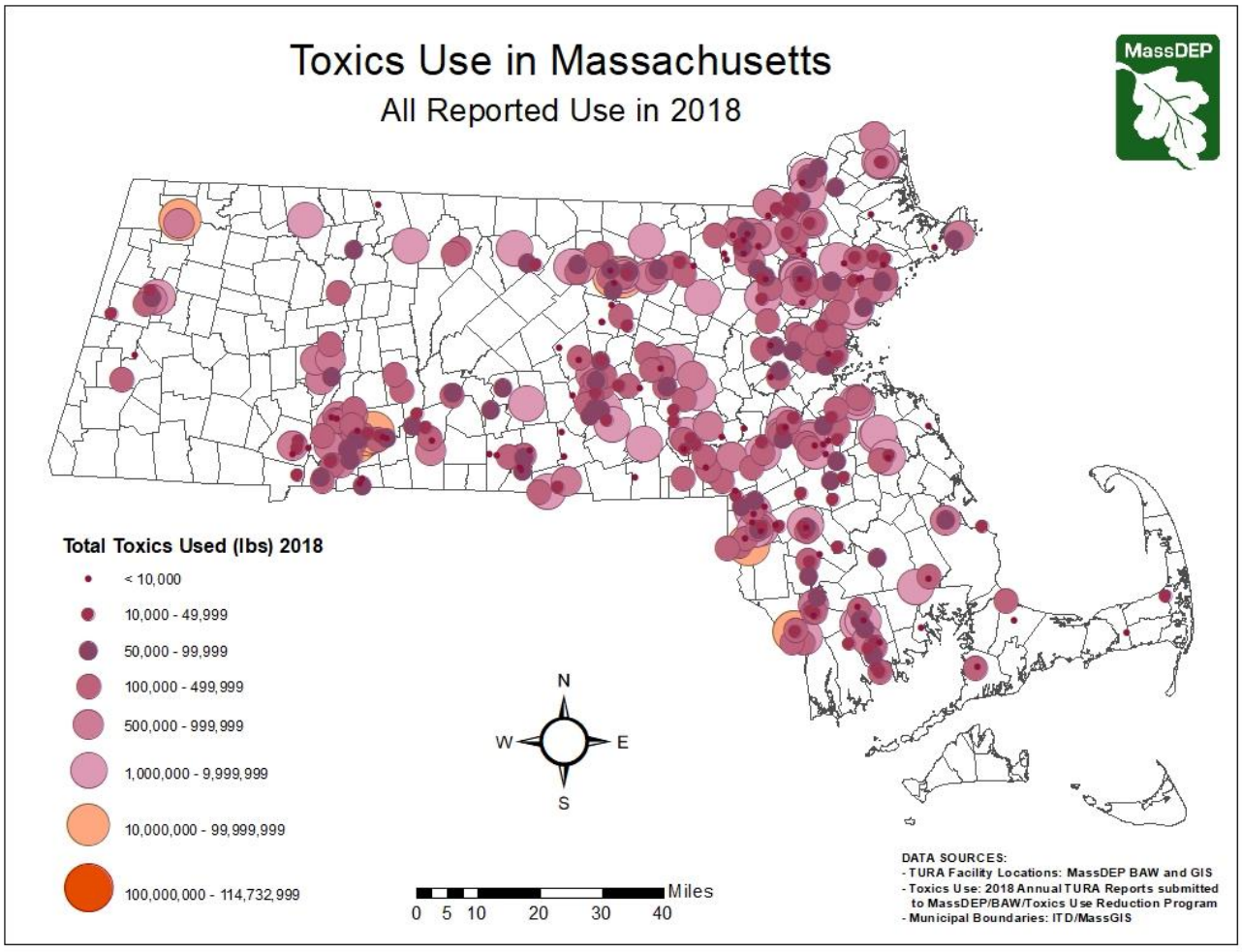
Reporting Year 2018
Toxics Use Reduction
Information Release



Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Department of Environmental Protection

Developed in collaboration with:
Toxics Use Reduction Institute
Office of Technical Assistance and Technology

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Executive Summary

In 1989, the Toxics Use Reduction Act (TURA) (Chapter 21I of the Massachusetts General Laws) was enacted, to protect public health and the environment by promoting the efficient use of toxic chemicals. TURA established incentives that encourage facilities to use toxic chemicals (hereinafter referred to as chemicals, toxics, or toxic chemicals) only when necessary to make a product and to waste as little as possible in the production process. TURA has been successful. Massachusetts manufacturers and other businesses subject to TURA have dramatically reduced their reliance on toxic chemicals making Massachusetts a national leader in toxics use reduction. Through toxics use reduction, Massachusetts businesses have saved money while reducing pollution released to the environment, chemical transportation risks, workplace hazards, and toxics in products and waste.

