

Review of Manufacturing Uses Under the City of Gainesville's I-2 Industrial Zoning

Prepared for

City of Gainesville
Community Development
200 E University Avenue
City Hall
P.O. Box 490
Gainesville, Florida 32602

Prepared by

Water & Air Research, Inc.
6821 S.W. Archer Road
Gainesville, Florida 32608



March 2001
01-5373-01

Contents

Section	Page
Review of Manufacturing Uses Under the City of Gainesville's I-2 Industrial Zoning.....	1
General Industrial District (I-2)	1
I-2 in Gainesville	1
Purpose of Study.....	2
Summary of Analysis.....	3
Sector Analysis	5
20-Food and Kindred Products	5
21-Tobacco Products	5
22-Textile Mill Products.....	5
23-Apparel and Other Finished Products Made from Fabrics and Similar Materials	7
24-Lumber and Wood Products, Except Furniture	7
25-Furniture and Fixtures.....	8
26-Paper and Allied Products.....	9
27-Printing, Publishing, and Allied Industries	10
28-Chemicals and Allied Products	11
Inorganic Chemical Industry.....	11
Organic Chemical Industry	12
Resin and Manmade Fiber Manufacturing	13
Pharmaceuticals	15
29-Petroleum Refining and Related Industries	16
30-Rubber and Miscellaneous Plastics Products	17
31-Leather and Leather Products.....	18
32-Stone, Clay, Glass, and Concrete Products	19
33-Primary Metal Industries.....	19
Iron and Steel.....	19
Nonferrous Metals	21
Metal Casting	22
34-Fabricated Metal Products, Except Machinery and Transportation Equipment.....	23
35-Industrial and Commercial Machinery.....	24
36-Electronic and Other Electrical Equipment and Components, Including Computer Equipment	24
37-Transportation Equipment	25
Motor Vehicles	26
Aerospace	26
38-Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks.....	27
39-Miscellaneous Manufacturing Industries	27

**Original
Report**

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I-2 Moratorium Information

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Table of Contents

Master

Section	Page
Original Report	1 st tab
Detailed Report.....	2 nd tab
Table 2.....	3 rd tab
Table 3.....	4 th tab

254 Partitions, Shelving, Lockers, and Office and Store Fixtures	0.9
395 Pens, Pencils, and Other Artists' Material	0.9
343 Heating Equipment, Except Electric and Warm Air; and Plumbing Fixtures	0.9
213 Chewing and Smoking Tobacco and Snuff	0.8 Odor
356 General Industrial Machinery and Equipment	0.8
209 Miscellaneous Food Preparations and Kindred Products	0.8
353 Construction, Mining, and Materials Handling Machinery and Equipment	0.7
227 Carpets and Rugs	0.6
393 Musical Instruments	0.6
385 Ophthalmic Goods	0.5
342 Cutlery, Handtools, and General Hardware	0.5
344 Fabricated Structural Metal Products	0.5
225 Knitting Mills	0.5 Noise
357 Computer and Office Equipment	0.5
365 Household Audio and Video Equipment, and Audio Recordings	0.5
313 Boot and Shoe Cut Stock and Findings	0.4
399 Miscellaneous Manufacturing Industries	0.4
278 Blankbooks, Looseleaf Binders, and Bookbinding and Related Work	0.4
345 Screw Machine Products, and Bolts, Nuts, Screws, Rivets, and Washers	0.4 Noise
381 Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments, and Equipment	0.4
273 Books	0.3
384 Surgical, Medical, and Dental Instruments and Supplies	0.2
382 Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments	0.2
359 Miscellaneous Industrial and Commercial Machinery and Equipment	0.2
387 Watches, Clocks, Clockwork Operated Devices, and Parts	0.2
259 Miscellaneous Furniture and Fixtures	0.2
205 Bakery Products	0.2 Odor
396 Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, Except Precious Metal	0.2
319 Leather Goods, Not Elsewhere Classified	0.2
314 Footwear, Except Rubber	0.2
355 Special Industry Machinery, Except Metalworking Machinery	0.2
271 Newspapers: Publishing, or Publishing and Printing	0.2
224 Narrow Fabric and Other Smallwares Mills	0.1

394		
	Dolls, Toys, Games and Sporting and Athletic Goods	0.1
276	Manifold Business Forms	0.1
354	Metalworking Machinery and Equipment	0.1
245	Wood Buildings and Mobile Homes	0.1
272	Periodicals: Publishing, or Publishing and Printing	0.1
391	Jewelry, Silverware, and Plated Ware	0.1
232	Men's and Boy's Furnishings, Work Clothing, and Allied Garments	0.1
317	Handbags and Other Personal Leather Goods	0.1
238	Miscellaneous Apparel and Accessories	0.1
239	Miscellaneous Fabricated Textile Products	0.0
316	Luggage	0.0
279	Service Industries for the Printing Trade	0.0
244	Wood Containers	0.0
234	Women's, Misses', Children's, and Infants' Undergarments	0.0
231	Men's and Boy's Suits, Coats, and Overcoats	0.0
235	Hats, Caps, and Millinery	0.0
212	Cigars	0.0 Odor
236	Girls', Children's, and Infants' Outerwear	0.0
274	Miscellaneous Publishing	0.0
233	Women's, Misses', and Juniors' Outerwear	0.0
241	Logging	0.0 Other Problems
315	Leather Gloves and Mittens	0.0
237	Fur Goods	0.0

* Environmental Selection Factor equally weights tons of toxics released; tons of ozone precursors (volatile organics and nitrogen oxides); and tons of particulates, sulfur dioxide, and carbon monoxide emitted by an average plant per year.

Watson Asphalt/Concrete Plant Timeline

An application has been received for preliminary site plan amendment/with Wellfield Special Use permit application. All fees have been paid.

<u>Status</u>	<u>Date</u>
Application for Concept Review	November 30, 2000
Concept Review	January 18, 2001
Application for Development Review Board (Preliminary and Final Approval)	February 14, 2001
Discussion with Ralph Eng (agent) regarding completeness of the application	Week of February 19, 2001
Letter received requesting exemption from Wellfield Special Use permit	February 19, 2001
Application for Wellfield Special Use Permit	March 8, 2001
Application cut-off for Wellfield Special Use Permit	March 12, 2001 (plan has been submitted)
Staff review	March 13 - March 26
Technical review meeting	March 27, 2001
Corrected plans due	April 3, 2001
Staff final comments due	April 10, 2001
City Plan Board meeting (Wellfield SUP and Site Plan)	April 19, 2001 (Wellfield Special Use Permit)
City Commission (Wellfield SUP and Site Plan)	May 14, 2001 (Quasi-Judicial Hearing, formal or informal, on the Wellfield Special Use Permit)

001066

<i>Summary Table</i>		<i>Environmental*</i>	
<i>SIC</i>		<i>Selection</i>	
<i>Code</i>	<i>Name</i>	<i>Factor</i>	<i>Remarks</i>
<i>(4-Digit)</i>			
3334	Primary Production of Aluminum	1,539.0	Heavy Industry
3331	Primary Smelting and Refining of Copper	1,490.1	Heavy Industry
2911	Petroleum Refining	1,065.6	Heavy Industry
2611	Pulp Mills	928.2	Heavy Industry
3312	Steel Works, Blast Furnaces, and Rolling Mills	663.4	Heavy Industry
2823	Cellulosic Manmade Fibers	417.7	Heavy Industry
2874	Phosphatic Fertilizers	391.5	Heavy Industry
2621	Paper Mills	343.5	Heavy Industry
2812	Alkalies and Chlorine	296.4	Heavy Industry
2816	Inorganic Pigments	263.7	Heavy Industry
2631	Paperboard Mills	214.7	Heavy Industry
2821	Plastics Materials and Synthetic Resins, and Nonvulcanizable Elastomers	212.9	Heavy Industry
2873	Nitrogenous Fertilizers	184.0	Heavy Industry
3241	Cement, Hydraulic	183.9	Heavy Industry
2824	Manmade Organic Fibers, Except Cellulosic	172.6	Heavy Industry
3313	Electrometallurgical Products, Except Steel	150.8	Heavy Industry
2999	Products of Petroleum and Coal, Not Elsewhere Classified	127.7	Heavy Industry
2861	Gum and Wood Chemicals	113.9	Heavy Industry
3274	Lime	107.5	Heavy Industry
2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	93.9	Heavy Industry
3353	Aluminum Sheet, Plate, and Foil	92.1	Heavy Industry
3221	Glass Containers	86.2	Heavy Industry
3211	Flat Glass	84.4	Heavy Industry
2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	76.2	Heavy Industry
3339	Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum	75.4	Heavy Industry
3251	Brick and Structural Clay Tile	50.0	
2833	Medicinal Chemicals and Botanical Products	48.7	Odor
2822	Synthetic Rubber	48.3	Odor, Noise
3341	Secondary Smelting and Refining of Nonferrous Metals	43.1	Odor
2892	Explosives	36.2	Other Problems
3355	Aluminum Rolling and Drawing, Not Elsewhere Classified	29.6	Noise
2895	Carbon Black	27.3	
2951	Asphalt Paving Mixtures and Blocks	22.6	Odor
2869	Industrial Organic Chemicals, Not Elsewhere Classified	21.8	Odor

3321 Gray and Ductile Iron Foundries	21.5
3295 Minerals and Earths, Ground or Otherwise Treated	21.0 Noise
3275 Gypsum Products	17.9 Noise
2879 Pesticides and Agricultural Chemicals, Not Elsewhere Classified	15.8 Odor
3351 Rolling, Drawing, and Extruding of Copper	13.9 Noise
2834 Pharmaceutical Preparations	12.5 Odor
3315 Steel Wiredrawing and Steel Nails and Spikes	11.4 Noise
2952 Asphalt Felts and Coatings	11.3 Odor
3229 Pressed and Blown Glass and Glassware, Not Elsewhere Classified	11.1
3316 Cold-Rolled Steel Sheet, Strip, and Bars	10.7 Noise
2899 Chemicals and Chemical Preparations, Not Elsewhere Classified	8.9 Odor
2671 Packaging Paper and Plastic Film, Coated and Laminated	7.5 Noise
3292 Asbestos Products	7.1 Other Problems
2672 Coated and Laminated Paper, Not Elsewhere Classified	7.0 Noise
3296 Mineral Wool	6.9
2891 Adhesives and Sealants	6.3 Odor
3322 Malleable Iron Foundries	6.2
2843 Surface Active Agents, Finishing Agents, Sulfonated Oils, and Assistants	6.2 Odor
3317 Steel Pipe and Tubes	5.9 Noise
2813 Industrial Gases	5.8
3369 Nonferrous Foundries, Except Aluminum and Copper	5.7
2653 Corrugated and Solid Fiber Boxes	4.7
3354 Aluminum Extruded Products	4.5 Noise
2851 Paint, Varnishes, Lacquers, Enamels, and Allied Products	4.5 Odor
3325 Steel Foundries, Not Elsewhere Classified	4.3
3297 Nonclay Refractories	4.2
3356 Rolling, Drawing, and Extruding of Nonferrous Metals, Except Copper and Aluminum	3.9 Noise
3255 Clay Refractories	3.3
3291 Abrasive Products	2.9
2844 Perfumes, Cosmetics, and Other Toilet Preparations	2.8 Odor
3259 Structural Clay Products, Not Elsewhere Classified	2.7
2679 Converted Paper and Paperboard Products, Not Elsewhere Classified	2.7
2992 Lubricating Oils and Greases	2.7
3324 Steel Investment Foundries	2.7
3261 Vitreous China Plumbing Fixtures and China Earthenware Fittings and Bathroom Accessories	2.5
3264 Porcelain Electrical Supplies	2.5
2656 Sanitary Food Containers, Except Folding	2.3

2841 Soap and Other Detergents, Except Specialty Cleaners	2.3 Odor
3357 Drawing and Insulating of Nonferrous Wire	2.2
3399 Primary Metal Products, Not Elsewhere Classified	2.2
2893 Printing Ink	1.8
3281 Cut Stone and Stone Products	1.8
2657 Folding Paperboard Boxes, Including Sanitary	1.1
2676 Sanitary Paper Products	1.1
2836 Biological Products, Except Diagnostic Substances	1.1 Other Problems
3253 Ceramic Wall and Floor Tile	1.1
3363 Aluminum Die-Castings	0.9
2662 Setup Paperboard Boxes	0.9
3299 Nonmetallic Mineral Products, Not Elsewhere Classified	0.9
2842 Specialty Cleaning, Polishing, and Sanitation Preparations	0.7
2673 Plastics, Foil, and Coated Paper Bags	0.6 Noise
3272 Concrete Products, Except Block and Brick	0.5
2875 Fertilizers, Mixing Only	0.4
3262 Vitreous China Table and Kitchen Articles	0.4
3398 Metal Heat Treating	0.4
2675 Die-Cut Paper and Paperboard and Cardboard	0.4
3273 Ready-Mixed Concrete	0.3
2655 Fiber Cans, Tubes, Drums, and Similar Products	0.3
3366 Copper Foundries	0.3
3231 Glass Products, Made of Purchased Glass	0.3
3364 Nonferrous Die-Castings, Except Aluminum	0.2
2677 Envelopes	0.2
3365 Aluminum Foundries	0.2
2674 Uncoated Paper and Multiwall Bags	0.1 Noise
2835 In Vitro and In Vivo Diagnostic Substances	0.1
3271 Concrete Block and Brick	0.1
3269 Pottery Products, Not Elsewhere Classified	0.0
2678 Stationary, Tablets, and Related Products	0.0
3263 Fine Earthenware Table and Kitchen Articles	0.0

3-Digit Codes

301 Tires and Inner Tubes	49.5 Odor
207 Fats and Oils	18.2 Odor
214 Tobacco Stemming and Redrying	18.2 Odor
341 Metal Cans and Shipping Containers	15.5 Noise
374 Railroad Equipment	15.1 Noise
386 Photographic Equipment and Supplies	14.2
221 Broadwoven Fabric Mills, Cotton	14.1 Noise
204 Grain Mill Products	13.1 Noise
211 Cigarettes	12.7 Odor
206 Sugar and Confectionary Products	12.5 Odor
208 Beverages	12.0

311 Leather Tanning and Finishing	10.4 Odor
201 Meat Products	10.0 Odor
382 Electrical Industrial Apparatus	9.4
226 Dying and Finishing Textiles, Except Wool Fabrics and Knit Goods	8.4
363 Household Appliances	8.3
376 Guided Missiles and Space Vehicles and Parts	8.2
351 Engines and Turbines	7.7 Noise
375 Motorcycles, Bicycles, and Parts	7.5
371 Motor Vehicles and Motor Vehicle Equipment	7.5 Noise
306 Fabricated Rubber Products, Not Elsewhere Classified	5.8 Odor
361 Electric Transmission and Distribution Equipment	5.5
229 Miscellaneous Textile Goods	5.2
228 Yarn and Thread Mills	5.1
202 Dairy Products	4.1
372 Aircraft and Parts	3.9
252 Office Furniture	3.6
349 Miscellaneous Fabricated Metal Products	3.4
242 Sawmills and Planing Mills	2.8 Noise
223 Broadwoven Fabric Mills, Wool	2.7 Noise
251 Household Furniture	2.6
275 Commercial Printing	2.5
352 Farm and Garden Machinery and Equipment	2.3 Noise
302 Rubber and Plastic Footwear	2.2
243 Millwork, Veneer, Plywood, and Structural Wood Members	2.2 Odor
277 Greeting Cards	2.2
347 Coating, Engraving, and Allied Services	2.0
203 Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties	1.9 Odor
308 Miscellaneous Plastics Products	1.7
379 Miscellaneous Transportation Equipment	1.6
368 Communications Equipment	1.5
346 Metal Forgings and Stampings	1.4 Noise
249 Miscellaneous Wood Products	1.4
369 Miscellaneous Electrical Machinery, Equipment, and Supplies	1.4
348 Ordnance and Accessories, Except Vehicles and Guided Missiles	1.3
373 Ship and Boat Building and Repairing	1.2 Noise, Odor
358 Refrigeration and Service Industry Machinery	1.2
367 Electronic Components and Accessories	1.2
384 Electric Lighting and Wiring Equipment	1.1
305 Gaskets, Packing, and Sealing Devices and Rubber and Plastics Hose and Belting	1.1 Odor
222 Broadwoven Fabric Mills, Manmade Fiber and Silk	1.1 Noise
253 Public Building and Related Furniture	1.1

Review of Manufacturing Uses Under the City of Gainesville's I-2 Industrial Zoning

General Industrial District (I-2)

The general industrial district (I-2) was established for the purpose of providing areas in appropriate locations where various heavy and extensive industrial operations can be conducted without creating hazards or property devaluation to surrounding land uses. Permitted uses include manufacturing as well as several other uses by right.

