs according to increasing darkness of ink color, using wipes as long as possible, and controlling inventory, can all minimize solvent losses from inks and cleaning solutions.
- Reducing ink vaporization by using diaphragm pumps which do not heat ink as much as mechanical vane pumps.
- Recycling waste solvents on-site or off-site. Segregating of solvents may allow a second use (e.g., for equipment cleaning or ink thinning).
- Recycling of certain waste inks where possible.
- Recycling of product rejects where possible.
- Using alternative ink and cleaning products with reduced VOC emissions. Lowering the VOC emissions from printing and press cleanup may be accomplished using vegetable oil-based inks or water-based inks (rather than solvent-based inks) where possible and using low-VOC or VOC-free cleaning solutions. A new printing system that features an oil-based lithographic ink that can be converted to a water-soluble state is currently available, allowing a water-based blanket wash to be used.
- Eliminating the use of chromium-containing fountain solutions to reduce the toxicity of spent fountain solutions.
- Installing automatic ink levelers help to keep ink conditions optimal.
- Using automatic cleaning equipment which can often be retrofitted to existing presses and operations. Typically, lower volumes of cleaning formulations are applied with such cleaning equipment, air contact, and thus volatilization, is reduced, and most are designed to include recycling and reuse of cleaning solutions.

- Minimizing finished product rejects by automating (noncontact) monitoring technologies which detect tears in web and press performance.
- Using fountain coolers to reduce evaporation from the dampening fountain.

V.A.4. Post-Press Operations

The final steps in making a printed product may involve folding, trimming, binding, laminating and embossing. Typical wastestreams include: scrap substrate from trimming, rejects from finishing operations, and VOCs released from adhesives. Pollution prevention opportunities include:

- Collecting and reclaiming recyclable materials is often done.
- Replacing VOC-based adhesives with water-soluble adhesives (binding adhesives that are not water-soluble may interfere with later recycling), hot-melt adhesives, or mechanical methods in binding operations.

VI. SUMMARY OF APPLICABLE FEDERAL STATUTES AND REGULATIONS

This section discusses the Federal statutes and regulations that may apply to this sector. The purpose of this section is to highlight, and briefly describe the applicable Federal requirements, and to provide citations for more detailed information. The three following sections are included.

- Section VI.A. contains a general overview of major statutes
- Section VI.B. contains a list of regulations specific to this industry
- Section VI.C. contains a list of pending and proposed regulations

The descriptions within Section VI are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Resource Conservation And Recovery Act

The Resource Conservation And Recovery Act (RCRA) of 1976 which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitibility, corrosivity, reactivity, or toxicity and designated with the code "D").

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and record keeping standards. Facilities that treat, store, or dispose of hazardous waste must obtain a permit, either from

EPA or from a State agency which EPA has authorized to implement the permitting program. Subtitle C permits contain general facility standards such as contingency plans, emergency procedures, record keeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.10) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA-regulated facilities.

Although RCRA is a Federal statute, many States implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 46 of the 50 States.

Most RCRA requirements are not industry specific but apply to any company that generates, transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) lays out the procedure every generator should follow to determine whether the material created is considered a hazardous waste, solid waste, or is exempted from regulation.

- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and record keeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.

- **Land Disposal Restrictions** (LDRs) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs (40 CFR 268), materials must meet land disposal restriction (LDR) treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Wastes subject to the LDRs include solvents, electroplating wastes, heavy metals, and acids. Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation,

burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil marketer (one who generates and sells off-specification used oil directly to a used oil burner), additional tracking and paperwork requirements must be satisfied.

- **Tanks and Containers** used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities who store such waste, including generators operating under the 90-day accumulation rule.

- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substance are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also establishes increasingly stringent standards, including upgrade requirements for existing tanks, that must be met by 1998.

- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with strict design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and restrict the type of waste that may be burned.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. The RCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., ET, excluding Federal holidays.

Comprehensive Environmental Response, Compensation, And Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response costs incurred by EPA. The Superfund Amendments and Reauthorization

Act (SARA) of 1986 revised various sections of CERCLA, extended the taxing authority for the Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA **hazardous substance release reporting regulations** (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which exceeds a reportable quantity. Reportable quantities are defined and listed in 40 CFR §302.4. A release report may trigger a response by EPA, or by one or more Federal or State emergency response authorities.