453 facilities reported using 131 different chemicals in 2018. In total (including data submitted as trade secret data – as defined on page 4), from 1990 to 2018, the following reductions were observed:

- Chemical Use (from 1.2 to 0.7 billion pounds)
- Byproduct Generation (from 127 to 73 million pounds)
- Shipped in Product (from 434 to 355 million pounds)
- On-Site Releases (from 21 to 3 million pounds)
- Transfers Off-Site (from 46 to 34 million pounds)

From 2007 to 2018, 2007 Core Group (as defined on page 4) facilities:

- reduced toxic chemical use by 41% (from 792 to 468 million pounds)
- reduced toxic byproducts by 10% (from 75 to 68 million pounds)
- increased toxic chemicals shipped in product by 27% (from 272 to 246 million pounds)
- reduced on-site releases of toxic chemicals to the environment by 61% (from 6 to 2 million pounds)
- increased transfers of toxic chemicals off-site for further waste management by 25% (from 25 to 31 million pounds).

This report includes the following six sections:

Section I: **Introduction**

Section II: **Key TURA Terms**

Section III: **2018 Toxics Use Reduction Progress** analyzes changes in reported chemical use and byproduct that can be attributed to the adoption of toxics use reduction by TURA filers, and associated reductions in pollution.

Section IV: **2018 Chemical Data** summarizes the reported information on chemical use in calendar year 2018 including detailed information on the top twenty chemicals used, generated as byproduct, shipped in product, released on-site as air or water pollution onsite, and shipped off-site for treatment and disposal.

Section V: **2018 Chemicals of Particular Concern** presents current and historical information on particularly toxic chemicals, on chemicals that promote asthma, and on carcinogens.

Section VI: **2018 Significant Industrial Sectors** describes the relative contributions of different industrial sectors to chemical use, waste and release.

Section VII: **2018 Major TURA Facilities** presents the top 20 facilities for use, byproduct generation, shipped in product, released to the environment and shipped offsite for treatment and disposal.

This 2018 Toxics Use Reduction Information Release contains chemical information useful to the public, government, and industry. However, because the data in this report is collected only from facilities within certain industrial sectors that have ten or more full-time employees, and use certain chemicals above established reporting thresholds, this report does not provide a complete picture of the use and release of all toxic chemicals in Massachusetts.

Downloadable data extracts, for reporting years 1990 through 2018, can be found at http://www.mass.gov/eea/agencies/massdep/toxics/reports/tura-data-and-results.html. The data extracts include all reported TURA data, with the exception of trade secret data, in an Excel format.

I. Introduction

This report describes toxic chemical use in Massachusetts in 2018 and progress in toxics use reduction (TUR) under the Toxics Use Reduction Act (TURA). TURA was enacted in 1989 in order to reduce the risks to the public, workers, and the environment from exposure to toxic chemicals. Rather than taking the then traditional "command and control" approach to pollution control and worker health and safety, TURA created incentives for Massachusetts facilities to reduce the amount of toxics used and wasted in their production processes. TURA requires Large Quantity Toxics Users (LQTUs, hereinafter referred to as filers) to submit annual reports to the Massachusetts Department of Environmental Protection (MassDEP). These reports detail the quantity of the listed chemicals they use, ship in product, "generate as byproduct" (waste -- neither shipped in product nor convert to another chemical during the production process), release to the environment as pollution, and ship offsite for waste treatment and disposal. Facilities are filers if they meet the following criteria:

- fall within Manufacturing Standard Industrial Classification SIC) codes (20-39 inclusive) and those in SIC codes 10-14, 40, 44-51, 72, 73, 75 and 76, or the corresponding NAICS codes,
- have ten or more full-time employee equivalents, and
- use listed toxic substances at or above reporting thresholds

Filers are also required to pay an annual fee based on the number of chemicals they use and the number of workers they employ, and must develop biennial TUR plans. TUR Plans identify techniques that the facility could adopt that could reduce the use and waste of toxic chemicals in their production processes and evaluate which of these TUR techniques would save the facility money if implemented. Although facilities are not required to implement identified TUR techniques, many do. The plans are not submitted to MassDEP for review and approval. Instead, they must be approved by a MassDEP-certified toxics use reduction planner (TURP). After several toxics use reduction planning efforts, facilities have the option of developing reduction plans for energy use, water use, solid waste disposal or use of other chemicals instead of the traditional TUR plan.

TURA also promotes toxics use reduction through two agencies that provide toxics use reduction education and assistance: The Office of Technical Assistance (OTA) and the Toxics Use Reduction Institute (TURI).

The work of MassDEP, OTA and TURI is supported by the fees paid by the filers and coordinated by the Toxics Use Reduction Administrative Council (Council). The Council is a governing body consisting of the Secretaries of Energy and Environmental Affairs, Economic Development, and Public Safety, the Commissioners of MassDEP and the Department of Public Health, and the Director of Labor and Workforce Development, and chaired by the Secretary of Energy and Environmental Affairs.