Manufacturing includes establishments engaged in the mechanical or chemical transformation of materials or substances into new products. These establishments are usually described as plants, factories, or mills and characteristically use power driven machines and material-handling equipment. Establishments engaged in assembling component parts of manufactured products are also considered manufacturing if the new product is neither a structure nor other fixed improvement. Also included is the blending of materials, such as lubricating oils, plastics resin, or liquors.

The materials processed by manufacturing establishments include products of agriculture, forestry, fishing, mining, and quarrying as well as products of other manufacturing establishments. The new product of a manufacturing establishment may be finished in the sense that it is ready for utilization or consumption, or it may be semi-finished to become a raw material for an establishment engaged in further manufacturing. For example, the product of the copper smelter is the raw material used in electrolytic refineries; refined copper is the raw material used by copper wire mills; and copper wire is the raw material used by certain electrical equipment manufacturers.

The materials used by manufacturing establishments may be purchased directly from producers, obtained through customary trade channels, or secured without recourse to the market by transferring the product from one establishment to another, which is under the same ownership. Manufacturing production is usually carried on for the wholesale market, for interplant transfer, or to order for industrial users, rather than for direct sale to the domestic consumer.

I-2 in Gainesville

General industrial districts (I-2) are located in seven areas of the city:

- Three along the northeast side of US 441 in the north portion of the city
- North of the airport
- An area west of Waldo Road and north of NE 23rd Avenue
- Around the railroad west of North Main Street between NW 39th Avenue and NW 23rd Avenue
- Around South Main Street south of Depot Road and north of SE 13th Lane

In these areas, the properties zoned I-2 are generally surrounded by land uses such as Limited industrial district (I-1), agricultural, and the airport. However, some of the I-2 zoned property is

adjacent to various residential designations. There are also two relatively small, comparatively isolated parcels that are zoned I-2 in the midst of residential areas.

Purpose of Study

This brief study reviews the major groups of manufacturing allowed under I-2 zoning. The broad span of activities encompassed by "manufacturing" that are allowed on I-2 property and the potential incompatibilities that could occur may be anticipated by an analysis of these major groups. This study provides indicators that will assist in identifying those manufacturing groups that need further study to determine whether those uses should be prohibited or subject to a special process with special standards. In this analysis we have focused on environmental impacts including nuisance factors such as odor and noise inherent in the process. In order to compare industries with such a wide range of diversity, a series of environmental indicators was developed.

The best source of comparative pollutant release information is the Toxic Release Inventory (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, 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 in this report is derived from the 1998 TRI reporting year, augmented where necessary by data from the 1995 and 1993 reports. TRI data provide the type, amount and media receptor of each chemical released or transferred from a manufacturing facility.

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.

Transfers refer to a transfer of toxic chemicals in wastes or by-products 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. In addition to disposal, transfers may be made to publicly owned treatment works (POTW), recycling, energy recovery, and/or treatment (such as incineration, biological destruction, or neutralization).

Comparing the weight of toxic chemicals released on-site by an industry provides a useful indicator of potential for pollution. It is important to note that TRI "pounds released" data 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. Additionally, it should be noted that the reported releases are accomplished within the permitting system of the jurisdiction in which each facility is located.

Additional relevant information is available from the Environmental Protection Agency (EPA). The EPA Office of Air Quality Planning and Standards has compiled air pollutant emission factors for determining the total air emissions of priority air pollutants from many manufacturing sources. The EPA database contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants that 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. These allow estimates of annual releases of carbon monoxide (CO), nitrogen dioxide (NO₂), particulate matter of 10 microns or less (PM₁₀), total particulates (PT), sulfur dioxide (SO₂), and volatile organic compounds (VOCs) for each industry group. Adding these emission levels together (realizing that PM₁₀ is contained in PT) provides a general indicator of impact on air quality. As with the TRI data, this indicator does not take into account the differing impacts of each pollutant on human health and welfare.

Another indicator was developed from this data by adding the VOC emissions and the NO₂ emissions. These pollutants, together with sunshine, are necessary for the formation of photochemical oxidants or ozone. The Gainesville area has exceeded the ozone standards on occasion in the recent past, indicating this is a special problem for this area. With the implementation of a new ozone standard by EPA, the likelihood of ozone exceedances in Gainesville is increased.

Nuisance factors such as odor and noise were also evaluated based upon the chemicals used and the amount of raw materials and/or products moved through the process. Large volumes generally require more trucks, or other transport, and large machines for material handling, all of which tend to result in higher noise levels.

Summary of Analysis

Each major industrial group was considered in turn to develop the environmental indicators. The indicators are summarized in Table 1 in an order that puts the most desirable based on these indicators at the bottom and the least desirable at the top.

TABLE 1
Summary of Environmental Indicators by Industry Group

SIC Code	Name	Indicators				
		Toxic Chemicals	Air Pollution	Ozone Formation	Odor	Noise
26	Paper	475,714	3,620	1,001	High	High
29	Petroleum	154,886	3,977	949	High	High
32	Stone/Clay/Glass	52,145	1,427	812	Medium	High
33	Primary Metals	194,567	1,241	172	High	High
28	Chemicals	183,162	367	103	High	High
21	Tobacco	156,592	*	74	Medium	Medium
24	Lumber	39,993	451	145	Medium	Medium
27	Printing	99,122	464	22	Medium	Medium
22	Textiles	41,285	413	147	Low	High
37	Transportation Equipment	70,285	190	43	Medium	Medium
999	Multiple Codes	78,678	*	31		
25	Furniture	45,607	265	24	Medium	Medium
30	Plastics	54,593	108	24	High	Medium
38	Measure/Photo	42,898	*	19	Low	Low
20	Food	43,591	*	16	High	Medium
31	Leather	32,860	*	16	Medium	Medium
9999	No Code	34,133	*	14		
39	Misc.	31,133	*	15		
23	Apparel	24,290	*	12	Low	Low
34	Fabricated Metals	22,093	52	6	Medium	High
36	Electrical Equipment	15,524	76	9	Low	Low
35	Machinery	13,331	*	7	Low	Medium

* = Data not yet found. Ozone indicator is likely 20 to 50 percent low.

By its nature, industry does not always fall into neat categories so that there are multiple category and "no category" responses in the TRI. Additionally, the SIC major groups cover a wide range of facilities of various ages, processes, size, and location producing a variety of products. Each facility is unique and should be evaluated as such.

Sector Analysis

20-Food and Kindred Products

This major group includes establishments manufacturing or processing foods and beverages for human consumption, and certain related products, such as manufactured ice, chewing gum, vegetable and animal fats and oils, and prepared feeds for animals and fowls. Products described as dietetic are classified in the same manner as non-dietetic products (e.g., as candy, canned fruits, and cookies). Chemical sweeteners are classified in Major Group 28.

TRI data for the food industry indicates 1,995 facilities reported 89.3 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 45,000 pounds per facility. About 2.6 percent of this was transferred off-site. About 73 percent of the on-site releases were to the atmosphere.

This industry often has nuisance odors associated with it.

21-Tobacco Products

This major group includes establishments engaged in manufacturing cigarettes, cigars, smoking and chewing tobacco, snuff, and reconstituted tobacco and in stemming and redrying tobacco. Also included in this major group is the manufacture of non-tobacco cigarettes. The manufacture of insecticides from tobacco byproducts is included in Major Group 28.

TRI data for the tobacco industry indicates 21 facilities reported 3.6 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 171,000 pounds per facility. About 8.5 percent of this was transferred off-site. About 95 percent of the on-site releases were to the atmosphere.

This industry generally contributes to the local odor levels. The odor of tobacco may disturb nearby residents.

22-Textile Mill Products

This major group includes establishments engaged in performing any of the following operations:

1. Preparation of fiber and subsequent manufacturing of yarn, thread, braids, twine, and cordage;
2. Manufacturing broad woven fabrics, narrow woven fabrics, knit fabrics, and carpets and rugs from yarn;
3. Dyeing and finishing fiber, yarn, fabrics, and knit apparel;
4. Coating, waterproofing, or otherwise treating fabrics;
5. The integrated manufacture of knit apparel and other finished articles from yarn; and
6. The manufacture of felt goods, lace goods, non-woven fabrics, and miscellaneous textiles.

According to the 1995 Toxics Release Inventory (TRI) data, 339 textile facilities reporting SIC 22, released (to the air, water, or land) and transferred (shipped off-site or discharged to sewers) a total of 25 million pounds of toxic chemicals during calendar year 1995. This represents approximately 0.4 percent of the 5.7 billion pounds of releases and transfers from all manufacturers (SICs 20-39) reporting to TRI that year.

Large volumes of solvents that are used extensively in coating textile materials with plastic and other synthetic materials dominate the releases and transfers. The top three chemicals released by volume are methyl ethyl ketone (MEK), toluene, and methanol. These three account for about 64 percent (11.4 million pounds) of the industry's total releases.

Evidence of the diversity of processes at textile facilities reporting to TRI is found in the fact that the most frequently reported chemicals, methanol and ammonia, account for only 18 percent of the total number of chemicals reported by all 339 textile facilities that report to TRI. Over half of the chemicals are reported by fewer than ten facilities. The variability in facilities' TRI chemical profiles may be attributed to the variety of processes and products in the industry.

The top five chemicals released by this industry, in terms of volumes, include: MEK, toluene, methanol, ammonia, and xylenes (mixed isomers). The very volatile nature of these chemicals is apparent in the fact that about 98 percent (17.5 million pounds) of the industry's releases are to the air. About 76 percent (13.6 million pounds) of all the chemicals released by the textile industry were released to air in the form of point source emissions. Another 22 percent (3.9 million pounds) were released as fugitive emissions. The remaining two percent (276,000 pounds) were released in the form of water discharges or disposals to land. Because the majority of TRI releases are in the form of air emissions, these data indicate that the large amount of wastewater discharged from textile facilities contain dilute amounts of TRI chemicals.

The total volume of transfers was 7 million pounds or 28 percent of the total volume of chemicals reported to TRI by the textile industry (i.e. releases and transfers). Transfers to POTWs accounted for the largest amount, 40 percent, (2.8 million pounds). About 30 percent (2.1 million pounds) was transferred either for disposal, recycling, or treatment and the remaining 30 percent (2.1 million pounds) was transferred for energy recovery. Three chemicals (MEK, toluene, and ammonia) accounted for about 38 percent of the 7.0 million pounds of total transfers for this industry.

Annual releases of priority air pollutants by the textile industry are estimated for 1995 as follows:

- 8,177 tons per year of carbon monoxide
- 34,523 tons per year of nitrogen dioxide
- 2,028 tons per year of particulate matter of 10 microns or less
- 9,479 tons per year of total particulates
- 43,050 tons per year of sulfur dioxide
- 27,768 tons per year of volatile organic compounds

Noise is a major potential nuisance problem for the industry, particularly when weaving is a part of the process.

23-Apparel and Other Finished Products Made from Fabrics and Similar Materials

This major group, known as the cutting-up and needle trades, includes establishments producing clothing and fabricating products by cutting and sewing purchased woven or knit textile fabrics and related materials, such as leather, rubberized fabrics, plastics, and furs. Also included are establishments that manufacture clothing by cutting and joining (for example, by adhesives) materials such as paper and non-woven textiles. Included in the apparel industries are three types of establishments:

1. The regular or inside factories;
2. Contract factories and;
3. Apparel jobbers.

The regular factories perform all of the usual manufacturing functions within their own plant; the contract factories manufacture apparel from materials owned by others; and apparel jobbers perform the entrepreneurial functions of a manufacturing company, such as buying raw materials, designing and preparing samples, arranging for the manufacture of clothing from their materials, and selling of the finished apparel.

TRI data for the apparel industry indicates 19 facilities reported 0.5 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 26,000 pounds per facility. About 8.2 percent of this was transferred off-site. Almost 100 percent of the on-site releases were to the atmosphere.

This industry does not generally generate significant odor or noise.

24-Lumber and Wood Products, Except Furniture

This major group includes establishments engaged in cutting timber and pulpwood; merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or related materials. Certain types of establishments producing wood products are classified elsewhere. For example, furniture and office and store fixtures are classified in Major Group 25; musical instruments, toys and playground equipment, and caskets are classified in Major Group 39. Woodworking in connection with construction, in the nature of reconditioning and repair, or performed to individual order, is classified in non-manufacturing industries. Establishments engaged in integrated operations of logging combined with sawmills, pulp mills, or other converting activity, with the logging not separately reported, are classified according to the primary product shipped.

According to the Toxic Release Inventory (TRI) data from SIC code 24, the lumber and wood products industry released (to the air, water, or land) and transferred (shipped off-site) a total of approximately 34.1 million pounds of toxic chemicals during calendar year 1995. Releases totaled 30.0 million pounds, or about 76,000 pounds per facility, and transfers totaled 4.1 million pounds, or about 10,000 pounds per facility. For the industry as a whole, VOCs (such as formaldehyde, xylene, toluene, and methanol) comprise the largest number of TRI releases. A large amount of VOC releases, both fugitive and point source emissions, result in part from the extensive use of glues and resins in this industry. VOCs are primarily released during

the drying and pressing phases of most wood panel product manufacturing processes. VOC emissions are also associated with solvents used to coat cabinets, decorative panels, and toys. Wood preservation facilities dealing with arsenic, chromium, and copper compounds tend to be smaller and more numerous and contribute waste to landfills.

Annual releases of priority air pollutants by the lumber and wood product industry are estimated for 1995 as follows:

- 122,061 tons per year of carbon monoxide
- 38,042 tons per year of nitrogen dioxide
- 20,456 tons per year of particulate matter of 10 microns or less
- 64,650 tons per year of total particulates
- 9,401 tons per year of sulfur dioxide
- 55,983 tons per year of volatile organic compounds

Nuisance problems in this industry are associated with some solvent odors or creosote odor, and the noise of equipment moving wood stacks.

25-Furniture and Fixtures

This major group includes establishments engaged in manufacturing household, office, public building, and restaurant furniture; and office and store fixtures. Establishments primarily engaged in the production of millwork are classified in Industry 2431; those manufacturing wood kitchen cabinets are classified in Industry 2434; those manufacturing cut stone and concrete furniture are classified in Major Group 32; those manufacturing laboratory and hospital furniture, except hospital beds, are classified in Major Group 38; those manufacturing beauty and barber shop furniture are classified in Major Group 39; and those engaged in woodworking to individual order or in the nature of reconditioning and repair are classified in non-manufacturing industries.

According to the Toxic Release Inventory (TRI) database for the year 1995, the TRI releases and transfers for the entire furniture and fixtures industry (SIC 25) totaled 47.5 million pounds, or an average of about 141,000 pounds for 336 facilities. Most of this (37.6 million pounds, or about 112,000 pounds per facility) were releases to the air, water and land. 9.9 million pounds, or about 29,000 pounds per facility were transfers to off-site facilities. For the industry as a whole, solvents (such as toluene, methanol, xylene, methyl ethyl ketone, and acetone) comprise the largest number of TRI releases. The large number of solvent releases, both fugitive and point source emissions, result from the solvent-intensive finishing processes employed by this industry. In addition to being used as vehicle carriers, solvents are also used to clean the coatings application equipment.

Annual releases of priority air pollutants by the furniture and fixtures industry are estimated for 1995 as follows:

- 2,754 tons per year of carbon monoxide
- 1,872 tons per year of nitrogen dioxide
- 2,502 tons per year of particulate matter of 10 microns or less
- 4,827 tons per year of total particulates
- 1,538 tons per year of sulfur dioxide
- 67,604 tons per year of volatile organic compounds

This industry has some solvent odor associated with it. It is not generally considered a major noise source.

26-Paper and Allied Products

This major group includes establishments primarily engaged in the manufacture of pulps from wood and other cellulose fibers and from rags; the manufacture of paper and paperboard; and the manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, paper boxes, and envelopes. Also included are establishments primarily engaged in manufacturing bags of plastic film and sheet. Certain types of converted paper products are classified elsewhere, such as abrasive paper, which is in Industry 3291; carbon paper in Industry 39555; and photo sensitized and blueprint paper in Industry 3861.

According to Toxic Release Inventory (TRI) data from SIC codes 261-265, the pulp and paper industry released (to the air, water, or land) and transferred (shipped off-site) a total of approximately 289.1 million pounds of toxic chemicals during calendar year 1995. This represents less than 4 percent of the total pounds of TRI chemicals released and transferred by all manufacturers that year. The mean amount of toxic chemical releases per facility was approximately 948,000 pounds for the industry. The mean amount transferred by pulp and paper facilities was 56.5 million pounds, or about 185,000 pounds per facility, while the releases were reported at 232.6 million pounds, or about 763,000 pounds per facility.