EPA implements **hazardous substance responses** according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as "removals." EPA generally takes remedial actions only at sites on the National Priorities List (NPL), which currently includes approximately 1300 sites. Both EPA and states can act at other sites; however, EPA provides responsible parties the opportunity to conduct removal and remedial actions and encourages community involvement throughout the Superfund response process.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. The CERCLA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., ET, excluding Federal holidays.

Emergency Planning And Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State and local governments. EPCRA required the establishment of State emergency response commissions (SERCs), responsible for coordinating certain emergency response activities and for appointing local emergency planning committees (LEPCs).

EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA §302** requires facilities to notify the SERC and LEPC of the presence of any "extremely hazardous substance" (the list of such substances is in 40 CFR Part 355, Appendices A and B) if it has such substance in excess of the substance's threshold planning quantity, and directs the facility to appoint an emergency response coordinator.

- **EPCRA §304** requires the facility to notify the SERC and the LEPC in the event of a release exceeding the reportable quantity of a CERCLA hazardous substance or an EPCRA extremely hazardous substance.

- **EPCRA §311 and §312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC and local fire department material safety data sheets (MSDSs) or lists of MSDS's and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.

- **EPCRA §313** requires manufacturing facilities included in SIC codes 20 through 39, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, commonly known as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media, and allows EPA to compile the national Toxic Release Inventory (TRI) database.

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's EPCRA Hotline, at (800) 535-0202, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. The EPCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., ET, excluding Federal holidays.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA include "priority"

pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The **National Pollutant Discharge Elimination System (NPDES)** program (CWA §402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either EPA or an authorized State (EPA has authorized approximately forty States to administer the NPDES program), contain industry-specific, technology-based and/or water quality-based limits, and establish pollutant monitoring requirements. A facility that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from State to State, and site to site, depending on the use classification of the receiving body of water. Most States follow EPA guidelines which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address **storm water discharges**. In response, EPA promulgated the NPDES storm water permit application regulations. Stormwater discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying stormwater and which is directly related to manufacturing, processing or raw material storage areas at an industrial plant (40 CFR 122.26(b)(14)). These regulations require that facilities with the following storm water discharges apply for an NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

The term "storm water discharge associated with industrial activity" means a storm water discharge from one of 11 categories of industrial activity defined at 40 CFR 122.26. Six of the categories are defined by SIC codes while the other five are identified through narrative descriptions of the regulated industrial activity. If the primary SIC code of the facility is one of those identified in the regulations, the facility is subject to the storm water permit application requirements. If any activity at a facility is covered by one of the five narrative categories, storm water discharges from those areas where the activities occur are subject to storm water discharge permit application requirements.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, the regulation should be consulted.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 229-petroleum refining; and SIC 311-leather tanning and finishing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC

44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather and tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-industrial and commercial machinery and computer equipment; SIC 36-electronic and other electrical equipment and components; SIC 37-transportation equipment (except ship and boat building and repairing); SIC 38-measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly-owned treatment works (POTWs). The national **pretreatment program** (CWA §307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under §307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants. Discharges to a POTW are regulated primarily by the POTW itself, rather than the State or EPA.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a State is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than Federal standards.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water resource center, at (202) 260-7786.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal-State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized States enforce the primary drinking water standards, which are, contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA **Underground Injection Control** (UIC) program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. UIC permits include design, operating, inspection, and monitoring requirements. Wells used to inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is primarily State-enforced, since EPA has authorized all but a few States to administer the program.

The SDWA also provides for a Federally-implemented Sole Source Aquifer program, which prohibits Federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a State-implemented Wellhead Protection

program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The Hotline operates from 9:00 a.m. through 5:30 p.m., ET, excluding Federal holidays.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA §5, EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemicals effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA §6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under §6 authority are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs).

EPA's TSCA Assistance Information Service, at (202) 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., ET, excluding Federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments, including the Clean Air Act Amendments (CAAA) of 1990, are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and

the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the States to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAAA, many facilities will be required to obtain permits for the first time. State and local governments oversee, manage, and enforce many of the requirements of the CAAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a given pollutant are classified as attainment areas; those that do not meet NAAQSs are classified as non-attainment areas. Under §110 of the CAA, each State must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet Federal air quality standards.