Massachusetts Department of Environmental Protection Toxics Use Reduction Program: www.mass.gov/dep/toxics/toxicsus.htm.

Office of Technical Assistance (OTA)

The Office of Technical Assistance and Technology (OTA) provides free, confidential, non-regulatory technical assistance to facilities seeking to reduce the use of toxics, develops fact sheets and other technical guidance documents, supports the development of technology solutions by leveraging state and federal funding, and creates marked-based incentives to reduce toxics use for qualifying TURA filers.
https://www.mass.gov/eea/ota

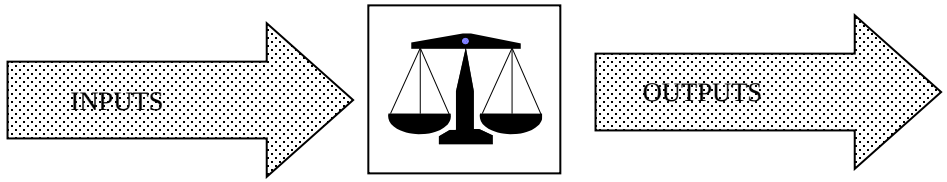
Toxics Use Reduction Institute (TURI)

The Toxics Use Reduction Institute (TURI) at the University of Massachusetts, Lowell provides toxics use reduction education, training, and library services; supports research on cleaner materials and processes; provides toxics use reduction grants for businesses, industries and communities; and operates a laboratory for testing non-toxic or less-toxic cleaning alternatives. TURI also makes TURA data available on its website (http://turadata.turi.org/) in a user-friendly way that is searchable by community, chemical or facility.
ww.turi.org

II. Key TURA Terms

TURA – Massachusetts Toxics Use Reduction Act of 1989 (MGL c. 21I)
TRI – federal EPA Toxics Release Inventory
TRADE SECRET DATA– the information identified as confidential by TURA filers and not determined to be otherwise by the Commissioner of MassDEP. To protect confidentiality claims by TURA filers, all trade secret data in this information release are presented in aggregated form. Aggregated data do not include the names and amounts of chemicals subject to claims of confidentiality.
2007 CORE GROUP -- – includes all industry categories and chemicals that were subject to TURA reporting in 2007 and remained subject to reporting in the current reporting year at the same reporting threshold. The 2007 Core Group is used to measure progress from 2007, the first reporting year since the 2006 TURA Amendments became effective. The 2007 Core Group does not include trade secret quantities.

The terms and definitions below have been arranged in order of inputs and outputs. Chemicals that are used by facilities brought into the facility and are manufactured, processed or otherwise used. As a result of using these chemicals, a facility has outputs that can include a product that is created for sale, or a waste ("byproduct" as defined by TURA). The calculation of use and waste of chemicals is known as 'mass balance.' Generally, the inputs equal the outputs, but there are some circumstances in which there is an imbalance between inputs and outputs. These most often the result of: 1) chemicals being recycled on-site, 2) the product being held in inventory, 3) chemicals being consumed or transformed into another chemical during the production process, or 4) the chemical is a metal in a compound as a result use is calculated differently than byproduct. For metal compounds, use is calculated as the total amount of the compound while byproduct is calculated as only the amount of the parent metal in the compound.



TOTAL USE – the total quantity in pounds of TURA chemicals reported as manufactured, processed and otherwise used.

MANUFACTURE – TURA defines "manufacture", in part, as: "to produce, prepare, import or compound a toxic or hazardous substance".

PROCESS – TURA defines "process", in part, as: "the preparation of a toxic or hazardous substance, after its manufacture, for distribution in commerce".

OTHERWISE USE – "Otherwise use" is defined in the TURA regulations (310 CMR 50.10), in part, as "any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product".

PRODUCT – a product, a family of products, an intermediate product, family of intermediate products, or a desired result or a family of results. "Product" also means a byproduct that is used as a raw material without treatment.
SHIPPED IN PRODUCT – the quantity in pounds of the chemical that leaves the facility as product.
BYPRODUCT – all non-product outputs of reportable substances generated by a production unit prior to handling, treatment, and release.
ON-SITE RELEASES – chemicals released to the air, land, surface or groundwater at the facility
TRANSFERS OFF-SITE – chemicals shipped offsite to a wastewater treatment or waste management, or recycling facility

III. 2018 Toxics Use Reduction Progress

In order to protect the environment, public, and workers from the adverse effects of toxic chemicals, the Toxics Use Reduction Act (TURA) established incentives that encourage facilities to implement toxics use reduction (TUR) techniques that result in:

1) the use of toxic chemicals only when necessary to make a product, and
2) the smallest possible amount of toxic chemicals are wasted in the production process.