The pulp and paper industry releases 87 percent of its total TRI poundage to the air, approximately 10 percent to water and POTWs, and 2 percent is transferred off-site or disposed on land. This release profile differs from other TRI industries that average approximately 93 percent to air 6 percent to land, and 1 percent to water. A larger proportion of water releases correlates with the water intensive processes of the pulp and paper industry. An average mill requires 10 million gallons of influent water per day and will produce the corresponding amount of effluent waters. Examining the pulp and paper industry's TRI reported toxic chemicals by chemical, highlights the likely origins of industry releases.

Air releases can be traced to a variety of sources. Approximately 50 percent are methanol, a by-product of the pulp making process. The other major air toxic chemicals: chlorinated compounds, sulfuric acid, and the chelator methyl ethyl ketone, originate in the bleaching stage. Methanol also accounts for approximately 40 percent of the water releases by pulp and paper facilities. Overall, methanol represents over 49 percent of the pulp and paper industry's TRI releases and transfers.

The diversity of processes in the pulp and paper industry can be seen in the diversity of chemicals found in the TRI report. The TRI chemical used by the greatest number of mills is sulfuric acid. In addition, some TRI chemicals are each only used by a few mills, suggesting process specific needs such as paper finishing or use in wet additives.

Annual releases of priority air pollutants by the pulp and paper industry are estimated for 1995 as follows:

- 566,883 tons per year of carbon monoxide
- 358,675 tons per year of nitrogen dioxide
- 35,030 tons per year of particulate matter of 10 microns or less
- 111,210 tons per year of total particulates

- 493,313 tons per year of sulfur dioxide
- 127,809 tons per year of volatile organic compounds

This industry is well known in the South for its characteristic odors. There is also a high level of noise associated with the processes.

27-Printing, Publishing, and Allied Industries

This major group includes establishments engaged in printing by one or more common processes, such as letterpress; lithography (including offset), gravure, or screen; and those establishments that perform services for the printing trade, such as bookbinding and platemaking. This major group also includes establishments engaged in publishing newspapers, books, and periodicals, regardless of whether or not they do their own printing. News syndicates are classified in Services, Industry 7383. Establishments primarily engaged in textile printing and finishing fabrics are classified in Major Group 22, and those engaged in printing and stamping on fabric articles are classified in Industry 2396. Establishments manufacturing products that contain incidental printing, such as advertising or instructions, are classified according to the nature of the products; for example, as cartons, bags, plastics film, or paper.

TRI data for the printing industry indicates 44.3 million pounds of toxic chemicals were released or transferred in 1995. This is an average of 169,000 pounds per facility. About 23 percent of this were transferred off-site, primarily as discharge to POTWs and treatment. Releases totaled 33.9 million pounds in 1995, or 129,000 pounds per facility. 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. 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.

Annual releases of priority air pollutants by the printing, publishing, and allied industries are estimated for 1995 as follows:

- 8,755 tons per year of carbon monoxide
- 3,542 tons per year of nitrogen dioxide
- 405 tons per year of particulate matter of 10 microns or less
- 1,198 tons per year of total particulates
- 1,684 tons per year of sulfur dioxide
- 103,018 tons per year of volatile organic compounds

This industry has some odor associated with solvents.

28-Chemicals and Allied Products

This major group includes establishments producing basic chemicals and establishments manufacturing products by predominantly chemical processes. Establishments classified in this major group manufacture three general classes of products:

1. Basic chemicals, such as acids, alkalis, salts, and organic chemicals;
2. Chemical products to be used in further manufacture, such as synthetic fibers, plastics materials, dry colors, and pigments; and
3. Finished chemical products to be used for ultimate consumption, such as drugs, cosmetics, and soaps; or to be used as materials or supplies in other industries, such as paints, fertilizers, and explosives.

The mining of natural alkalis and other natural chemicals and fertilizers are classified in Mining, Industry Group 147. Establishments primarily engaged in manufacturing nonferrous metals and high-percentage ferroalloys are classified in Major Group 33; those manufacturing silicon carbide are classified in Major Group 32; those manufacturing baking powder, other leavening compounds, and starches are classified in Major Group 20; and those manufacturing artists' colors are classified in Major Group 39. Establishments primarily engaged in packaging, repackaging, and bottling of purchased chemical products, but not engaged in manufacturing chemicals and allied products, are classified in Wholesale or Retail Trade industries.

Inorganic Chemical Industry

The TRI data for 555 inorganic chemicals manufacturing facilities indicates they released (discharged to the air, water, or land without treatment) and transferred (shipped off-site) a total of 250 million pounds of 112 different chemical toxic chemicals. This represents about 10 percent of the TRI releases and transfers of the chemical manufacturing industry and about three percent of the total releases and transfers of all manufacturers that year. In comparison, the organic chemical industry (SIC 286) produced 438 million pounds that year, almost twice that of the inorganic chemical industry. It should be noted that the Bureau of Census identified 1,429 facilities manufacturing inorganic chemicals. More than half of these facilities, however, have fewer than 20 employees, many of which are likely to be below the TRI reporting thresholds of employment (TRI reporting threshold is greater than 10 employees) and/or chemical use and, therefore, are not required to report to TRI.

The chemical industry's releases have been declining in recent years. Between 1988 and 1993 emissions from chemical companies (all those categorized within SIC 28, not just inorganic chemical manufacturers) to air, land, and water were reduced 44 percent, which is slightly above the average for all manufacturing sectors reporting to TRI.

The inorganic chemical manufacturing industry released 60.7 million pounds of toxic chemicals to the environment and 21.7 million pounds were transferred. The frequency with which chemicals are reported by facilities within a sector is one indication of the diversity of operations and processes. Many of the TRI chemicals are released or transferred by only a small number of facilities which indicates a wide diversity of production processes, particularly for specialty inorganics over 70 percent of the 110 chemicals reported are released or transferred by fewer than 10 facilities.

The inorganic chemical industry releases 69 percent of its total TRI poundage to the water (including 67 percent to underground injection and two percent to surface waters), 14 percent to the air, and 17 percent to the land. This release profile differs from other TRI industries that average approximately 30 percent to the water, 59 percent to air, and 10 percent to land. Examining the inorganic chemical industry's TRI reported toxic chemical releases highlights the likely origins of the large water releases for the industry. On-site underground injection of essentially one chemical, hydrochloric acid, accounts for the largest portion, 55 percent, of the inorganic chemical industry's total releases and transfers as reported in TRI. Only five facilities of the 555 identified facilities reported releasing hydrochloric acid through underground injection. Two of these facilities accounted for over 85 percent of the total hydrochloric acid injected to the subsurface, or 42 percent of the inorganic chemical industry's total releases and transfers. Land disposal accounted for the next largest amount, 17 percent, of the industry's total releases. The largest single chemical released to the air by the inorganic chemical industry, carbonyl sulfide, is only emitted by eleven facilities manufacturing certain inorganic pigments.

Discharges to POTWs accounted for 43 percent of the industry's total transfers of TRI chemicals. Ammonia, hydrochloric acid, and sulfuric acid account for over 66 percent of chemicals transferred off-site. Finally, approximately 31 percent of the total is transferred off-site for treatment.

Annual releases of priority air pollutants by the inorganic chemical industry are estimated for 1995 as follows:

- 153,294 tons per year of carbon monoxide
- 106,522 tons per year of nitrogen dioxide
- 6,703 tons per year of particulate matter of 10 microns or less
- 34,664 tons per year of total particulates
- 194,153 tons per year of sulfur dioxide
- 65,427 tons per year of volatile organic compounds

Nuisance problems in this industry may be as noise and/or odorous compounds depending upon the process (es) used.

Organic Chemical Industry

According to the Toxics Release Inventory (TRI) data, 417 organic chemical facilities released (to the air, water or land) and transferred (shipped off-site or discharged to sewers) a total of 438 million pounds of toxic chemicals during calendar year 1993. That represents approximately 18 percent of the 2.5 billion pounds of releases and transfers from the chemical industry as a whole (SIC 28) and about six percent of the releases and transfers for all manufacturers reporting to TRI that year. By comparison, the inorganic chemical industry's releases and transfers in 1993 totaled 249.7 million pounds, or sixty percent of the releases and transfers of the industrial organic chemical sector.

The quantity of the basic feedstocks released by organic chemical facilities reflects their volume of usage. The inorganic chemicals among the top ten released (ammonia, nitric acid, ammonium sulfate, and sulfuric acid) are also large volume reaction feedstocks. Inorganic chemicals contained in wastes injected underground on-site account for 58 percent of the industry's releases; ammonia makes up the vast majority of TRI chemicals disposed of via underground injection. Air releases account for 40 percent (61 million pounds), and the

TABLE 3
Pollution Indicators by 3-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
311	Leather Tanning and Finishing	2,774	903	654
207	Fats and Oils	357	4,794	2,021
204	Grain Mill Products	172	7,048	1,104
341	Metal Cans and Shipping Containers	845	1,291	1,235
386	Photographic Equipment and Supplies	766	1,887	752
208	Beverages	41	2,140	1,420
275	Commercial Printing	619	926	903
	Dyeing and Finishing Textiles, Except Wool Fabrics and			
226	Knit Goods	334	1,652	813
206	Sugar and Confectionary Products	41	2,436	815
362	Electrical Industrial Apparatus	98	2,262	652
375	Motorcycles, Bicycles, and Parts	76	1,219	1,149
347	Coating, Engraving, and Allied Services	640	472	431
301	Tires and Inner Tubes	60	1,523	823
229	Miscellaneous Textile Goods	451	702	543
221	Broadwoven Fabric Mills, Cotton	22	1,365	861
349	Miscellaneous Fabricated Metal Products	169	2,320	148
306	Fabricated Rubber Products, Not Elsewhere Classified	354	683	587
242	Sawmills and Planing Mills	9	2,012	418
374	Railroad Equipment	72	1,554	523
214	Tobacco Stemming and Redrying	209	900	572
361	Electric Transmission and Distribution Equipment	67	1,587	242
	Millwork, Veneer, Plywood, and Structural Wood			
243	Members	51	1,086	460
249	Miscellaneous Wood Products	182	646	287
202	Dairy Products	162	530	345
201	Meat Products	25	671	488
371	Motor Vehicles and Motor Vehicle Equipment	186	421	324
308	Miscellaneous Plastics Products	455	60	48
251	Household Furniture	85	443	402
252	Office Furniture	107	390	360
352	Farm and Garden Machinery and Equipment	55	673	252
363	Household Appliances	135	321	247
373	Ship and Boat Building and Repairing	258	151	123
228	Yarn and Thread Mills	154	301	180
395	Pens, Pencils, and Other Artists' Material	161	224	201
351	Engines and Turbines	129	378	181
379	Miscellaneous Transportation Equipment	47	782	105
399	Miscellaneous Manufacturing Industries	225	120	89
305	Gaskets, Packing, and Sealing Devices and Rubber	287	3	2

TABLE 3
Pollution Indicators by 3-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
254	and Plastics Hose and Belting Partitions, Shelving, Lockers, and Office and Store Fixtures	32	276	268
369	Micellaneous Electrical Machinery, Equipment, and Supplies	216	116	37
393	Musical Instruments	94	193	169
223	Broadwoven Fabric Mills, Wool	148	261	50
346	Metal Forgings and Stampings	127	211	72
367	Electronic Components and Accessories	194	29	20
372	Aircraft and Parts	138	110	61
364	Electric Lighting and Wiring Equipment	115	93	69
348	Ordnance and Accessories, Except Vehicles and Guided Missiles	89	216	42
376	Guided Missiles and Space Vehicles and Parts	151	45	16
345	Screw Machine Products, and Bolts, Nuts, Screws, Rivits, and Washers	153	24	22
385	Ophthalmic Goods	140	46	31
344	Fabricated Structural Metal Products	82	102	89
209	Miscellaneous Food Preparations and Kindred Products	25	267	103
203	Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties	45	230	88
359	Miscellaneous Industrial and Commercial Machinery and Equipment	60	307	24
343	Heating Equipment, Except Electric and Warm Air; and Plumbing Fixtures	111	101	30
302	Rubber and Plastic Footwear	62	107	104
342	Cutlery, Handtools, and General Hardware	138	37	14
211	Cigarettes	150	0	0
396	Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, Except Precious Metal	136	0	0
358	Refrigeration and Service Industry Machinery	56	114	76
277	Greeting Cards	30	119	107
366	Communications Equipment	66	77	65
356	General Industrial Machinery and Equipment	40	116	83
253	Public Building and Related Furniture	25	145	87
365	Household Audio and Video Equipment, and Audio Recordings	96	28	28
313	Boot and Shoe Cut Stock and Findings	44	79	79
227	Carpets and Rugs	109	0	0
353	Construction, Mining, and Materials Handling	25	109	70

TABLE 3
Pollution Indicators by 3-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
	Machinery and Equipment			
278	Blankbooks, Looseleaf Binders, and Bookbinding and Related Work	22	96	76
354	Metalworking Machinery and Equipment	85	12	2
387	Watches, Clocks, Clockwork Operated Devices, and Parts	85	0	0
355	Special Industry Machinery, Except Metalworking Machinery	64	13	12
391	Jewelry, Silverware, and Plated Ware	47	50	13
384	Surgical, Medical, and Dental Instruments and Supplies	66	4	2
273	Books	10	66	58
222	Broadwoven Fabric Mills, Manmade Fiber and Silk	21	92	27
259	Miscellaneous Furniture and Fixtures	39	25	25
394	Dolls, Toys, Games and Sporting and Athletic Goods	44	21	18
319	Leather Goods, Not Elsewhere Classified	0	67	66
382	Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments	46	16	13
225	Knitting Mills	29	48	23
276	Manifold Business Forms	55	1	1
357	Computer and Office Equipment	36	24	21
213	Chewing and Smoking Tobacco and Snuff	0	118	21
314	Footwear, Except Rubber	32	3	2
272	Periodicals: Publishing, or Publishing and Printing	3	33	32
271	Newspapers: Publishing, or Publishing and Printing	0	31	27
381	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments, and Equipment	25	0	0
205	Bakery Products	6	23	19
239	Miscellaneous Fabricated Textile Products	16	9	7
317	Handbags and Other Personal Leather Goods	5	17	17
224	Narrow Fabric and Other Smallwares Mills	5	17	17
279	Service Industries for the Printing Trade	7	13	13
238	Miscellaneous Apparel and Accessories	10	7	7
316	Luggage	11	5	3
244	Wood Containers	1	35	5
245	Wood Buildings and Mobile Homes	0	14	8
232	Men's and Boy's Furnishings, Work Clothing, and Allied Garments	0	15	5
235	Hats, Caps, and Millinery	6	0	0
274	Miscellaneous Publishing	1	3	3

TABLE 3
 Pollution Indicators by 3-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
212	Cigars	3	0	0
231	Men's and Boy's Suits, Coats, and Overcoats	3	0	0
236	Girls', Children's, and Infants' Outerwear Women's, Misses', Children's, and Infants'	2	0	0
234	Undergarments	1	2	0
241	Logging	0	2	0
233	Women's, Misses', and Juniors' Outerwear	0	1	0
237	Fur Goods	0	0	0
315	Leather Gloves and Mittens	0	0	0