Title I also authorizes EPA to establish New Source Performance Standards (NSPSs), which are nationally uniform emission standards for new stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source but allow the affected industries the flexibility to devise a cost-effective means of reducing emissions.

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Title III of the CAAA further directed EPA to develop a list of sources that emit any of 189 HAPs, and to develop regulations for these categories of sources. To date EPA has listed 174 categories and developed a schedule for the establishment of emission standards. The emission standards will be developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV establishes a sulfur dioxide emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances, which, beginning in 1995, will be set below previous levels of sulfur dioxide releases.

Title V of the CAAA of 1990 created a permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States are developing the permit programs in accordance with guidance and regulations from EPA. Once a State program is approved by EPA, permits will be issued and monitored by that State.

Title VI is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their use and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs), will be phased out entirely by the year 2000, while certain hydrochlorofluorocarbons (HCFCs) will be phased out by 2030.

EPA's Control Technology Center, at (919) 541-0800, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996, provides general information about regulations promulgated under Title VI of the CAA, and EPA's EPCRA Hotline, at (800) 535-0202, answers questions about accidental release prevention under CAA §112(r). In addition, the Technology Transfer Network Bulletin Board System (modem access (919) 541-5742)) includes recent CAA rules, EPA guidance documents, and updates of EPA activities.

VI.B. Industry Specific Regulatory Requiremets

While the list of environmental statutes *potentially* affecting printers includes all of the major media-oriented statutes, the actual number is much smaller. In general, printers' relatively small size and lower chemical usage place them below many of the thresholds which would trigger regulatory requirements. For example, the 70 percent of printers with fewer than ten employees typically face only RCRA manifesting and discharge limits established by the local publicly owned wastewater treatment works (POTW). Larger facilities, however, may have to meet Clean Air Act requirements in ozone nonattainment areas, Emergency Planning and Community Right-to Know Act requirements, as well as state requirements established by the State Implementation Plan (SIP) process. These statutes are most frequently triggered because of solvent releases from image developing, inks and cleaning operations.

A fairly complete list of environmental regulations affecting the printing industry is available from the Agency's Design for the Environment Program or, more specifically, the document entitled *Federal Environmental Regulations Potentially Affecting the Commercial Printing Industry* (Contact: Stephanie Bergman 202-260-1821). Most importantly, it includes examples connecting chemicals used in the printing industry to applicable regulations. More accurate profiles of the regulatory requirements for printing facilities may become available in the near future as projects in support of consolidated reporting are completed.

Clean Air Act (CAA)

Title I - Provisions for Attainment and Maintenance of the National Ambient Air Quality Standards (NAAQS):

- Reasonably Available Control Technologies (RACTs) as defined in State Implementation Plans (SIPs) are required at major sources in "nonattainment" areas, defined by severity of air quality problems. NAAQS have been established for six pollutants: ozone, carbon monoxide particulate matter, sulfur dioxide, nitrogen dioxide and lead. Regulations relating to ozone (VOCs react to form O_3), NO_x and particulates are likely to have a significant impact on the printing industry. Control Technology Guidelines (CTGs) exist for gravure and flexographic printing, and fabric and paper coating. These CTGs apply primarily in ozone nonattainment areas to sources with potential uncontrolled VOC emissions (ozone precursors) of 25 tons or more per year depending on the severity of the non-

attainment classification. (Contact: David Salman 919-541-0859)

- There are also New Source Performance Standards for the construction, operation or modification of presses, coaters, control devices, boilers, cyclones, evaporators, distillation units, and some bindery equipment.

Title V - Permits:

- A new permit system will require all major sources to obtain operating permits to cover all applicable control requirements. States were required to develop and implement the program in 1993 and the first permits are likely to be issued in late 1995. Although revisions to the definition of what constitutes a major source were being negotiated at the time that this document went to press, it is important to note that major source determination will likely be based on a facility's potential emissions and not its actual emissions; require emissions monitoring, and record keeping and reporting.