TURA has been a resounding success. TURA's initial goal of a 50% reduction in the quantity of toxic chemicals "generated as byproduct" (wasted – neither shipped in product nor converted into another chemical during production) was met by 1997, and the TURA program has continued to make progress in TUR in the ensuing years. This section of the report describes the trends in chemical use by filers.

Trends in the Numbers of Filers and Reported Chemical Use, Byproduct, On-site Releases, and Transfers Off-Site for Treatment or Disposal

As shown in Figures 1 and 2 below, the number of different TURA-listed chemicals used in the Commonwealth at reportable levels, the number of facilities using those chemicals, and the total amount of those chemicals used, generated as byproduct, released to the environment, and shipped off-site for treatment and disposal has declined in the twenty-eight years since 1990.

As shown in Figure 1, out of 1,416 chemicals listed under TURA, 131 were reported in 2018. The number of filers rose from 686 in 1990 to 728 in 1991 and 1992, gradually declined, and then rose again to 713 in 2001, largely due to the promulgation of a lower reporting threshold for persistent bioaccumulative toxic (PBT) chemicals (see Section IV, 2018 TURA Chemical Data). The number of filers has since declined to 453 in 2018. The number of individual chemical reports submitted (facilities file one Form S for each chemical reported) has followed a similar trend, decreasing from a high of 2,666 in 1994, to 1,567 in 2018, consistent with the decline in the number of TURA filers.

These reported amounts are influenced by changes in regulatory requirements. For example, the number of individual chemicals reported reached a high of 202 in 1996 due to an expansion in the chemical list, and the number of TURA filers increased to a high of 713 in 2001, due to a drop in the reporting threshold for certain chemicals. The number of chemical reports dropped by approximately 25% in 2007 when the TURA reporting threshold was raised for certain manufactured and processed chemicals to match the EPA TRI threshold. Individual chemical reports have since declined as Massachusetts businesses reported using fewer chemicals.

As shown in Figure 2, chemical use decreased from 1.2 billion pounds in 1990 to 0.7 billion pounds in 2018. Byproduct generation decreased from 127 million pounds in 1990 to 73 million pounds in 2018.

Figure 1
# of TURA Filers, Individual Chemical Reports, and Different Chemicals Reported (1990-2018)
(Including Trade Secret Data)