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
2656	Sanitary Food Containers, Except Folding	103	64	64		
2657	Folding Paperboard Boxes, Including Sanitary	226	7	7		
2671	Packaging Paper and Plastic Film, Coated and Laminated	423	556	555		
2672	Coated and Laminated Paper, Not Elsewhere Classified	1,097	354	343		
2673	Plastics, Foil, and Coated Paper Bags	115	15	15		
2674	Uncoated Paper and Multiwall Bags	22	0	0		
2675	Die-Cut Paper and Paperboard and Cardboard	152	22	14		
2676	Sanitary Paper Products	72	2	2		
2677	Envelopes	35	5	5		
2678	Stationary, Tablets, and Related Products	9	0	0		
2679	Converted Paper and Paperboard Products, Not Elsewhere Classified	450	636	174		
27	Printing, Publishing, and Allied Industries				Medium	Medium
271	Newspapers: Publishing, or Publishing and Printing	0	31	27		
272	Periodicals: Publishing, or Publishing and Printing	3	33	32		
273	Books	10	66	58		
274	Miscellaneous Publishing	1	3	3		
275	Commercial Printing	619	926	903		
276	Manifold Business Forms	55	1	1		
277	Greeting Cards	30	119	107		
278	Blankbooks, Loose-leaf Binders, and Bookbinding and Related Work	22	96	76		
279	Service Industries for the Printing Trade	7	13	13		
28	Chemicals and Allied Products				High	High
2812	Alkalies and Chlorine	17,904	20,510	9,133		
2813	Industrial Gases	1,305	3,755	2,572		
2816	Inorganic Pigments	26,840	25,647	1,196		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	3,116	11,092	3,546		
2821	Plastics Materials and Synthetic Resins, and Nonvulcanizable Elastomers	3,348	15,612	13,188		
2822	Synthetic Rubber	11,055	0	0		
2823	Cellulosic Manmade Fibers	10,134	0	0		
2824	Manmade Organic Fibers, Except Cellulosic	1,362	5,540	2,486		
2833	Medicinal Chemicals and Botanical Products	5,451	5,487	1,653		
2834	Pharmaceutical Preparations	635	744	373		
2835	In Vitro and In Vivo Diagnostic Substances	13	0	0		
2836	Biological Products, Except Diagnostic Substances	322	0	0		
2841	Soap and Other Detergents, Except Specialty Cleaners	162	933	301		
2842	Specialty Cleaning, Polishing, and Sanitation Preparations	75	174	167		
2843	Surface Active Agents, Finishing Agents, Sulfonated Oils, and Assistants	2,392	189	101		
2844	Perfumes, Cosmetics, and Other Toilet Preparations	40	335	209		
2851	Paint, Varnishes, Lacquers, Enamels, and Allied Products	1,293	576	477		
2861	Gum and Wood Chemicals	1,638	44,782	18,861		
2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	10,271	4,002	1,066		
2869	Industrial Organic Chemicals, Not Elsewhere Classified	10,157	12,088	6,832		
2873	Nitrogenous Fertilizers	36,595	35,415	20,039		
2874	Phosphatic Fertilizers	42,200	11,173	1,952		
2875	Fertilizers, Mixing Only	313	67	7		
2879	Pesticides and Agricultural Chemicals, Not Elsewhere Classified	2,752	1,855	1,054		
2891	Adhesives and Sealants	688	3,415	673		
2892	Explosives	944	4,364	2,569		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
2893	Printing Ink	265	962	378		
2895	Carbon Black	6,592	0	0		
2899	Chemicals and Chemical Preparations, Not Elsewhere Classified	1,567	3,533	1,845		
29	Petroleum Refining and Related Industries				High	High
2911	Petroleum Refining	5,113	54,410	22,159		
2951	Asphalt Paving Mixtures and Blocks	2	31,417	10,202		
2952	Asphalt Felts and Coatings	31	3,345	1,191		
2992	Lubricating Oils and Greases	151	844	718		
2999	Products of Petroleum and Coal, Not Elsewhere Classified	2,547	93,649	15,110		
30	Rubber and Miscellaneous Plastics Products				High	Medium
301	Tires and Inner Tubes	60	1,523	823		
302	Rubber and Plastic Footwear	62	107	104		
305	Gaskets, Packing, and Sealing Devices and Rubber and Plastics Hose and Belting	287	3	2		
306	Fabricated Rubber Products, Not Elsewhere Classified	354	683	587		
308	Miscellaneous Plastics Products	455	60	48		
31	Leather and Leather Products				Medium	Medium
311	Leather Tanning and Finishing	2,774	903	654		
313	Boot and Shoe Cut Stock and Findings	44	79	79		
314	Footwear, Except Rubber	32	3	2		
315	Leather Gloves and Mittens	0	0	0		
316	Luggage	11	5	3		
317	Handbags and Other Personal Leather Goods	5	17	17		
319	Leather Goods, Not Elsewhere Classified	0	67	66		
32	Stone, Clay, Glass, and Concrete Products				Medium	High
3211	Flat Glass	37	2,901	1,886		
3221	Glass Containers	39	3,247	1,614		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
3229	Pressed and Blown Glass and Glassware, Not Elsewhere Classified	155	1,687	1,120		
3231	Glass Products, Made of Purchased Glass	50	44	35		
3241	Cement, Hydraulic	39	57,641	13,948		
3251	Brick and Structural Clay Tile	29	10,387	5,405		
3253	Ceramic Wall and Floor Tile	342	76	4		
3255	Clay Refractories	39	2,033	238		
3259	Structural Clay Products, Not Elsewhere Classified	4	1,499	648		
3261	Vitreous China Plumbing Fixtures and China Earthenware Fittings and Bathroom Accessories	73	116	91		
3262	Vitreous China Table and Kitchen Articles	48	0	0		
3263	Fine Earthenware Table and Kitchen Articles	0	0	0		
3264	Porcelain Electrical Supplies	180	315	199		
3269	Pottery Products, Not Elsewhere Classified	2	48	14		
3271	Concrete Block and Brick	8	118	6		
3272	Concrete Products, Except Block and Brick	6	352	106		
3273	Ready-Mixed Concrete	1	418	56		
3274	Lime	5	36,310	6,638		
3275	Gypsum Products	2	6,755	864		
3281	Cut Stone and Stone Products	7	3,741	256		
3291	Abrasive Products	187	506	229		
3292	Asbestos Products	3,174	1,460	715		
3295	Minerals and Earths, Ground or Otherwise Treated	957	17,691	2,376		
3296	Mineral Wool	291	1,469	393		
3297	Nonclay Refractories	85	932	346		
3299	Nonmetallic Mineral Products, Not Elsewhere Classified	265	462	71		
33	Primary Metal Industries				High	High
3312	Steel Works, Blast Furnaces, and Rolling Mills	1,833	17,680	3,119		
3313	Electrometallurgical Products, Except Steel	3,749	20,851	2,441		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
3315	Steel Wiredrawing and Steel Nails and Spikes	839	2,162	286		
3316	Cold-Rolled Steel Sheet, Strip, and Bars	2,083	456	187		
3317	Steel Pipe and Tubes	702	116	110		
3321	Gray and Ductile Iron Foundries	240	4,179	363		
3322	Malleable Iron Foundries	19	1,773	126		
3324	Steel Investment Foundries	153	293	22		
3325	Steel Foundries, Not Elsewhere Classified	296	500	236		
3331	Primary Smelting and Refining of Copper	62,896	0	0		
3334	Primary Production of Aluminum	998	60,841	1,758		
3339	Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum	17,506	3,558	526		
3341	Secondary Smelting and Refining of Nonferrous Metals	2,277	19,272	1,297		
3351	Rolling, Drawing, and Extruding of Copper	889	1,179	38		
3353	Aluminum Sheet, Plate, and Foil	489	2,050	1,851		
3354	Aluminum Extruded Products	191	135	109		
3355	Aluminum Rolling and Drawing, Not Elsewhere Classified	177	5,287	591		
3356	Rolling, Drawing, and Extruding of Nonferrous Metals, Except Copper and Aluminum	632	110	64		
3357	Drawing and Insulating of Nonferrous Wire	165	59	43		
3363	Aluminum Die-Castings	202	0	0		
3364	Nonferrous Die-Castings, Except Aluminum	77	0	0		
3365	Aluminum Foundries	48	15	5		
3366	Copper Foundries	196	5	4		
3369	Nonferrous Foundries, Except Aluminum and Copper	529	979	712		
3398	Metal Heat Treating	196	57	11		
3399	Primary Metal Products, Not Elsewhere Classified	454	489	95		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
34	Fabricated Metal Products, Except Machinery and Transportation Equipment				Medium	High
341	Metal Cans and Shipping Containers	845	1,291	1,235		
342	Cutlery, Handtools, and General Hardware	138	37	14		
343	Heating Equipment, Except Electric and Warm Air; and Plumbing Fixtures	111	101	30		
344	Fabricated Structural Metal Products	82	102	89		
345	Screw Machine Products, and Bolts, Nuts, Screws, Rivets, and Washers	153	24	22		
346	Metal Forgings and Stampings	127	211	72		
347	Coating, Engraving, and Allied Services	640	472	431		
348	Ordnance and Accessories, Except Vehicles and Guided Missiles	89	216	42		
349	Miscellaneous Fabricated Metal Products	169	2,320	148		
35	Industrial and Commercial Machinery and Computer Equipment				Low	Medium
351	Engines and Turbines	129	378	181		
352	Farm and Garden Machinery and Equipment	55	673	252		
353	Construction, Mining, and Materials Handling Machinery and Equipment	25	109	70		
354	Metalworking Machinery and Equipment	85	12	2		
355	Special Industry Machinery, Except Metalworking Machinery	64	13	12		
356	General Industrial Machinery and Equipment	40	116	83		
357	Computer and Office Equipment	36	24	21		
358	Refrigeration and Service Industry Machinery	56	114	76		

TRI pounds transferred. Phenols are often found in chemical binding systems and may be present in waste sand containing chemical binders.

Annual releases of priority air pollutants by the metal casting industry are estimated for 1995 as follows:

- 116,538 tons per year of carbon monoxide
- 11,911 tons per year of nitrogen dioxide
- 10,995 tons per year of particulate matter of 10 microns or less
- 20,973 tons per year of total particulates
- 6,513 tons per year of sulfur dioxide
- 19,031 tons per year of volatile organic compounds

Noise and to a lesser extent odor are potential nuisance problem for the industry.

34-Fabricated Metal Products, Except Machinery and Transportation Equipment

This major group includes establishments engaged in fabricating ferrous and nonferrous metal products, such as metal cans, tinware, handtools, cutlery, general hardware, nonelectric heating apparatus, fabricated structural metal products, metal forgings, metal stampings ordnance (except vehicles and guided missiles), and a variety of metal and wire products, not elsewhere classified in other major groups, such as machinery in Major Groups 35 and 36; transportation equipment, including tanks, in Major Group 37; professional scientific and controlling instruments, watches, and clocks in Major Group 38; and jewelry and silverware in Major Group 39. Establishments primarily engaged in producing ferrous and nonferrous metals and their alloys are classified in Major Group 33.

TRI releases and transfers for the Fabricated Metal Products industry (SIC 34) were reported at 434 million pounds in 1995. The number of reporting facilities was 2,676, giving an average of about 162,000 pounds for each facility. Almost 81 percent (350.5 million pounds) were transferred off-site. About 60 percent was sent for recycling, reflecting the reuse of metal scrap. Most of the remainder of the transfers goes to treatment (15 percent) and disposal (16 percent). 83.5 million pounds, or 31,000 pounds per facility was released to the environment on site. Solvents comprise the largest number of TRI releases. This reflects the fact that solvents are used during numerous metal shaping, surface preparation, and surface finishing operations. For example, during metal shaping and surface preparation operations, solvents are used primarily to degrease metal. Solvents are also used during painting operations. All of the processes that use solvents generally result in air emissions, contaminated wastewater, and solid wastes.

Annual releases of priority air pollutants by the fabricated metal products industry are estimated for 1995 as follows:

- 4,925 tons per year of carbon monoxide
- 11,104 tons per year of nitrogen dioxide
- 1,019 tons per year of particulate matter of 10 microns or less
- 2,790 tons per year of total particulates
- 3,169 tons per year of sulfur dioxide
- 86,472 tons per year of volatile organic compounds

These industries have some odor associated with solvents. They may be noisy depending on how they shape the metal and the type of metal they use for raw materials.

35-Industrial and Commercial Machinery

This major group includes establishments engaged in manufacturing industrial and commercial machinery and equipment. Included are the manufacture of engines and turbines; farm and garden machinery; construction, mining, and oil field machinery; elevators and conveying equipment; hoists, cranes, monorails, and industrial trucks and tractors; metalworking machinery; special industry machinery; general industrial machinery; and refrigeration and service industry machinery. Machines powered by built-in or detachable motors ordinarily are included in this major group, with the exception of electrical household appliances. Power-driven handtools are included in this major group, whether electric or otherwise driven. Establishments primarily engaged in manufacturing electrical equipment are classified in Major Group 36, and those manufacturing handtools, except powered, are classified in Major Group 34.

TRI data for the machinery industry indicates 1,117 facilities reported 19.4 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 17,000 pounds per facility. About 23.4 percent of this was transferred off-site. About 98 percent of the on-site releases were to the atmosphere.

Depending on the precise nature of the operations, a facility may be a source of odor and noise.

36-Electronic and Other Electrical Equipment and Components, Including Computer Equipment

This major group includes establishments engaged in manufacturing machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy. Included are the manufacturing of computers, electricity distribution equipment; electrical industrial apparatus; household appliances; electrical lighting and wiring equipment; radio and television receiving equipment; communications equipment; electronic components and accessories; and other electrical equipment and supplies. The manufacture of household appliances is included in this group, but industrial machinery and equipment powered by built-in or detachable electric motors is classified in Major Group 35. Establishments primarily engaged in manufacturing instruments are classified in Major Group 38.

According to the 1995 TRI data for the semiconductor, printed wiring board (PWB) and cathode ray tube (CRT) industries, the manufacture of these products results in the release of similar substances, including solvents, acids, and heavy metals. The commonly released solvents include acetone, xylene, and methanol. Commonly released acids include sulfuric, hydrochloric, and nitric. A significant amount of ammonia is also released by the electronics/computer industry.

TRI data pertaining to semiconductor manufacturing shows that sulfuric acid and hydrochloric acid, two of the most commonly released chemicals, are used during etching and cleaning processes. Solvents such as acetone, glycol ethers, xylene, and Freon 113 are used during photolithography and cleaning processes. 1,1,1-trichloroethane is used during oxidation and ammonia is used during photolithography and cleaning. A significant amount of methyl ethyl

ketone is released during the degreasing and cleaning processes. Most of these solvents are released into the air.

Data relating to printed wiring board (PWB) manufacturing shows the top releases of acids from PWB facilities include sulfuric acid, hydrochloric acid, and nitric acid, all of which are used during cleaning, electrolyses plating and electroplating operations. Hydrochloric acid is also used during etching. The acids are primarily released to the air or recycled. Glycol ethers are released during image application and cleaning; most of the releases are emitted into the air. Freon 113 is used primarily for flux removal and is released into the air. Nearly all Freon 113 transfers are recycled. Acetone, a solvent used to clean the board before imaging, is released primarily into the air. Ammonium sulfate solution is used during electroplating, imaging, and etching processes and is released to the water or transferred to POTWs. Metals such as lead and copper are commonly used during electroplating, etching, and soldering (i.e., lead) processes. These metals and their compounds are primarily recycled.

In the manufacture of cathode ray tubes (CRT) a significant amount of lead (used during the frit sealing process) is released, much of which is transferred off-site for disposal and recycling. Zinc compounds are used during the phosphor stripe process and are transferred for recycling. Nitric acid, which is used during tube salvaging, is released into the air. Freon 113 is used as a cleaning agent during panel shadow mask preparation and is also released into the air. Solvents (i.e., acetone, methyl ethyl ketone, toluene, and methanol) are used for cleaning and degreasing and are released primarily into the air or transferred for recycling.

For the industry as a whole, annual release to the air, water, and land accounted for 4.3 million pounds, or an average of 11,000 pounds per facility. Transfers amounted to 68.8 million pounds, or 169,000 pounds per facility.

Annual releases of priority air pollutants by the electronics and computer industry are estimated for 1995 as follows:

- 356 tons per year of carbon monoxide
- 1,501 tons per year of nitrogen dioxide
- 224 tons per year of particulate matter of 10 microns or less
- 385 tons per year of total particulates
- 741 tons per year of sulfur dioxide
- 4,866 tons per year of volatile organic compounds

Nuisance problems are generally not encountered in this industry.

37-Transportation Equipment

This major group includes establishments engaged in manufacturing equipment for transportation of passengers and cargo by land, air, and water. Important products produced by establishments classified in this major group include motor vehicles, aircraft, guided missiles and space vehicles, ships, boats, railroad equipment, and miscellaneous transportation equipment, such as motorcycles, bicycles, and snowmobiles. Establishments primarily engaged in manufacturing mobile homes are classified in Industry 2451. Establishments primarily engaged in manufacturing equipment used for moving materials on farms; in mines and on construction sites; in individual plants; in airports; or on other locations off the highway are classified in Major Group 35.

In this analysis, we assume that Gainesville is not likely to attract shipbuilding and repair industry. Therefore this segment has been omitted, leaving motor vehicles and aerospace in the transportation equipment industry.

Motor Vehicles

TRI releases and transfers for the motor vehicles and motor vehicle equipment industry totaled 273.3 million pounds over 754 facilities in 1995 (SIC 371). The majority of TRI reporting facilities were located in Michigan, Ohio, Indiana, Illinois, and Tennessee. These States, with the exception of Tennessee, have historically been the focal point of automobile manufacturing.

TRI transfers total 194 million pounds, or 257,000 pounds per facility. Almost 80 percent of this go off-site for recycling. Another 9 percent go to energy recovery. Most of the remainder goes to disposal sites.

TRI releases totaled 79.3 million pounds per year, or 105,000 pounds per facility. 98 percent of these releases are to the air. Solvents such as toluene, xylene, methyl ethyl ketone, and acetone comprise the largest number of TRI releases. The large quantity of solvent release, both fugitive and point source can be attributed to the solvent-intensive finishing processes employed by the industry. In addition to being used to clean equipment and metal parts, solvents are a component found in many of the coating and finishes applied to automobile during the assembly and painting/finishing operations.