Resource Conservation and Recovery Act (RCRA)

Hazardous waste generators are divided in three categories: large quantity generators (1,000 kg or more/month or more than one kg/month of extremely hazardous waste); small quantity generators (100 to 1,000 kg/month and less than one kg/month of extremely hazardous waste); and conditionally exempt small generators (less than 100 kg/month and less than one kg/month of extremely hazardous waste). Each generator bears the responsibility for determining whether or not a waste is hazardous and the appropriate waste code.

- Facility Status (40 CFR Part 262) - Facilities may possibly be classified as Treatment Storage or Disposal Facilities (TSDFs) if they do not send their waste off-site before the applicable time limit (90 to 180 days depending upon the volume).
- Waste Containers (40 CFR §§262.32, 262.34, 265.171, 265.172 and 265.173) - Wastes must be properly stored to meet basic safety requirements and prevent leaks, and must be labeled as hazardous waste and dated at the time that accumulation begins.
- Hazardous Waste Shipments (40 CFR §262.20) - A Uniform Hazardous Waste Manifest must be completed and accompany the shipment. Wastes must be sent to a RCRA C permitted facility. An exception report must be filed with the relevant regulatory agency if the manifest copy is not received within 45 days of

shipment. Also, an exemption is allowed for small quantity generators from the manifest requirement if their waste is shipped under contract, records are maintained for three years, and the vehicle used to haul the waste is owned by the reclaimer.

- Land Disposal Restrictions (40 CFR §268.7) - Additional notification must be sent along with each manifest to the destination facility.
- Biennial Reporting (40 CFR §262.41) - Large quantity generators must submit a report of hazardous waste generation and management activities by March 1 of every even-numbered year.
- Record Keeping (40 CFR §268.7) - Copies of each manifest, biennial report (if a large quantity generator), exception report, test analysis, and inspection log must be kept for three years.
- Training (40 CFR §262.34 (a)(4),(d)(5)(iii)) - Facilities storing waste for longer than the 90-180 day threshold must ensure that employees are familiar with hazardous waste handling procedures or provide training.
- Release or Threat of Release Reporting (40 CFR §262.34) - In case of a release to the environment, the generator must contact the National Response Center.

Emergency Planning and Community Right-to-Know Act (EPCRA)

- Emergency Planning (§302(A)) - Businesses that produce, use, or store "hazardous chemicals" at or above "threshold planning quantities" must submit: 1) material safety data sheets or the equivalent and 2) Tier I/Tier II annual inventory report forms to the appropriate local emergency planning commission. Those handling "extremely hazardous substances" are also required to submit a one-time notice to the state emergency response commission.
- Emergency Notification of Extremely Hazardous Substance Release (§304) - A business that unintentionally releases a reportable quantity of an extremely hazardous substance must report that release to the state emergency planning commission and the local emergency planning commission.
- Release Reporting (§313) - Manufacturing businesses with ten or more employees that manufactured, processed, or otherwise used a listed toxic chemical in excess of the "established threshold" must file annually a Toxic Chemical Release form with EPA and the state. Approximately 318 printers nationwide submitted forms summarizing their chemical releases in 1993. Documentation supporting release estimates must be kept for three years.

Clean Water Act (CWA)

- Discharges to a POTW (40 Part 403) - Facilities discharging wastewater to a sewer are often subject to restrictions required under the Clean Water Act and established by the local sewerage authority to prevent significant interference with the treatment facility or pass-through of pollutants not removed by treatment. The specific requirements include: notifying the POTW of discharges that could cause problems at the POTW, monitoring and recordkeeping as established by the POTW, and a one-time notice of the discharge of hazardous waste, specifically, if more than 33 pounds/month.
- Direct discharges (40 CFR Parts 116 and 117) - Facilities discharging hazardous substances are required to notify the federal government (33 §153.203) when discharges meet or exceed the reportable quantity.
- The Storm Water Rule (40 §122.26(b)(14) subpart (xi)) requires that printing facilities falling within any of 11 categories defined in 40 CFR 122.26 is subject to storm water permit application regulations.

Occupational Health and Safety Administration (OSHA)

A more up-to-date summary of OSHA regulations may be available from OSHA. The following is a summary taken from industry literature.

Exposure Monitoring (29 CFR §1910.1045) standard requires initial and periodic monitoring when an employer suspects exposure levels could exceed Permissible Exposure Limits (PELs). Also requires employee notification and recordkeeping.