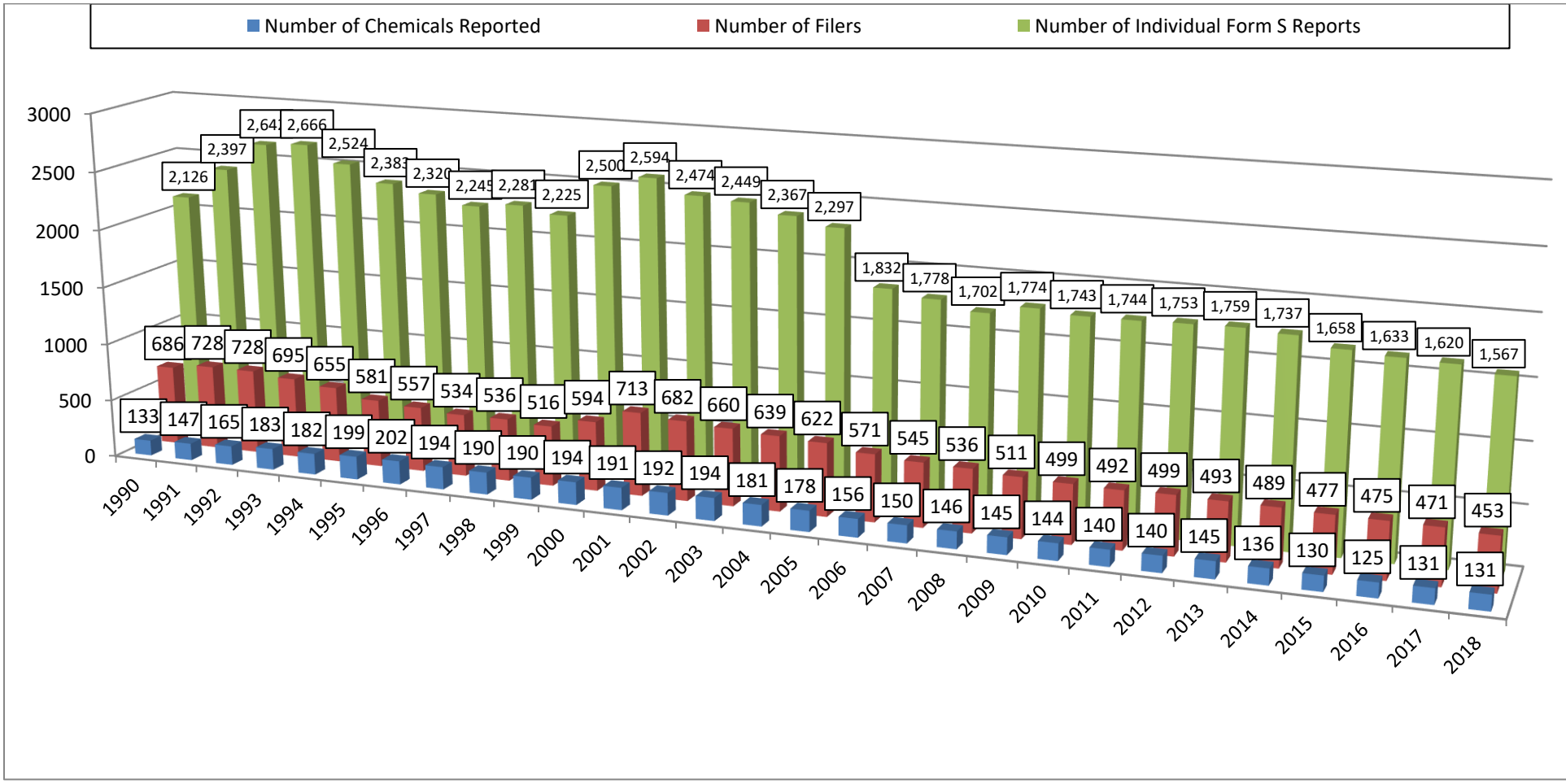
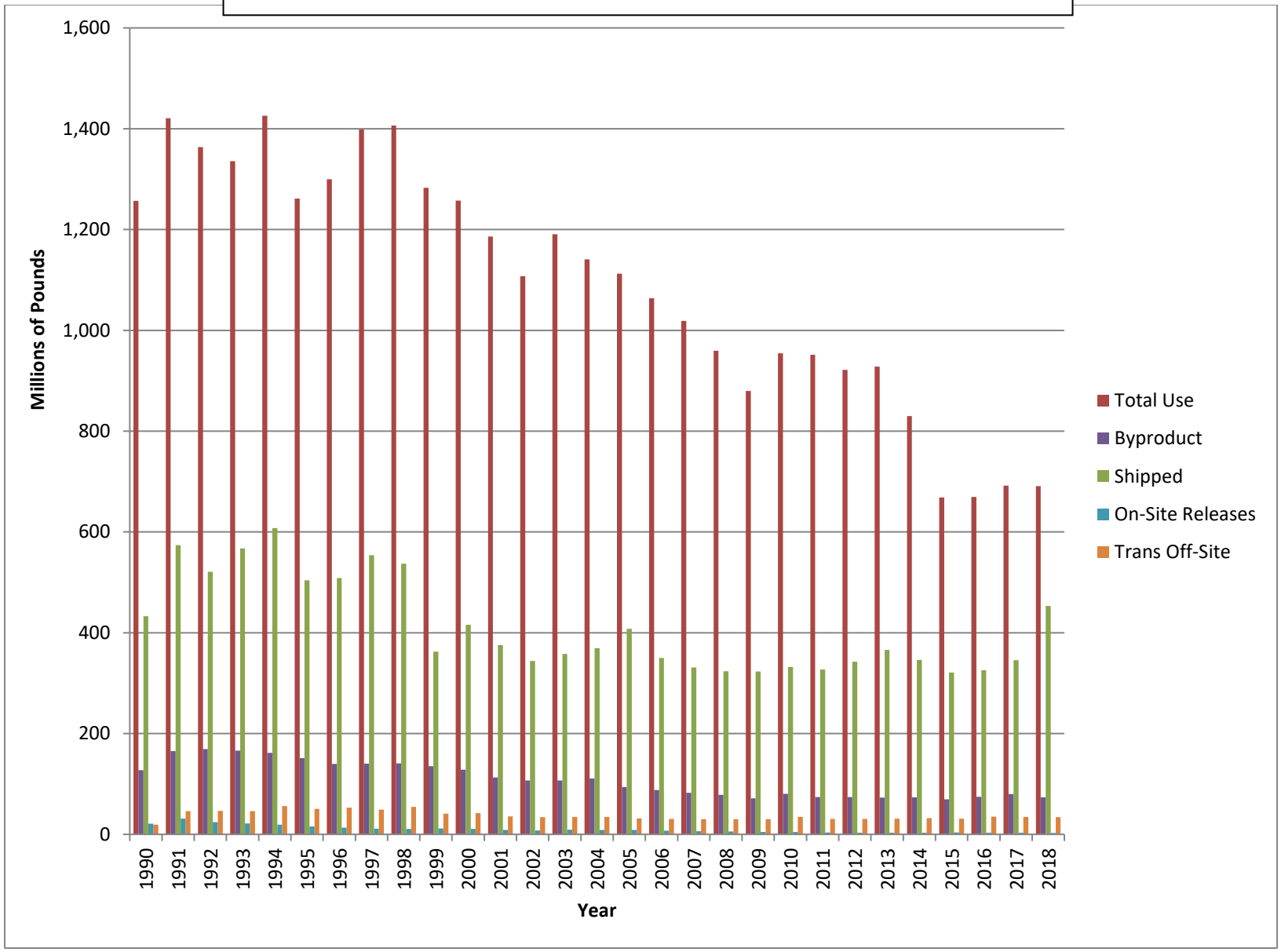