Annual releases of priority air pollutants by the manufacture of motor vehicles, bodies, parts, and accessories are estimated for 1995 as follows:

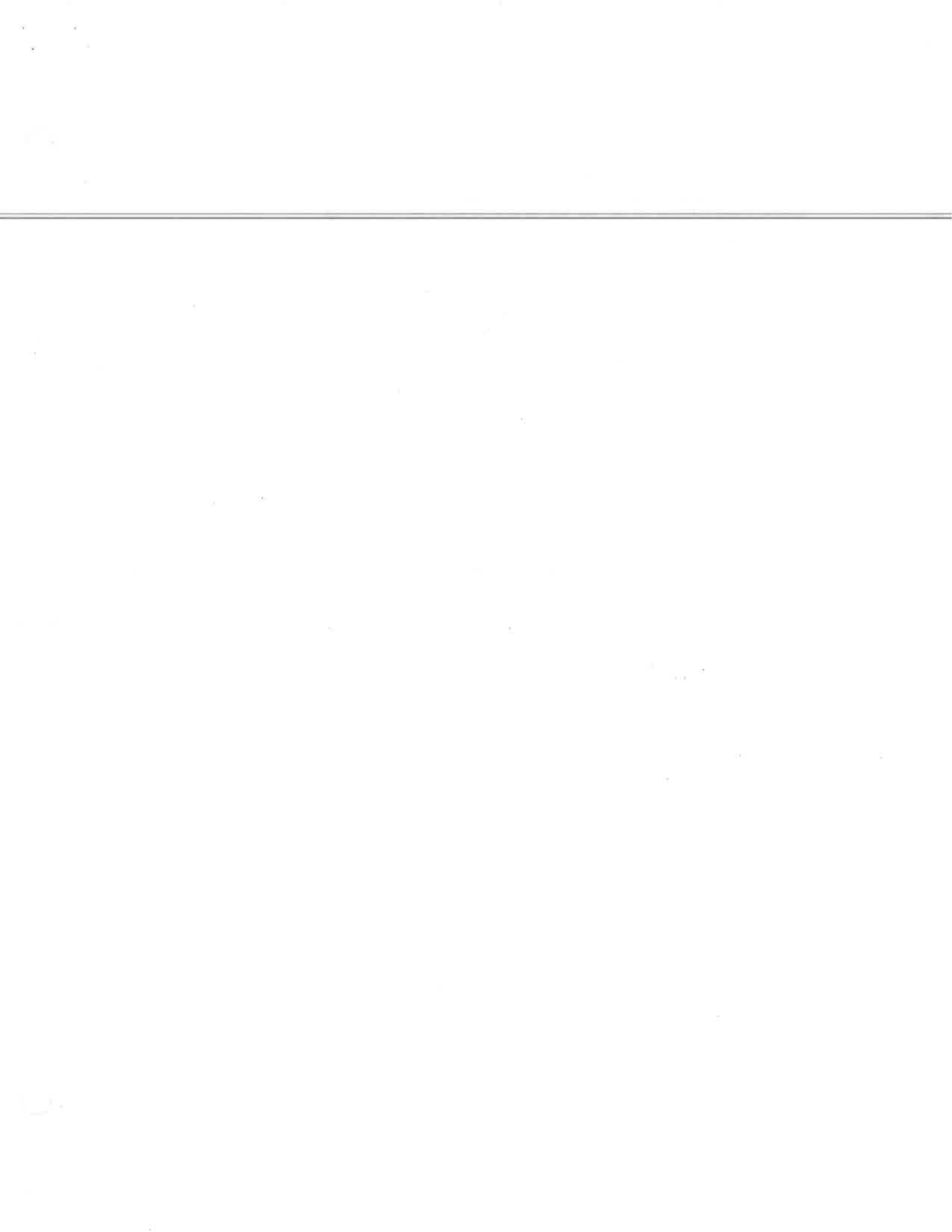
- 15,109 tons per year of carbon monoxide
- 27,355 tons per year of nitrogen dioxide
- 1,048 tons per year of particulate matter of 10 microns or less
- 3,699 tons per year of total particulates
- 20,378 tons per year of sulfur dioxide
- 96,338 tons per year of volatile organic compounds

These industries have some odor associated with solvents. It is generally housed in large factories and has little noise impact upon surrounding properties. Manufacturers of components may have noisy operations.

Aerospace

According to the 1996 Toxics Release Inventory (TRI) data, 199 aerospace facilities released (to the air, water, or land) and transferred (shipped off-site or discharged to sewers) a total of approximately 27 million pounds of 65 different toxic chemicals during calendar year 1996. This represents approximately 0.5 percent of the 5.6 billion pounds of releases and transfers from all manufacturers (SICs 20-39) reporting to TRI that year. Facilities released an average of 43,862 pounds per facility and transferred an average of 93,503 pounds per facility. The top four chemicals released by weight are solvents. They were methyl ethyl ketone, 1,1,1-trichloroethane, trichloroethylene, and toluene. They accounted for about 66 percent (5.8 million pounds) of the industry's total releases. Nickel, chromium, sulfuric acid, and methyl ethyl ketone were the four top chemicals transferred by weight. These four account for 55 percent (10.2 million pounds) of the total TRI chemicals transferred by the aerospace industry. Only 22 percent of the 65 chemicals reported to the TRI as releases or transfers were

**Detailed
Addendum**



Additional Detail in the Review of Manufacturing Uses Under the City of Gainesville's I-2 Industrial Zoning

Introduction

Merging Manufacturing Census data with Environment Protection Agency data on air, water, and solid waste emissions created a database that allowed more detailed analysis of pollution potential for industry categories. This database was designed to allow deployment of indicators of air, water, or solid waste releases from the facilities normalized by the number of employees at the facilities. Because of the difficulty in obtaining permission to use the latest census information, 1990 vintage information was used. This information, while dated, can still be useful as a guide to probable pollution problems, even if exact estimates are not possible. Given more time and resources, this approach could be updated to include the latest available data and incorporate a range of risk factors for human toxic and ecotoxic effects. Such an analysis would provide planners with a tool to estimate comprehensive profiles of industrial pollution for proposed new projects involving manufacturing plants.

Databases used were the Environmental Protection Agency (EPA) Toxic Release Inventory (TRI), EPA Aerometric Information Retrieval System (AIRS), and the Census Bureau Logitudinal Research Database (LRD). The pollution profile was obtained by obtaining the media-specific releases of toxic chemicals in the TRI, the AIRS estimates of releases of the six criteria pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide, total particulates, particulates below 10 microns, and volatile organic compounds), and the employment from the LRD. Employment was chosen as the base for normalizing the data because it is generally available to planners for a proposed project and is available in the LRD. The TRI data only cover facilities releasing pollutants in quantities over a threshold level of emissions. Consequently, pollution profiles based on these data may be upwardly biased, since cleaner facilities are not included in the totals. Thus facilities that were reported in the LRD but not reported in the TRI were assumed to emit zero pollutants. To the extent that these facilities have some emissions, the pollution profiles presented are biased downward.

Results

In accordance with the request of City staff, the top five industrial groups presented in Table 1 of our earlier report were given a more detailed analysis by taking them to a four digit Standard Industrial Classification (SIC) Code. The results are presented in a table labeled Table 2 to avoid confusion with Table 1 in our first report. Table 3 presents similar data for the other SIC Groups taken to a three digit SIC Code. Both these tables are presented ranked according to an equal weighting of each indicator within the industries with largest pollution potential presented first. Table 4 presents the same data listed according to SIC Code.

TABLE 2
Pollution Indicators by 4-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
2873	Nitrogenous Fertilizers	36,595	35,415	20,039
	Products of Petroleum and Coal, Not			
2999	Elsewhere Classified	2,547	93,649	15,110
3331	Primary Smelting and Refining of Copper	62,896	0	0
2911	Petroleum Refining	5,113	54,410	22,159
2611	Pulp Mills	8,425	62,668	13,151
2874	Phosphatic Fertilizers	42,200	11,173	1,952
2861	Gum and Wood Chemicals	1,638	44,782	18,861
3241	Cement, Hydraulic	39	57,641	13,948
2812	Alkalies and Chlorine	17,904	20,510	9,133
2816	Inorganic Pigments	26,840	25,647	1,196
	Plastics Materials and Synthetic Resins, and			
2821	Nonvulcanizable Elastomers	3,348	15,612	13,188
3334	Primary Production of Aluminum	998	60,841	1,758
2951	Asphalt Paving Mixtures and Blocks	2	31,417	10,202
	Industrial Organic Chemicals, Not Elsewhere			
2869	Classified	10,157	12,088	6,832
3274	Lime	5	36,310	6,638
	Primary Smelting and Refining of Nonferrous			
3339	Metals, Except Copper and Aluminum	17,506	3,558	526
3313	Electrometallurgical Products, Except Steel	3,749	20,851	2,441
3312	Steel Works, Blast Furnaces, and Rolling Mills	1,833	17,680	3,119
	Cyclic Organic Crudes and Intermediates,			
2865	and Organic Dyes and Pigments	10,271	4,002	1,066
	Industrial Inorganic Chemicals, Not			
2819	Elsewhere Classified	3,116	11,092	3,546
2631	Paperboard Mills	1,172	16,632	3,162
3251	Brick and Structural Clay Tile	29	10,387	5,405
2621	Paper Mills	969	14,477	3,603
	Secondary Smelting and Refining of			
3341	Nonferrous Metals	2,277	19,272	1,297
	Minerals and Earths, Ground or Otherwise			
3295	Treated	957	17,691	2,376
2822	Synthetic Rubber	11,055	0	0
2833	Medicinal Chemicals and Botanical Products	5,451	5,487	1,653
2823	Cellulosic Manmade Fibers	10,134	0	0
2824	Manmade Organic Fibers, Except Cellulosic	1,362	5,540	2,486
2813	Industrial Gases	1,305	3,755	2,572
2892	Explosives	944	4,364	2,569
2895	Carbon Black	6,592	0	0
2899	Chemicals and Chemical Preparations, Not	1,567	3,533	1,845

TABLE 2
Pollution Indicators by 4-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
	Elsewhere Classified			
2879	Pesticides and Agricultural Chemicals, Not Elsewhere Classified	2,752	1,855	1,054
3292	Asbestos Products	3,174	1,460	715
3353	Aluminum Sheet, Plate, and Foil	489	2,050	1,851
3275	Gypsum Products	2	6,755	864
3211	Flat Glass	37	2,901	1,886
3221	Glass Containers	39	3,247	1,614
	Aluminum Rolling and Drawing, Not Elsewhere Classified			
3355	Elsewhere Classified	177	5,287	591
2952	Asphalt Felts and Coatings	31	3,345	1,191
2891	Adhesives and Sealants	688	3,415	673
	Surface Active Agents, Finishing Agents, Sulfonated Oils, and Assistants			
2843	Pressed and Blown Glass and Glassware, Not Elsewhere Classified	2,392	189	101
3229	Elsewhere Classified	155	1,687	1,120
3316	Cold-Rolled Steel Sheet, Strip, and Bars	2,083	456	187
3321	Gray and Ductile Iron Foundries	240	4,179	363
	Paint, Varnishes, Lacquers, Enamels, and Allied Products			
2851	Elsewhere Classified	1,293	576	477
3315	Steel Wiredrawing and Steel Nails and Spikes	839	2,162	286
	Nonferrous Foundries, Except Aluminum and Copper			
3369	Elsewhere Classified	529	979	712
3281	Cut Stone and Stone Products	7	3,741	256
	Coated and Laminated Paper, Not Elsewhere Classified			
2672	Structural Clay Products, Not Elsewhere Classified	1,097	354	343
	Lubricating Oils and Greases			
3259	Elsewhere Classified	4	1,499	648
2992	Lubricating Oils and Greases	151	844	718
2834	Pharmaceutical Preparations	635	744	373
	Packaging Paper and Plastic Film, Coated and Laminated			
2671	Elsewhere Classified	423	556	555
3296	Mineral Wool	291	1,469	393
3351	Rolling, Drawing, and Extruding of Copper	889	1,179	38
3255	Clay Refractories	39	2,033	238
2893	Printing Ink	265	962	378
2653	Corrugated and Solid Fiber Boxes	6	644	495
	Soap and Other Detergents, Except Specialty Cleaners			
2841	Elsewhere Classified	162	933	301
3297	Nonclay Refractories	85	932	346
2679	Converted Paper and Paperboard Products,	450	636	174

TABLE 2
Pollution Indicators by 4-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
	Not Elsewhere Classified			
3322	Malleable Iron Foundries	19	1,773	126
3317	Steel Pipe and Tubes	702	116	110
3325	Steel Foundries, Not Elsewhere Classified	296	500	236
3399	Primary Metal Products, Not Elsewhere Classified	454	489	95
3356	Rolling, Drawing, and Extruding of Nonferrous Metals, Except Copper and Aluminum	632	110	64
3291	Abrasive Products	187	506	229
3264	Porcelain Electrical Supplies	180	315	199
3299	Nonmetallic Mineral Products, Not Elsewhere Classified	265	462	71
2844	Perfumes, Cosmetics, and Other Toilet Preparations	40	335	209
3354	Aluminum Extruded Products	191	135	109
2842	Specialty Cleaning, Polishing, and Sanitation Preparations	75	174	167
3253	Ceramic Wall and Floor Tile	342	76	4
2875	Fertilizers, Mixing Only	313	67	7
2652	Setup Paperboard Boxes	8	267	152
2836	Biological Products, Except Diagnostic Substances	322	0	0
3272	Concrete Products, Except Block and Brick	6	352	106
3324	Steel Investment Foundries	153	293	22
3261	Vitreous China Plumbing Fixtures and China Earthenware Fittings and Bathroom Accessories	73	116	91
3273	Ready-Mixed Concrete	1	418	56
3357	Drawing and Insulating of Nonferrous Wire	165	59	43
2657	Folding Paperboard Boxes, Including Sanitary	226	7	7
3398	Metal Heat Treating	196	57	11
2656	Sanitary Food Containers, Except Folding	103	64	64
3366	Copper Foundries	196	5	4
3363	Aluminum Die-Castings	202	0	0
2675	Die-Cut Paper and Paperboard and Cardboard	152	22	14
2673	Plastics, Foil, and Coated Paper Bags	115	15	15
2655	Fiber Cans, Tubes, Drums, and Similar Products	62	57	30

TABLE 2
 Pollution Indicators by 4-Digit SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors
3231	Glass Products, Made of Purchased Glass	50	44	35
3364	Nonferrous Die-Castings, Except Aluminum	77	0	0
2676	Sanitary Paper Products	72	2	2
3271	Concrete Block and Brick	8	118	6
3365	Aluminum Foundries	48	15	5
3262	Vitreous China Table and Kitchen Articles	48	0	0
2677	Envelopes	35	5	5
3269	Pottery Products, Not Elsewhere Classified	2	48	14
2674	Uncoated Paper and Multiwall Bags	22	0	0
2835	In Vitro and In Vivo Diagnostic Substances	13	0	0
2678	Stationary, Tablets, and Related Products	9	0	0
3263	Fine Earthenware Table and Kitchen Articles	0	0	0

remaining approximately 1.5 percent (2.4 million pounds) is discharged directly to water or land disposed.

Off-site transfers by organic chemical facilities account for the largest amount, 65 percent, of the organic chemical industry's total releases and transfers as reported in TRI. Three chemicals (sulfuric acid, methanol and tert-butyl alcohol) account for over one-half of the 287 million pounds transferred off-site. The 49 million pounds of POTW discharges (primarily methanol and ammonia) account for 17 percent of releases and transfers.

The frequency with which chemicals are reported by facilities within a sector is one indication of the diversity of operations and processes. Many chemicals are released or transferred by a small number of facilities, which indicates a wide diversity of production processes, particularly for specialty organic chemicals. Over one half of the 204 chemicals reported are released by fewer than 10 facilities, however, the organic chemical industry is also characterized by one of the largest numbers of chemicals reported by any manufacturing sector. Of the over 300 chemicals currently listed on TRI, 204 are reported as released or transferred by at least one organic chemical facility.

Annual releases of priority air pollutants by the organic chemical industry are estimated for 1995 as follows:

- 112,410 tons per year of carbon monoxide
- 187,400 tons per year of nitrogen dioxide
- 14,596 tons per year of particulate matter of 10 microns or less
- 16,053 tons per year of total particulates
- 176,115 tons per year of sulfur dioxide
- 180,350 tons per year of volatile organic compounds

Nuisance problems in this industry are odorous compounds and commonly noisy equipment is used.

Resin and Manmade Fiber Manufacturing

According to the 1995 Toxics Release Inventory (TRI) data, 444 plastic resin and manmade fiber manufacturing facilities reporting SIC 2821, 2823, or 2824 released (to the air, water, or land) and transferred (shipped off-site or discharged to sewers) a total of 399 million pounds of toxic chemicals during calendar year 1995. This represents approximately seven percent of the 5.7 billion pounds of releases and transfers from all manufacturers (SICs 20-39) reporting to TRI that year. The top three chemicals released by volume are carbon disulfide, nitrate compounds, and ethylene. These three account for about 51 percent (82 million pounds) of the industries' total releases. Ethylene glycol, used in making polyester, accounts for 45 percent (107 million pounds) of the total TRI chemicals transferred by the industries. The variability in facilities' TRI chemical profiles may be attributed to the variety of processes and products in the industries. It should be noted that over half of the chemicals were reported by fewer than ten facilities.