Permissible Exposure Limits (PELs) (29 CFR §1910.1000) for chemicals released during printing operations, such as glycol ethers, toluene and methylene chloride.

Respiratory Protective Equipment (29 CFR §1910.134) established new standards for protective equipment.

Methods of Compliance (29 CFR §1910.1000 and §1910.134) allows the use of a respirator in lieu of administrative or engineering controls during installation of engineering controls or upset conditions.

State Statutes

A 1992 Source Reduction Review Project (SRRP) review of state air regulations found that **thirty states** (AL, CO, CT, DE, DC, FL, GA, AL, KS, KY, LA, MD, MA, MI, MO, NH, NJ, NY, NC, OH, OK, OR, PA, RI, SC, TN, UT, VA, WA and WI) regulate volatile organic compounds emitted from printing and publishing operations. In general, all employ the same type of standards with potential release triggers of 50,000 pounds/year to 500 pounds/day. Typical standards include: 1) specifying a maximum volatile fraction (e.g., 25 percent by volume) of ink; 2) a minimum water volume (e.g., 75 percent or a "waterborne ink"); or 3) a minimum nonvolatile fraction (e.g., "high solids inks"). In addition, control technologies (i.e., carbon adsorption, incineration, or comparable alternative) are required to reduce or destroy VOCs. Specific efficiencies are established for gravure and flexographic printing.

Illinois, although not included in the 1992 SRRP, is known to have air regulations similar to those described above.

California has emergency planning requirements similar to those established by EPCRA but the state's lower thresholds result in smaller operations being subject to the planning requirements.

California's **South Coastal Air Quality Management District** and the Air Pollution Control District for the County of San Diego have issued regulations affecting graphic arts operations. These regulations establish standards for the VOC content of inks, cleaning solvents, fountain solutions, as well as work practices and record-keeping.

VI.C. Pending and Proposed Regulatory Requirements

Several regulatory requirements are currently pending that will potentially affect printers. The Clean Air Act Amendments of 1990 and RCRA are both potential sources of new regulatory requirements.

Clean Air Act Amendments of 1990 (CAAA)

The Clean Air Act Amendments of 1990 included a number of provisions for which the Agency will develop regulations likely to affect printers directly. A draft lithography Control Technology Guidance (CTG) was announced in the Federal Register in November of 1993 to be used by state and Regional air programs as the basis for controls of VOCs released from lithographic printing operations in ozone nonattainment areas. In June of 1994, a lithography Alternative Control Technology (ACT) was issued in response to the comments received regarding the CTG.

Title I - Provisions for Attainment and Maintenance of the National Ambient Air Quality Standards (NAAQS):

- Ozone nonattainment areas are classified as: marginal, moderate, serious, severe, or extreme. "Major" stationary sources are defined as having potential emissions of 50 tons of VOCs per year in serious areas; 25 tons per year in severe areas; and 10 tons or more in extreme areas. For all other areas, a major source is one that releases 100 tons of VOCs per year.
- An Alternative Control Techniques Guideline (ACT) was developed for offset lithographic printing which will affect formulations of fountain solutions and cleaning solvents. (Contact: Dave Salman 919-541-0859)
- Printers not subject to a CTG but designated a major source are subject to Reasonably Available Control Technology (RACT) requirements. The state must develop and adopt non-CTG RACT rules for such sources.

Title III - National Emissions Standards for Hazardous Air Pollutants (NESHAP):

- Maximum Achievable Control Technology (MACT) standards are scheduled for a list of 189 Hazardous Air Pollutants (HAPs) listed in §112. MACT standards for the commercial printing industry are scheduled for 1994. The Agency is studying the feasibility and benefits of MACT standards for publication and packaging gravure and wide web flexographic sources. (Contact: Bob Blaszczak 919-541-5432)

Resource Conservation and Recovery Act (RCRA)

- While developed for wastes such as batteries, simplified recordkeeping and manifesting for a number of waste streams with hazardous constituents, such as rags and wipes containing inks and solvents may apply to printers. (Contact: Ronald Josephson 202-260-6715)

- Additional RCRA listings of solvents and chemicals used by printers are also under investigation.