Figure 2
Raw Reported Data on the Pounds of Total Use, Generated as Byproduct, Shipped in or as Product, Released On-Site and Transferred Off-Site for Treatment or Disposal
Reporting Years 1990-2018 (includes trade secret data)



Progress in Toxics Use Reduction: 2007 Core Group

The 2007 Core Group includes all industry categories and chemicals that were subject to TURA reporting in 2007 and remained subject to reporting in 2018 at the same reporting threshold. The 2007 Core Group is used to measure progress from 2007, the first reporting year after the 2006 TURA Amendments became effective. (The 2007 Core Group excludes trade secret chemicals and chemicals designated as higher hazard substances (HHS) that were filed under the lower 1,000 pound threshold after 2007. It also excludes N-Propyl Bromide, which was first listed in 2010 and designated as a HHS in 2016.) The 2007 Core Group includes 424 filers, which represents 94% of the 2018 TURA filers.

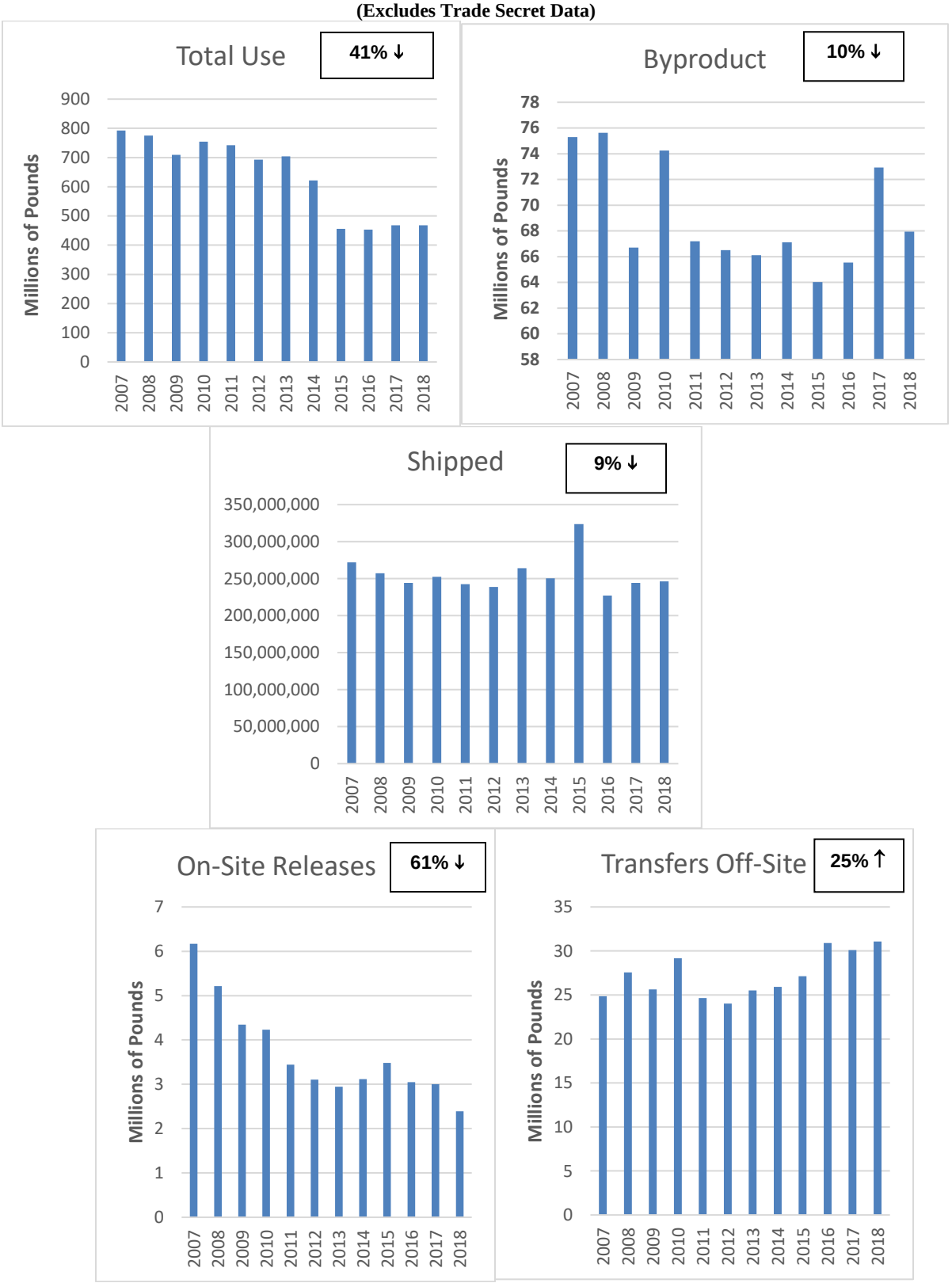
Table 1 and Figure 3 below summarize TURA data from 2007 to 2018, excluding trade secret data. The quantities reported by the 2007 Core Group over the period 2007 to 2018 are shown in Table 1. From 2007 to 2018, 2007 Core Group facilities:

- reduced toxic chemical use by 41% (from 792 to 468 million pounds)
- reduced toxic byproducts by 10% (from 75 to 68 million pounds)
- increased toxic chemicals shipped in product by 27% (from 272 to 246 million pounds)
- reduced on-site releases of toxic chemicals to the environment by 61% (from 6 to 2 million pounds)
- increased transfers of toxic chemicals off-site for further waste management by 25% (from 25 to 31 million pounds).

Table 1
2007 CORE GROUP DATA: 2007-2018 TREND SUMMARY
(Quantities are in millions of pounds and do not include trade secret data)

Year	Total Use	Byproduct	Shipped in Product	On-Site Releases	Transfers Off-Site
2007	792.35	75.30	271.92	6.17	24.85
2008	774.75	75.64	257.38	5.21	27.57
2009	708.84	66.69	244.25	4.35	25.63
2010	754.15	74.24	252.55	4.23	29.17
2011	742.17	67.20	242.66	3.44	24.66
2012	693.00	66.51	238.63	3.11	24.03
2013	703.99	66.11	264.04	2.95	25.53
2014	621.58	67.13	250.47	3.11	25.92
2015	456.21	64.03	323.68	3.49	27.12
2016	453.48	65.55	227.24	3.05	30.91
2017	468.36	72.93	244.33	3.00	30.09
2018	467.57	67.94	246.25	2.39	31.06
Percent Change 2007-2018	41% Reduction	10% Reduction	9% Reduction	61% Reduction	25% Increase

Figure 3 – 2007 Core Group Toxics Use Reduction Progress 2007-2018
(Excludes Trade Secret Data)



IV. 2018 TURA Chemical Data

Table 2 All Reported Chemical Data 2018 (rounded to millions of pounds) (Includes Trade Secret Data)		
TOTAL USE	691,000,000	
SHIPPED IN PRODUCT	355,000,000	51% of total chemical use
GENERATED AS BYPRODUCT (total waste prior to treatment or disposal)	73,000,000	11% of total chemical use
ON-SITE RELEASES (to air, water or land disposal)	3,000,000	0.4% of total chemical use 4% of total byproduct
TRANSFERS OFF-SITE (to a wastewater treatment plant, recycling or waste management facility for treatment or disposal)	34,000,000	5% of total chemical use 47% of total byproduct

Trade Secret

Under certain circumstances facilities have the right to claim that the amount of chemical they use and generate as byproduct is a trade secret. As long as the regulatory standards for making such a claim are met and the Commissioner has not made a determination that the information is not a trade secret, MassDEP may not share that information. In 2018, nine facilities made trade secret claims on a combined total of:

- 222 million pounds of chemical use
- 5 million pounds of byproduct generation
- 108 million pounds shipped in product.

Chemical Use by Use Category

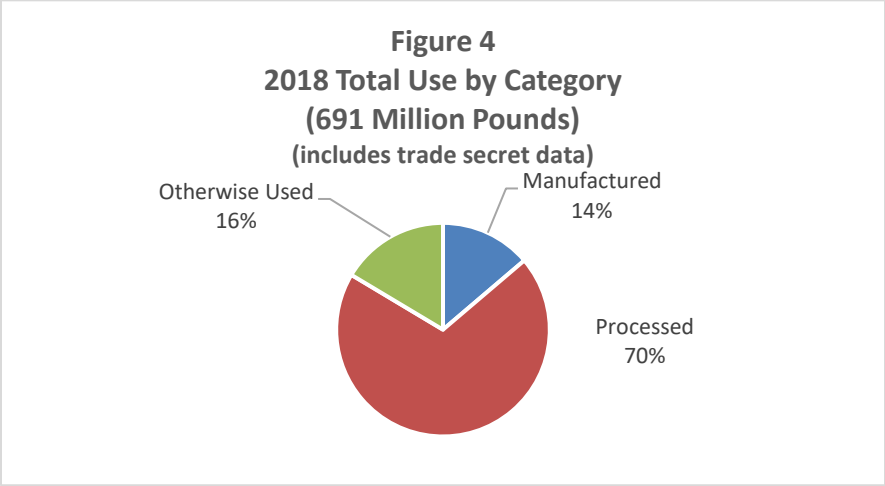
TURA requires that facilities report chemical use in one of three use categories, identified by the Federal Toxics Release Inventory (TRI) program.