Plastic Resin. About 410 plastic resin facilities reported TRI emissions for 184 chemicals in 1995. The total volume of releases was 64.1 million pounds or 25 percent of the total volume of chemicals reported to TRI by the plastic resin industry (i.e. releases and transfers). The top five chemicals released by this industry, in terms of volumes, include: ethylene, methanol, acetonitrile, propylene, and ammonia. The very volatile nature of these chemicals is apparent in

the fact that about 74 percent (48 million pounds) of the industry's releases are to the air. About 49 percent (31.4 million pounds) of all the TRI chemicals released by the plastic resin industry were released to air in the form of point source emissions, and 25 percent (16.3 million pounds) were released as fugitive air emissions. Roughly 21 percent (13.3 million pounds) of releases were by underground injection. The remaining five percent were released as water discharges and disposals to land.

The total volume of transfers was 192 million pounds or 75 percent of the total volume of chemicals reported to TRI by the plastic resin industry (i.e. releases and transfers). Transfers to recycling and energy recovery accounted for the largest amount, 46 percent (88.5 million pounds) and 31 percent (60.2 million pounds), respectively. About 16 percent (30.5 million pounds) was transferred off-site for treatment, with the remaining seven percent (13.2 million pounds) transferred for either disposal or POTW treatment. Four chemicals (ethylene glycol, N-hexane, xylene (mixed isomers), and vinyl acetate) accounted for about 59 percent of the 192 million pounds of total transfers for this industry. Ethylene glycol alone accounted for about 34 percent (65.0 million pounds) of the total transfers and was primarily recycled.

Manmade Fibers. Thirty-four manmade fiber facilities reported TRI emissions for 116 chemicals in 1995. The total volume of releases was 95.9 million pounds or 67 percent of the total volume of TRI chemicals reported by the manmade fiber industry (i.e. releases and transfers). The top five chemicals released by this industry, in terms of volumes, include: carbon disulfide, nitrate compounds, hydrochloric acid, formic acid, and methanol.

A typical manmade fiber facility averaged 2.8 million pounds of releases and 1.4 million pounds of transfers. The high release average is attributed largely to the release of carbon disulfide by four facilities. Carbon disulfide, used in making rayon, accounted for about 62 percent (59.5 million pounds) of TRI releases for the industry. Even eliminating carbon disulfide from the average release calculation reveals that manmade fiber facilities still average about 1.1 million pounds of releases per facility. These relatively high releases and transfers per facility may reflect the large volumes of material processed at a relatively small number of facilities.

About 72 percent (69.5 million pounds) of all the chemicals released by the manmade fiber industry were released to air in the form of point source emissions, and six percent (6.3 million pounds) were released as fugitive air emissions. Roughly 19 percent (17.9 million pounds) of releases were by underground injection. The remaining three percent were released as water discharges and disposals to land.

The total volume of transfers off-site was 47.3 million pounds or 33 percent of the total volume of chemicals reported to TRI by the manmade fiber industry (i.e. releases and transfers). Transfers to recycling accounted for 90 percent of all transfers (42.5 million pounds). The remaining 10 percent (4.8 million pounds) was transferred for disposal, treatment, energy recovery, or to a POTW. Ethylene glycol accounted for about 90 percent of the industry's transfers (42.5 million pounds), and was primarily recycled.

For the plastic resin and manmade fiber industry as a whole, annual releases to the air, water, and land accounted for 64.1 million pounds, or an average of 156,000 pounds per facility. Transfers amounted to 192.4 million pounds, or 469,000 pounds per facility.

Annual releases of priority air pollutants by the resin and manmade fiber industry are estimated for 1995 as follows:

- 16,388 tons per year of carbon monoxide
- 41,771 tons per year of nitrogen dioxide
- 2,218 tons per year of particulate matter of 10 microns or less
- 7,546 tons per year of total particulates
- 67,546 tons per year of sulfur dioxide
- 74,138 tons per year of volatile organic compounds

Nuisance problems are primarily in the form of odorous compounds in this industry.

Pharmaceuticals

According to 1995 TRI data, pharmaceutical facilities released (discharged to the air, water, or land without treatment) and transferred (shipped off-site) a total of 177 million pounds of pollutants, made up of 104 different chemicals. This represents about 3 percent of the 5.7 billion pounds of TRI chemicals released and transferred by all manufacturers that year. In comparison, the chemical industry (SIC 28) as a whole produced 1.7 billion pounds that year, accounting for about 30 percent of all releases and transfers.

Of the pharmaceutical industry's TRI releases, 57 percent go to the air, 25 percent to underground injection, 17 percent to surface waters, and 1 percent to the land. This release profile differs from other TRI industries that average approximately 59 percent to air, 30 percent to water, and 10 percent to land.

Of the pharmaceutical industry's transfers, about 55 percent are transferred for energy recovery off-site, 19 percent for treatment off-site, 13 percent are transferred to POTWs, 12 percent for recycling off-site, and about 1 percent for disposal off-site.

Of the top ten most frequently reported toxic chemicals on the TRI list, the prevalence of volatile chemicals explains the air intensive toxic chemical loading of the pharmaceutical industry. Seven of the ten most commonly reported toxic chemicals are highly volatile. Six of the ten are volatile organic compounds (methanol, dichloromethane, toluene, ethylene glycol, N,N-Dimethylformamide, and acetonitrile). These are primarily solvents used to extract active ingredients and for cleaning equipment. The primary means of release to the environment are from fugitive air and point air sources. Large quantities of methanol, N,N-Dimethylformamide, and acetonitrile, however, are released via underground injection. Other commonly reported chemicals released and transferred are acids (hydrochloric, sulfuric, and phosphoric), which can be used for pH control or as catalysts.

Annual releases of priority air pollutants by the pharmaceuticals industry are estimated for 1995 as follows:

- 6,586 tons per year of carbon monoxide
- 19,088 tons per year of nitrogen dioxide
- 1,576 tons per year of particulate matter of 10 microns or less
- 4,425 tons per year of total particulates
- 21,311 tons per year of sulfur dioxide
- 37,214 tons per year of volatile organic compounds

Nuisance problems in this industry are primarily in the form of odorous compounds.

29-Petroleum Refining and Related Industries

This major group includes establishments primarily engaged in petroleum refining, manufacturing paving and roofing materials, and compounding lubricating oils and greases from purchased materials. Establishments manufacturing and distributing gas to consumers are classified in public utilities industries, and those primarily engaged in producing coke and byproducts are classified in Major Group 33.

The amount of TRI chemicals generated by the petroleum refining industry provides a gross profile of the types and relative amounts of toxic chemical outputs from refining 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 list releases to air, water, and land separately. The distribution across media can also be compared to the profile of other industry sectors.

The petroleum refining industry releases 75 percent of its total TRI poundage to the air, 24 percent to the water (including 20 percent to underground injection and 4 percent to surface waters), and 1 percent to the land. This release profile differs from other TRI industries that average approximately 59 percent to air, 30 percent to water, and 10 percent to land. Examining the petroleum refining industry's TRI reported toxic chemical releases highlights the likely origins of the large air releases for the industry.

According to TRI data, in 1993 the petroleum refining industry released (discharged to the air, water, or land without treatment) and transferred (shipped off-site) a total of 482 million pounds of pollutants, made up of 103 different chemicals. This represents about 11 percent of the total pounds of TRI chemicals released and transferred by all manufacturers that year. In comparison, the chemical industry (SIC 28) produced 2.5 billion pounds that year, accounting for 33 percent of all releases and transfers.

Overall, the petroleum refining industry's releases declined between 1988 and 1993. Between 1991 and 1993 the decrease in releases was 6.7 percent compared to the average for all industries of 18 percent. In the same period, however, transfers were reported to increase 65 percent which is higher than the average increase in transfers of 25 percent for all manufacturing industries. A large portion of the increases was in the form of transfers to recycling. Spent sulfuric acid generated in the alkylation process makes up about half of all transfers of TRI listed chemicals off-site. At the facility level, the industry reported a level of pollution prevention activities of 42 percent of all refineries, which is slightly higher than the overall average of about 35 percent of TRI reporting facilities.

Comparisons of the reported pounds released or transferred per facility demonstrate that the petroleum refining industry is far above average in its pollutant releases and transfers per facility when compared to other TRI industries. Of the twenty manufacturing SIC codes listed in the TRI database, the mean amount of pollutant release per facility (including petroleum refining) was approximately 120,000 pounds. The TRI releases of the average petroleum refining facility (SIC 2911) were 404,000 pounds, making the industry 3.4 times higher in per facility releases than for other industries. For transfers, the mean of petroleum refining facilities was about 13 times as much that of all TRI manufacturing facilities (202,000 pounds transferred off-site per facility compared to 2,626,000 per refinery). These high releases and transfers per facility reflect the large volumes of material processed at a relatively small number of facilities.

Of the top ten most frequently reported toxic chemicals on the TRI list, the prevalence of volatile chemicals explains the air intensive toxic chemical loading of the refining industry. Nine of the ten most commonly reported toxic chemicals are highly volatile. Seven of the ten are aromatic hydrocarbons (benzene, toluene, ethylbenzene, xylene, cyclohexane, 1,2,4-trimethylbenzene and ethylbenzene). Aromatic hydrocarbons are highly volatile compounds and make up a portion of both crude oil and many finished petroleum products. Ammonia, the ninth most commonly reported toxic chemical, is also released and transferred from petroleum refineries in large quantities. Ammonia may be found in high concentrations in process water streams from steam distillation processes and in refinery sour gas. The primary means of release to the environment is through underground injection of wastewater and emissions to air. Gasoline blending additives (i.e., methanol, ethanol, and MTBE) and chemical feedstocks (propylene, ethylene and naphthalene) are also commonly reported to TRI. Additives and chemical feedstocks are, for the most part, released as air emissions due to their high volatility. A significant portion of the remaining chemicals of the reported TRI toxic chemicals are metals compounds, which are typically transferred off-site for recovery or as a component of hazardous wastes. Although it is not the most frequently reported toxic chemical released or transferred, sulfuric acid is, by far, generated in the largest quantities. Spent sulfuric acid is primarily generated during the alkylation process. The acid is typically transferred off-site for regeneration.

Annual releases of priority air pollutants by the petroleum refining industry are estimated for 1995 as follows:

- 734,630 tons per year of carbon monoxide
- 355,852 tons per year of nitrogen dioxide
- 27,497 tons per year of particulate matter of 10 microns or less
- 36,141 tons per year of total particulates
- 619,775 tons per year of sulfur dioxide
- 313,982 tons per year of volatile organic compounds

Nuisance problems in this industry are odorous compounds and noisy equipment.

30-Rubber and Miscellaneous Plastics Products

This major group includes establishments manufacturing products, not elsewhere classified, from plastic resins and from natural, synthetic, or reclaimed rubber, gutta percha, balata, or gutta siak. Numerous products made from these materials are included in other major groups, such as boats in Major Group 37, and toys, buckles, and buttons in Major Group 39. This group includes establishments primarily manufacturing tires, but establishments primarily recapping and retreading automobile tires are classified in Services, Industry 7534. Establishments primarily engaged in manufacturing synthetic rubber and synthetic plastics resins are classified in Industry Group 282.

According to the TRI data, the manufacture of rubber and miscellaneous plastic products results primarily in the release of solvents. The commonly released solvents include acetone, toluene, methyl ethyl ketone, 1,1,1-trichloroethane, and dichloromethane. According to the Toxic Release Inventory (TRI) Public Release Data for 1993, the rubber and miscellaneous plastics products industry released over 118 million pounds of pollutants and transferred over 44 million pounds of pollutants. Of pollutants released, approximately 69 percent were released as point source air emissions, approximately 30.5 percent were released as fugitive air emissions,

approximately 0.2 percent were released to water, and approximately 0.3 percent were disposed of on land.

The rubber and miscellaneous plastics products industry air releases can be traced primarily to the mixing component preparation and building/assembly stages of the rubber manufacturing process and to the solvent cleaning and finishing stages of the plastics products manufacturing process. Major pollutants released to air include toluene, dichloromethane, methylene chloride, and carbon disulfide. Releases of pollutants to water and transfers of pollutants to POTWs arise primarily from the cleaning and cooling of machinery in both the rubber and plastic manufacturing processes and from the cooling and heating of rubber during the rubber products manufacturing process. Major pollutants released to water include zinc compounds, sulfuric acid, ammonia, and ammonium sulfate. Major pollutants transferred to POTWs include acetone, methanol, and zinc compounds, and ammonium sulfate. Releases of pollutants to land arise from the use of various chemicals in the rubber and plastic mixing processes. Major releases of pollutants to land include barium compounds, antimony compounds, zinc compounds, and styrene.

The rubber and miscellaneous plastics products industry releases and transfers a number of metals in large quantities (i.e., transfers as high as millions of pounds and releases as high as hundreds of thousands of pounds). These metals include zinc compounds, copper, lead, and lead compounds. Both zinc and lead are used in the rubber mixing process as vulcanizing agents, accelerator activators, and processing aids (zinc only). Lead and zinc can be released during mixing operation as spills, leaks, and fugitive emissions in the form of dust and particulates (which can and often are captured by filters).

Annual releases of priority air pollutants by the rubber and miscellaneous plastics industry are estimated for 1995 as follows:

- 2,200 tons per year of carbon monoxide
- 9,955 tons per year of nitrogen dioxide
- 2,618 tons per year of particulate matter of 10 microns or less
- 5,182 tons per year of total particulates
- 21,720 tons per year of sulfur dioxide
- 132,945 tons per year of volatile organic compounds

Nuisance problems in this industry are odorous compounds and noisy equipment.

31-Leather and Leather Products

This major group includes establishments engaged in tanning, currying, and finishing hides and skins, leather converters, and establishments manufacturing finished leather and artificial leather products and some similar products made of other materials.

This industry makes use of toxic chemicals in the tanning process. TRI data for the leather industry indicates 80 facilities reported 4.8 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 60,311 pounds per facility. About 45.5 percent of this was transferred off-site. About 97 percent of the on-site releases were to the atmosphere.

The industry does generate odors that may be a nuisance to nearby residents.

32-Stone, Clay, Glass, and Concrete Products

This major group includes establishments engaged in manufacturing flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone, abrasive and asbestos products, and other products from materials taken principally from the earth in the form of stone, clay, and sand. When separate reports are available for mines and quarries operated by manufacturing establishments, they are classified in division B, mining. When separate reports are not available, the mining and quarrying activities, other than those of Industry 3295, are classified herein with the manufacturing operations.

623 facilities within SIC 32 reported releases of over 100 toxic chemicals, including solvents, acids, heavy metals, and other compounds. The concrete and cement industries reported high volumes of solvent releases. Trichloroethylene and 1,1,1-trichloroethane together accounted for more than a third of total releases from the concrete industry. The flat glass industry reported a relatively low level of releases, with sulfuric acid accounting for more than two-thirds of the industry total. Releases from the fiberglass industry included significant amounts of acids, heavy metals, and solvents.

The TRI database contains 623 reporting facilities. In 1995, they reported release or transfer of 75.7 million pounds, for an average of 121,000 pounds per facility. 43.9 million pounds were released to the environment, for an average of 70,000 pounds per facility. The remaining 31.8 million pounds were transferred to other facilities, or an average of 51,000 pounds per facility.

Annual releases of priority air pollutants by the stone, clay, glass, and concrete industry are estimated for 1995 as follows:

- 105,059 tons per year of carbon monoxide
- 340,639 tons per year of nitrogen dioxide
- 192,962 tons per year of particulate matter of 10 microns or less
- 662,233 tons per year of total particulates
- 308,534 tons per year of sulfur dioxide
- 34,337 tons per year of volatile organic compounds

Nuisance problems in this industry are related to generally noisy equipment and some odors.

33-Primary Metal Industries

This major group includes establishments engaged in smelting and refining ferrous and nonferrous metals from ore, pig, or scrap; in rolling, drawing, and alloying metals; in manufacturing castings and other basic metal products; and in manufacturing nails, spikes, and insulated wire and cable. This major group includes the production of coke. Establishments primarily engaged in manufacturing metal forgings or stampings are classified in Industry Group 346.

Iron and Steel

TRI reports in 1995 that 705 reporting facilities in this SIC consist of 331 in iron and steel manufacture and 282 in nonferrous metals manufacture. The major sources of toxic chemicals are blast furnaces and steel mills and primary smelting and refining. Of the TRI data for the iron

and steel industry, blast furnaces and steel mills are responsible for over 75 percent of reported releases and transfers. Almost half of the reported releases and transfers in the nonferrous metals manufacturing industry are from smelting and refining facilities. Facilities not part of these two major groups have significantly different TRI profiles.

According to TRI data, the iron and steel industry released and transferred a total of approximately 604.6 million pounds of pollutants during calendar year 1995. Large volumes of metal-bearing wastes dominate these releases and transfers. The majority of these wastes (70 percent or 423 million pounds) are transferred off-site for recycling, typically for recovery of the metal content. Transfers of TRI chemicals account for 85 percent of the iron and steel industry's total TRI-reportable chemicals (513.9 million pounds) while releases make up 15 percent (90.7 million pounds). Metal-bearing wastes account for approximately 80 percent of the industry's transfers and over fifty percent of the releases.

Releases from the industry continue to decrease, while transfers increased from 1992 to 1995. The increase in transfers is likely due to increased off-site shipments for recovery of metals from wastes. This shift may also have contributed to the decrease in releases. Another factor influencing an overall downward trend since 1988 in releases and transfers is the steel mill production decrease during the 1988 to 1995 period. In addition, pollution control equipment and a shift to new technologies, such as continuous casting, are responsible for significant changes in the amount and type of pollutants released during steelmaking. Finally, the industry's efforts in pollution preventing also play a role in driving pollutant release reductions.

Evidence of the diversity of processes at facilities reporting to TRI is found in the fact that the most frequently reported chemical (sulfuric acid) is reported by only 41 percent of the facilities; the sixth most frequently reported chemical was used by just one-fourth of TRI facilities. The variability in facilities' pollutant profile may be attributable to a number of factors. Fewer than 30 of the facilities in the TRI database are fully integrated plants making coke, iron, and steel products. The non-integrated facilities do not perform one or more of the production steps and, therefore, may have considerably different emissions profiles. Furthermore, steel making operations with electric arc furnaces have significantly different pollutant profiles than those making steel with basic oxygen furnaces.

The iron and steel industry releases just 15 percent of its TRI total poundage. Of these releases, over half go to on-site land disposal and one quarter of releases are fugitive or point source air emissions. Manganese, zinc, chromium, and lead account for over 90 percent of the on-site land disposal. The industry's air releases are associated with volatilization, fume or aerosol formation in the high temperature furnaces and byproduct processing. Ammonia, lighter weight organics, such as methanol, acids and metal contaminants found in the iron ore are the principal types of chemicals released to the air. In addition to air releases of chemicals reported in TRI, the iron and steel industry is a significant source of particulates, carbon monoxide, nitrogen oxides and sulfur compounds due to combustion. Ammonia releases account for the largest part of the fugitive releases (approximately 42 percent) and 1,1,1-trichloroethane, hydrochloric acid, zinc compounds, and trichloroethylene each contribute another 4 - 5 percent. Underground injection (principally of hydrochloric acid) makes up about 14 percent of the releases reported by the industry.

Eighty percent of transfers reported by the iron and steel industry are sent off-site for recycling. Zinc, manganese, chromium, copper, nickel, and lead are the six metals transferred by the greatest number of facilities.

Acids used during steel finishing, such as hydrochloric, sulfuric, nitric, and phosphoric acids, account for another 17 percent of transfers. These acids are most often sent off-site for recycling or for treatment. Hydrochloric acids are also managed by on-site underground injection. The next classes of chemicals of significant volume in TRI are solvents and lightweight carbon byproducts, including: 1,1,1-trichloroethane, trichloroethylene, phenol, xylene, methanol, and toluene. These solvents are primarily released as fugitive air emissions, but also from point sources. A small percentage of these solvents are transferred off-site for recycling.

Chemicals sent off-site for disposal (primarily zinc, sulfuric acid, manganese, and ammonium sulfate) account for another 10 percent of transfers. Only approximately 7 percent of chemicals transferred off-site go to treatment. These chemicals are primarily hydrochloric acid, sulfuric acid, and nitric acid. Only about one percent of transfers by weight are POTW discharges (mainly sulfuric acid). Another one percent of transfers are sent for energy recovery (with hydrochloric acid as the most significant contributor).

Annual releases of priority air pollutants by the iron and steel industry are estimated for 1995 as follows:

- 1,386,461 tons per year of carbon monoxide
- 153,607 tons per year of nitrogen dioxide
- 83,939 tons per year of particulate matter of 10 microns or less
- 87,938 tons per year of total particulates
- 232,347 tons per year of sulfur dioxide
- 83,882 tons per year of volatile organic compounds

These industries have distinctive odors associated with them and use noisy, heavy machinery to handle large quantities of raw and finished materials.

Nonferrous Metals

In the nonferrous metals industry, the 1995 TRI data indicates 365.7 million pounds of releases and transfers of toxic chemicals. 45 percent (164 million pounds) were transferred to off-site facilities for recycle or disposal. The average facility released 715,000 pounds and transferred 582,000 pounds in 1995. Chlorine comprised the largest number of TRI releases. This is reflected in the fact that chlorine is a by-product of the magnesium industry and the largest reporter is a magnesium facility. The other top releases are copper compounds, zinc compounds, lead compounds, and sulfuric acid, all of which are by-products of the various processes used in this industry.

Annual releases of priority air pollutants by the nonferrous metals industry are estimated for 1995 as follows:

- 214,243 tons per year of carbon monoxide
- 31,136 tons per year of nitrogen dioxide
- 10,403 tons per year of particulate matter of 10 microns or less
- 24,654 tons per year of total particulates
- 253,538 tons per year of sulfur dioxide
- 11,058 tons per year of volatile organic compounds

These industries have distinctive odors associated with them and use noisy, heavy machinery to handle large quantities of raw and finished materials.

Metal Casting

According to the 1995 TRI data, the reporting ferrous and nonferrous foundries released and transferred a total of approximately 109 million pounds of pollutants during calendar year 1995. Large volumes of metallic wastes dominate these releases and transfers. Evidence of the diversity of processes at foundries reporting to TRI is found in the fact that the most frequently reported chemical (copper) is reported by only 45 percent of the facilities and over half of the TRI chemicals were reported by fewer than ten facilities. The variability in facilities' pollutant profiles may be attributable to the large number of different types of foundry processes and products. For example, foundries casting only ferrous parts will have different pollutant profiles than those foundries casting both ferrous and nonferrous products.

Releases to the air, water, and land accounted for 33 percent (36 million pounds) of foundries' total reportable chemicals. Of these releases, 70 percent go to onsite land disposal, and about 75 percent are fugitive or point source air emissions. Metallic wastes accounted for over 95 percent of the industry's releases. Manganese, zinc, chromium, and lead account for over 95 percent of the on-site land disposal. The industry's air releases are associated with volatilization, fume or aerosol formation in the furnaces and byproduct processing. Lighter weight organics, such as methanol, acids and metal contaminants found in scrap metal are the principal types of TRI chemicals released to the air. In addition to air releases of chemicals reported to TRI, foundries are often a source of particulates, carbon monoxide, nitrogen oxides and sulfur compounds due to sand handling operations, curing of chemical binders, and combustion of fossil fuels. Methanol, trichloroethylene and other solvent releases account for most of the fugitive releases (approximately 61 percent).

Off-site transfers of TRI chemicals account for 69 percent of foundries' total TRI-reportable chemicals (74 million pounds). Almost 57 percent of the industry's total TRI wastes (42 million pounds) are metallic wastes that were transferred off-site for recycling, typically for recovery of the metal content. Metallic wastes account for approximately 95 percent of the industry's transfers. About 61 percent of off-site transfers reported by foundries are sent off-site for recycling. Copper, manganese, zinc, chromium, nickel, and lead are the six metals transferred in the greatest amounts and number of facilities (See Table 8). TRI chemicals sent off-site for disposal (primarily manganese, zinc, chromium, and copper) account for 31 percent of transfers. Less than three percent of the remaining transfers from foundries go to treatment off-site, discharge to POTWs, and energy recovery.

After metals, the next largest volume of chemicals transferred are acids including: sulfuric acid, nitric acid, phosphoric acid, and hydrochloric acid. Spent acids can be generated in wet scrubber systems. In addition, acids are often used to clean and finish the surfaces of the metal castings before plating or coating. The spent acids are often sent off-site for recycling or for treatment. Solvents and other lightweight organic compounds are frequently reported but account for a relatively small amount of total transfers. Solvents are used frequently for cleaning equipment and cast parts. The primary solvents and lightweight organics include: phenol, xylene, 1,2,4-trimethylbenzene, 1,1,1-trichloroethane, trichloroethylene, methanol, and toluene. Transferred solvents are most often sent off-site for disposal or recycling. Phenols and phenoisocyanates are frequently reported but amount to less than 1 percent of the total

reported by more than 10 facilities, evidence of the many different materials used by the industry and the variance between facilities on choice of these materials.

Transfers to recycling facilities accounted for the largest percentage, 70 percent, of transfers. The next greatest was 17 percent to treatment facilities. The majority of transfers consisted of metals, spent acids, and solvents. 66 percent (12.3 million pounds) of the total transfers were metals. Nickel represented the largest quantity of transfers, 5.3 million pounds or 29 percent of the total. Chromium composed the second largest quantity of transfers with 12 percent of the total. The chemical with the largest quantity of releases, methyl ethyl ketone, accounted for about 6 percent of the total transfers.

Annual releases of priority air pollutants by the aerospace industry are estimated for 1995 as follows:

- 4,261 tons per year of carbon monoxide
- 5,705 tons per year of nitrogen dioxide
- 890 tons per year of particulate matter of 10 microns or less
- 757 tons per year of total particulates
- 3,705 tons per year of sulfur dioxide
- 10,804 tons per year of volatile organic compounds

Noise and odor are potential nuisance problem for the industry, particularly when composite materials are used in the construction.

38-Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks

This major group includes establishments engaged in manufacturing instruments (including professional and scientific) for measuring, testing, analyzing, and controlling, and their associated sensors and accessories; optical instruments and lenses; surveying and drafting instruments; hydrological, hydrographic, meteorological, and geophysical equipment; search, detection, navigation, and guidance systems and equipment; surgical, medical, and dental instruments, equipment, and supplies; ophthalmic goods; photographic equipment and supplies; and watches and clocks.

TRI data for the measurement/photography equipment industry indicates 253 facilities reported 12.2 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 48,000 pounds per facility. About 10.8 percent of this was transferred off-site. About 88 percent of the on-site releases were to the atmosphere, with most of the remainder released to surface waters.

This industry is generally not considered a source of odor or noise, although each facility must be investigated.

39-Miscellaneous Manufacturing Industries

This major group includes establishments primarily engaged in manufacturing products not classified in any other manufacturing major group. Industries in this group fall into the following

categories: jewelry, silverware, and plated ware; musical instruments; dolls, toys, games, and sporting and athletic goods; pens, pencils, and artists' materials; buttons, costume novelties, miscellaneous notions; brooms and brushes; caskets; and other miscellaneous manufacturing industries.

TRI data for the miscellaneous category of industry indicates 316 facilities reported 10.6 million pounds of toxic chemicals were released or transferred in 1998. This is an average of 33,000 pounds per facility. About 7 percent of this was transferred off-site. About 98 percent of the on-site releases were to the atmosphere, with most of the remainder released to surface waters. Each facility must be independently analyzed for noise and odor potential.

Table 2

**Table 2- Pollution Indicators by 4-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
2873	Nitrogenous Fertilizers	36,595	35,415	20,039	83.99
	Products of Petroleum and				
2999	Coal, Not Elsewhere	2,547	93,649	15,110	66.04
	Primary Smelting and				
3331	Refining of Copper	62,896	0	0	64.61
2911	Petroleum Refining	5,113	54,410	22,159	63.03
2611	Pulp Mills	8,425	62,668	13,151	55.85
2874	Phosphatic Fertilizers	42,200	11,173	1,952	51.15
2861	Gum and Wood Chemicals	1,638	44,782	18,861	50.21
3241	Cement, Hydraulic	39	57,641	13,948	46.35
2812	Alkalies and Chlorine	17,904	20,510	9,133	41.39
2816	Inorganic Pigments	26,840	25,647	1,196	40.34
	Plastics Materials and				
2821	Synthetic Resins, and	3,348	15,612	13,188	30.70
	Primary Production of				
3334	Aluminum	998	60,841	1,758	29.62
	Asphalt Paving Mixtures and				
2951	Blocks	2	31,417	10,202	29.31
	Industrial Organic				
2869	Chemicals, Not Elsewhere	10,157	12,088	6,832	26.26
3274	Lime	5	36,310	6,638	25.82
	Primary Smelting and				
3339	Refining of Nonferrous	17,506	3,558	526	20.32
	Electrometallurgical				
3313	Products, Except Steel	3,749	20,851	2,441	16.53
	Steel Works, Blast				
3312	Furnaces, and Rolling Mills	1,833	17,680	3,119	14.27
	Cyclic Organic Crudes and				
2865	Intermediates, and Organic	10,271	4,002	1,066	13.92
	Industrial Inorganic				
2819	Chemicals, Not Elsewhere	3,116	11,092	3,546	13.46
2631	Paperboard Mills	1,172	16,632	3,162	13.22
	Brick and Structural Clay				
3251	Tile	29	10,387	5,405	12.90
2621	Paper Mills	969	14,477	3,603	12.78
	Secondary Smelting and				
3341	Refining of Nonferrous	2,277	19,272	1,297	12.56
	Minerals and Earths, Ground				
3295	or Otherwise Treated	957	17,691	2,376	12.22
2822	Synthetic Rubber	11,055	0	0	11.36
	Medicinal Chemicals and				
2833	Botanical Products	5,451	5,487	1,653	10.52
2823	Cellulosic Manmade Fibers	10,134	0	0	10.41
	Manmade Organic Fibers,				
2824	Except Cellulosic	1,362	5,540	2,486	7.64
2813	Industrial Gases	1,305	3,755	2,572	6.96
2892	Explosives	944	4,364	2,569	6.84
2895	Carbon Black	6,592	0	0	6.77

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
359	Miscellaneous Industrial and Commercial Machinery and Equipment	60	307	24		
36	Electronic and Other Electrical Equipment and Components, Except Computer Equipment				Low	Low
361	Electric Transmission and Distribution Equipment	67	1,587	242		
362	Electrical Industrial Apparatus	98	2,262	652		
363	Household Appliances	135	321	247		
364	Electric Lighting and Wiring Equipment	115	93	69		
365	Household Audio and Video Equipment, and Audio Recordings	96	28	28		
366	Communications Equipment	66	77	65		
367	Electronic Components and Accessories	194	29	20		
369	Miscellaneous Electrical Machinery, Equipment, and Supplies	216	116	37		
37	Transportation Equipment				Medium	Medium
371	Motor Vehicles and Motor Vehicle Equipment	186	421	324		
372	Aircraft and Parts	138	110	61		
373	Ship and Boat Building and Repairing	258	151	123		
374	Railroad Equipment	72	1,554	523		
375	Motorcycles, Bicycles, and Parts	76	1,219	1,149		
376	Guided Missiles and Space Vehicles and Parts	151	45	16		
379	Miscellaneous Transportation Equipment	47	782	105		
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks				Low	Low
381	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments,	25	0	0		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
	and Equipment					
382	Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments	46	16	13		
384	Surgical, Medical, and Dental Instruments and Supplies	66	4	2		
385	Ophthalmic Goods	140	46	31		
386	Photographic Equipment and Supplies	766	1,887	752		
387	Watches, Clocks, Clockwork Operated Devices, and Parts	85	0	0		
39	Miscellaneous Manufacturing Industries					
391	Jewelry, Silverware, and Plated Ware	47	50	13		
393	Musical Instruments	94	193	169		
394	Dolls, Toys, Games and Sporting and Athletic Goods	44	21	18		
395	Pens, Pencils, and Other Artists' Material	161	224	201		
396	Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, Except Precious Metal	136	0	0		
399	Miscellaneous Manufacturing Industries	225	120	89		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
20	Food and Kindred Products				High	Medium
201	Meat Products	25	671	488		
202	Dairy Products	162	530	345		
203	Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties	45	230	88		
204	Grain Mill Products	172	7,048	1,104		
205	Bakery Products	6	23	19		
206	Sugar and Confectionery Products	41	2,436	815		
207	Fats and Oils	357	4,794	2,021		
208	Beverages	41	2,140	1,420		
209	Miscellaneous Food Preparations and Kindred Products	25	267	103		
21	Tobacco Products				Medium	Medium
211	Cigarettes	150	0	0		
212	Cigars	3	0	0		
213	Chewing and Smoking Tobacco and Snuff	0	118	21		
214	Tobacco Stemming and Redrying	209	900	572		
22	Textile Mill Products				Low	High
221	Broadwoven Fabric Mills, Cotton	22	1,365	861		
222	Broadwoven Fabric Mills, Manmade Fiber and Silk	21	92	27		
223	Broadwoven Fabric Mills, Wool	148	261	50		
224	Narrow Fabric and Other Smallwares Mills	5	17	17		
225	Knitting Mills	29	48	23		
226	Dying and Finishing Textiles, Except Wool Fabrics and Knit Goods	334	1,652	813		
227	Carpets and Rugs	109	0	0		
228	Yarn and Thread Mills	154	301	180		
229	Miscellaneous Textile Goods	451	702	543		
230	Apparel and Other Finished Products Made From Fabrics and Similar Materials				Low	Low
231	Men's and Boy's Suits, Coats, and Overcoats	3	0	0		

TABLE 4
Pollution Indicators by SIC Code (lb/yr/employee)

SIC Code	Name	Toxic Releases	Air Emissions	Ozone Precursors	Odor Potential	Noise Potential
232	Men's and Boy's Furnishings, Work Clothing, and Allied Garments	0	15	5		
233	Women's, Misses', and Juniors' Outerwear	0	1	0		
234	Women's, Misses', Children's, and Infants' Undergarments	1	2	0		
235	Hats, Caps, and Millinery	6	0	0		
236	Girls', Children's, and Infants' Outerwear	2	0	0		
237	Fur Goods	0	0	0		
238	Miscellaneous Apparel and Accessories	10	7	7		
239	Miscellaneous Fabricated Textile Products	16	9	7		
240	Lumber and Wood Products, Except Furniture				Medium	Medium
241	Logging	0	2	0		
242	Sawmills and Planing Mills	9	2,012	418		
243	Millwork, Veneer, Plywood, and Structural Wood Members	51	1,086	460		
244	Wood Containers	1	35	5		
245	Wood Buildings and Mobile Homes	0	14	8		
249	Miscellaneous Wood Products	182	646	287		
250	Furniture and Fixtures				Medium	Medium
251	Household Furniture	85	443	402		
252	Office Furniture	107	390	360		
253	Public Building and Related Furniture	25	145	87		
254	Partitions, Shelving, Lockers, and Office and Store Fixtures	32	276	268		
259	Miscellaneous Furniture and Fixtures	39	25	25		
260	Paper and Allied Products				High	High
2611	Pulp Mills	8,425	62,668	13,151		
2621	Paper Mills	969	14,477	3,603		
2631	Paperboard Mills	1,172	16,632	3,162		
2652	Setup Paperboard Boxes	8	267	152		
2653	Corrugated and Solid Fiber Boxes	6	644	495		
2655	Fiber Cans, Tubes, Drums, and Similar Products	62	57	30		

**Table 3- Pollution Indicators by 3-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
311	Leather Tanning and Finishing	2,774	903	654	78.76
207	Fats and Oils	357	4,794	2,021	68.34
204	Grain Mill Products	172	7,048	1,104	65.58
341	Metal Cans and Shipping Containers	845	1,291	1,235	45.48
	Photographic Equipment and				
386	Supplies	766	1,887	752	40.59
208	Beverages	41	2,140	1,420	35.23
275	Commercial Printing	619	926	903	33.16
	Dying and Finishing Textiles, Except				
226	Wool Fabrics and Knit Goods	334	1,652	813	30.05
206	Sugar and Confectionary Products	41	2,436	815	28.46
362	Electrical Industrial Apparatus	98	2,262	652	26.29
375	Motorcycles, Bicycles, and Parts	76	1,219	1,149	26.16
	Coating, Engraving, and Allied				
347	Services	640	472	431	23.91
301	Tires and Inner Tubes	60	1,523	823	23.10
229	Miscellaneous Textile Goods	451	702	543	22.67
221	Broadwoven Fabric Mills, Cotton	22	1,365	861	21.74
	Miscellaneous Fabricated Metal				
349	Products	169	2,320	148	21.06
	Fabricated Rubber Products, Not				
306	Elsewhere Classified	354	683	587	20.97
242	Sawmills and Planing Mills	9	2,012	418	19.27
374	Railroad Equipment	72	1,554	523	19.26
214	Tobacco Stemming and Redrying	209	900	572	18.86
	Electric Transmission and				
361	Distribution Equipment	67	1,587	242	15.31
	Millwork, Veneer, Plywood, and				
243	Structural Wood Members	51	1,086	460	14.82
249	Miscellaneous Wood Products	182	646	287	12.50
202	Dairy Products	162	530	345	12.11
201	Meat Products	25	671	488	11.93
	Motor Vehicles and Motor Vehicle				
371	Equipment	186	421	324	11.63
308	Miscellaneous Plastics Products	455	60	48	11.50
251	Household Furniture	85	443	402	10.60
252	Office Furniture	107	390	360	10.14
	Farm and Garden Machinery and				
352	Equipment	55	673	252	9.24
363	Houshold Appliances	135	321	247	8.72

**Table 3- Pollution Indicators by 3-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
373	Ship and Boat Building and Repairing	258	151	123	8.66
228	Yarn and Thread Mills	154	301	180	8.06
	Pens, Pencils, and Other Artists'				
395	Material	161	224	201	8.02
351	Engines and Turbines	129	378	181	8.01
	Miscellaneous Transportation				
379	Equipment	47	782	105	7.67
	Miscellaneous Manufacturing				
399	Industries	225	120	89	7.21
	Gaskets, Packing, and Sealing				
	Devices and Rubber and Plastics				
305	Hose and Belting	287	3	2	6.62
	Partitions, Shelving, Lockers, and				
254	Office and Store Fixtures	32	276	268	6.37
	Micellaneous Electrical Machinery,				
369	Equipment, and Supplies	216	116	37	6.23
393	Musical Instruments	94	193	169	5.82
223	Broadwoven Fabric Mills, Wool	148	261	50	5.80
346	Metal Forgings and Stampings	127	211	72	5.31
	Electronic Components and				
367	Accessories	194	29	20	4.91
372	Aircraft and Parts	138	110	61	4.75
	Electric Lighting and Wiring				
364	Equipment	115	93	69	4.22
	Ordnance and Accessories, Except				
348	Vehicles and Guided Missiles	89	216	42	4.06
	Guided Missiles and Space Vehicles				
376	and Parts	151	45	16	3.98
	Screw Machine Products, and Bolts,				
345	Nuts, Screws, Rivits, and Washers	153	24	22	3.97
385	Ophthalmic Goods	140	46	31	3.93
344	Fabricated Structural Metal Products	82	102	89	3.81
	Miscellaneous Food Preparations				
209	and Kindred Products	25	267	103	3.79
	Canned, Frozen, and Preserved				
	Fruits, Vegetables, and Food				
203	Specialties	45	230	88	3.78

**Table 3- Pollution Indicators by 3-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
359	Miscellaneous Industrial and Commercial Machinery and Equipment	60	307	24	3.71
343	Heating Equipment, Except Electric and Warm Air; and Plumbing Fixtures	111	101	30	3.62
302	Rubber and Plastic Footwear	62	107	104	3.60
342	Cutlery, Handtools, and General Hardware	138	37	14	3.59
211	Cigarettes	150	0	0	3.44
396	Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, Except Precious Metal	136	0	0	3.11
358	Refrigeration and Service Industry Machinery	56	114	76	3.10
277	Greeting Cards	30	119	107	3.00
366	Communications Equipment	66	77	65	2.95
356	General Industrial Machinery and Equipment	40	116	83	2.87
253	Public Building and Related Furniture	25	145	87	2.77
365	Household Audio and Video Equipment, and Audio Recordings	96	28	28	2.77
313	Boot and Shoe Cut Stock and Findings	44	79	79	2.67
227	Carpets and Rugs	109	0	0	2.49
353	Construction, Mining, and Materials Handling Machinery and Equipment	25	109	70	2.28
278	Blankbooks, Looseleaf Binders, and Bookbinding and Related Work	22	96	76	2.21
354	Metalworking Machinery and Equipment	85	12	2	2.05
387	Watches, Clocks, Clockwork Operated Devices, and Parts	85	0	0	1.95
355	Special Industry Machinery, Except Metalworking Machinery	64	13	12	1.73
391	Jewelry, Silverware, and Plated Ware	47	50	13	1.59
384	Surgical, Medical, and Dental Instruments and Supplies	66	4	2	1.56
273	Books	10	66	58	1.49

**Table 3- Pollution Indicators by 3-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
	Broadwoven Fabric Mills, Manmade				
222	Fiber and Silk	21	92	27	1.47
259	Miscellaneous Furniture and Fixtures Dolls, Toys, Games and Sporting and Athletic Goods	39	25	25	1.42
394	Leather Goods, Not Elsewhere	44	21	18	1.41
319	Classified Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments	0	67	66	1.39
382	Instruments	46	16	13	1.34
225	Knitting Mills	29	48	23	1.31
276	Manifold Business Forms	55	1	1	1.27
357	Computer and Office Equipment	36	24	21	1.27
213	Chewing and Smoking Tobacco and Snuff	0	118	21	1.07
314	Footwear, Except Rubber	32	3	2	0.78
272	Periodicals: Publishing, or Publishing and Printing	3	33	32	0.75
271	Newspapers: Publishing, or Publishing and Printing	0	31	27	0.59
381	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical Systems, Instruments, and Equipment	25	0	0	0.58
205	Bakery Products	6	23	19	0.55
239	Miscellaneous Fabricated Textile Products	16	9	7	0.52
317	Handbags and Other Personal Leather Goods	5	17	17	0.47
224	Narrow Fabric and Other Smallwares Mills	5	17	17	0.46
279	Service Industries for the Printing Trade	7	13	13	0.44
238	Miscellaneous Apparel and Accessories	10	7	7	0.37
316	Luggage	11	5	3	0.34
244	Wood Containers	1	35	5	0.33
245	Wood Buildings and Mobile Homes	0	14	8	0.21
232	Men's and Boy's Furnishings, Work Clothing, and Allied Garments	0	15	5	0.17
235	Hats, Caps, and Millinery	6	0	0	0.13
274	Miscellaneous Publishing	1	3	3	0.08

**Table 3- Pollution Indicators by 3-Digit SIC Code
(lb/yr/employee)**

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
212	Cigars	3	0	0	0.07
231	Men's and Boy's Suits, Coats, and Overcoats	3	0	0	0.06
236	Girls', Children's, and Infants' Outerwear	2	0	0	0.05
234	Women's, Misses', Children's, and Infants' Undergarments	1	2	0	0.03
241	Logging	0	2	0	0.02
233	Women's, Misses', and Juniors' Outerwear	0	1	0	0.01
237	Fur Goods	0	0	0	0.00
315	Leather Gloves and Mittens	0	0	0	0.00
	Total	14,561	51,317	23,209	1,000

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In the second section, the author details the various methods used to collect and analyze the data. This includes both manual and automated processes. The goal is to ensure that the data is as accurate and reliable as possible.

The third part of the document focuses on the results of the analysis. It shows that there is a clear trend in the data, which is consistent with the initial hypothesis. This finding is significant as it provides strong evidence for the proposed model.

Finally, the document concludes with a summary of the findings and a list of recommendations for future research. It suggests that further studies should be conducted to explore the underlying causes of the observed trends.

Table 2- Pollution Indicators by 4-Digit SIC Code
(lb/yr/employee)

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
	Chemicals and Chemical				
2899	Preparations, Not Elsewhere Pesticides and Agricultural	1,567	3,533	1,845	6.00
2879	Chemicals, Not Elsewhere	2,752	1,855	1,054	5.26
3292	Asbestos Products	3,174	1,460	715	5.00
	Aluminum Sheet, Plate, and				
3353	Foil	489	2,050	1,851	4.27
3275	Gypsum Products	2	6,755	864	4.22
3211	Flat Glass	37	2,901	1,886	4.22
3221	Glass Containers	39	3,247	1,614	3.95
	Aluminum Rolling and				
3355	Drawing, Not Elsewhere	177	5,287	591	3.35
2952	Asphalt Felts and Coatings	31	3,345	1,191	3.32
2891	Adhesives and Sealants	688	3,415	673	3.21
	Surface Active Agents,				
2843	Finishing Agents, Sulfonated	2,392	189	101	2.70
	Pressed and Blown Glass				
3229	and Glassware, Not	155	1,687	1,120	2.63
	Cold-Rolled Steel Sheet,				
3316	Strip, and Bars	2,083	456	187	2.63
	Gray and Ductile Iron				
3321	Foundries	240	4,179	363	2.59
	Paint, Varnishes, Lacquers,				
2851	Enamels, and Allied	1,293	576	477	2.32
	Steel Wiredrawing and Steel				
3315	Nails and Spikes	839	2,162	286	2.23
	Nonferrous Foundries,				
3369	Except Aluminum and	529	979	712	2.07
	Cut Stone and Stone				
3281	Products	7	3,741	256	2.00
	Coated and Laminated				
2672	Paper, Not Elsewhere	1,097	354	343	1.81
	Structural Clay Products,				
3259	Not Elsewhere Classified	4	1,499	648	1.65
	Lubricating Oils and				
2992	Greases	151	844	718	1.64
2834	Pharmaceutical Preparations	635	744	373	1.55
	Packaging Paper and Plastic				
2671	Film, Coated and Laminated	423	556	555	1.54
3296	Mineral Wool	291	1,469	393	1.54
	Rolling, Drawing, and				
3351	Extruding of Copper	889	1,179	38	1.47
3255	Clay Refractories	39	2,033	238	1.28
2893	Printing Ink	265	962	378	1.27
	Corrugated and Solid Fiber				
2653	Boxes	6	644	495	1.05
	Soap and Other Detergents,				
2841	Except Specialty Cleaners	162	933	301	1.03
3297	Nonclay Refractories	85	932	346	1.03

Table 2- Pollution Indicators by 4-Digit SIC Code
(lb/yr/employee)

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
	Converted Paper and				
2679	Paperboard Products, Not	450	636	174	1.00
3322	Malleable Iron Foundries	19	1,773	126	0.97
3317	Steel Pipe and Tubes	702	116	110	0.94
	Steel Foundries, Not				
3325	Elsewhere Classified	296	500	236	0.89
	Primary Metal Products, Not				
3399	Elsewhere Classified	454	489	95	0.82
	Rolling, Drawing, and				
3356	Extruding of Nonferrous	632	110	64	0.80
3291	Abrasive Products	187	506	229	0.76
3264	Porcelain Electrical Supplies	180	315	199	0.63
	Nonmetallic Mineral				
3299	Products, Not Elsewhere	265	462	71	0.58
	Perfumes, Cosmetics, and				
2844	Other Toilet Preparations	40	335	209	0.51
	Aluminum Extruded				
3354	Products	191	135	109	0.42
	Specialty Cleaning,				
2842	Polishing, and Sanitation	75	174	167	0.41
3253	Ceramic Wall and Floor Tile	342	76	4	0.39
2875	Fertilizers, Mixing Only	313	67	7	0.36
2652	Setup Paperboard Boxes	8	267	152	0.36
	Biological Products, Except				
2836	Diagnostic Substances	322	0	0	0.33
	Concrete Products, Except				
3272	Block and Brick	6	352	106	0.32
3324	Steel Investment Foundries	153	293	22	0.32
	Vitreous China Plumbing				
3261	Fixtures and China	73	116	91	0.27
3273	Ready-Mixed Concrete	1	418	56	0.27
	Drawing and Insulating of				
3357	Nonferrous Wire	165	59	43	0.26
	Folding Paperboard Boxes,				
2657	Including Sanitary	226	7	7	0.25
3398	Metal Heat Treating	196	57	11	0.24
	Sanitary Food Containers,				
2656	Except Folding	103	64	64	0.23
3366	Copper Foundries	196	5	4	0.21
3363	Aluminum Die-Castings	202	0	0	0.21
	Die-Cut Paper and				
2675	Paperboard and Cardboard	152	22	14	0.19
	Plastics, Foil, and Coated				
2673	Paper Bags	115	15	15	0.15
	Fiber Cans, Tubes, Drums,				
2655	and Similar Products	62	57	30	0.13
	Glass Products, Made of				
3231	Purchased Glass	50	44	35	0.12

Table 2- Pollution Indicators by 4-Digit SIC Code
(lb/yr/employee)

SIC Code	Name	Toxics Releases	Air Emissions	Ozone Precursors	Combined Indicators
3364	Nonferrous Die-Castings, Except Aluminum	77	0	0	0.08
2676	Sanitary Paper Products	72	2	2	0.08
3271	Concrete Block and Brick	8	118	6	0.07
3365	Aluminum Foundries	48	15	5	0.06
3262	Vitreous China Table and Kitchen Articles	48	0	0	0.05
2677	Envelopes	35	5	5	0.04
3269	Pottery Products, Not Elsewhere Classified	2	48	14	0.04
2674	Uncoated Paper and Multiwall Bags	22	0	0	0.02
2835	In Vitro and In Vivo Diagnostic Substances	13	0	0	0.01
2678	Stationary, Tablets, and Related Products	9	0	0	0.01
3263	Fine Earthenware Table and Kitchen Articles	0	0	0	0.00
	Total	324,479	784,574	213,081	1,000

Table 3