Manufacture is defined in TURA, in part, as "to produce, prepare, import or compound a toxic or hazardous substance". For example, the intentional manufacture of a chemical substance such as formaldehyde or the "coincidental" (unintentional) manufacture of chemicals such as the creation of sulfuric acid from fuel combustion for power generation and the production of nitrate compounds as a result of using nitric acid to treat wastewater. Chemicals that are imported are also counted as "manufactured". Manufacturing represented 14% of total chemical use in 2018.

Process is defined in TURA, in part, as "the preparation of a toxic or hazardous substance, after its manufacture, for distribution in commerce". Most chemical use in Massachusetts is processed. Chemicals processed accounted for 70% of 2018 total chemical use.

Otherwise Use is defined in the TURA regulations (310 CMR 50.10), in part, as "any use of a toxic substance that is not covered by the terms "manufacture" or "process". These substances are neither chemically converted nor incorporated directly into a product. Examples include chemicals used to clean parts prior to plating for finishing, chemical solvents used to carry a coating that evaporate off the product as the coating dries, catalysts, chemicals contained in fuels that are combusted, and chemicals used in waste treatment operations. Chemicals "otherwise used" accounted for 16% of 2018 total chemical use.

Figure 4 below shows the proportion of use for the three use categories:



Top 20 Chemicals

In 2018, filers reported using 131 out of the 1,416 TURA-listed chemicals in amounts above the reporting threshold. The data was analyzed by chemical to identify the top 20 chemicals in each of the following amounts: used, generated as byproduct, shipped in product, released on-site as pollution, and shipped off-site for treatment or disposal.

Chemical Use

As shown in Table 3 below, the 2018 top 20 chemicals accounted for 84%, (394 million pounds) of the total reported (trade secret data was excluded to protect confidentiality claims). The top four chemicals, Sodium Hydroxide (15% of total use, 154 facilities, 71 million pounds), Methanol (14% of total use, 31 facilities, 67 million pounds), Hydrochloric Acid (12% of total use, 42 facilities, 58 million pounds), and Sodium Hypochlorite (8% of total use, 32 facilities, 37 million pounds), accounted for almost half of the total reported use (excluding trade secret data) in the state.

Tables 4 and 5 show the top 20 chemicals for the other reporting categories. As with use, the top 20 chemicals represent a significant proportion of the total amount reported (Table 1): The top 20 chemicals comprised:

- 88% of the total reported byproducts (including trade secret data)
- 89% of the total reported shipped in product (excluding trade secret data)
- 92% of the total on-site releases (including trade secret data)
- 91% of the total off-site transfers (including trade secret data).

Acetone was the top chemical for on-site releases, accounting for 21% of the statewide total of on-site releases (550,000 pounds). Hydrochloric Acid was the second top chemical for on-site releases. Eighty-five (85) percent of hydrochloric acid releases were from municipal waste combustors. Over 99% of total on-site releases of lead were attributed to lead in ash disposed by one municipal waste combustor in an on-site lined landfill.

Nitrate compounds was the top chemical for transfers offsite, accounting for 19% of the statewide total transfers off-site (6 million pounds). Nitrate compounds were primarily coincidentally manufactured during neutralization of nitric acid in wastewater treatment, and were discharged to Publicly Owned Wastewater Treatment Plants. Ninety-two (92) percent of total transfers off-site of lead, the fifth chemical on the list, was attributed to four municipal waste combustors that transferred lead in ash to off-site lined landfills.

Table 3 – 2018 Top 20 Chemicals: Total Use *These quantities do not include Trade Secret Data*		
Chemical Name (CAS #)	**CAS #**	**Total Use (Lbs.)**
Sodium Hydroxide	1310732	70,952,370
Methanol	**67561**	67,424,507
Hydrochloric Acid	7647010	58,190,777
Sodium Hypochlorite	7681529	36,565,787
Sulfuric Acid	7664939	22,187,664
Ammonia	7664417	13,787,407
Acetone	**67641**	13,447,076
Potassium Hydroxide	1310583	13,053,984
Toluene	**108883**	11,436,120
Nitrate Compounds	1090	10,649,506
Diisocyanates	1050	10,408,991
Methyl Ethyl Ketone	**78933**	10,057,612
Ethylene Glycol	107211	9,289,386
Zinc Compounds	1039	9,252,957
Ethyl Acetate	141786	7,977,141
Nitric Acid	7697372	7,746,580
Methyl Methacrylate	80626	5,621,574
Phosphoric Acid	7664382	5,313,953
Styrene Monomer	100425	5,266,315
Toluene Diisocyanatec	26471625	5,126,282

NOTE: **Bolded** chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

Butyraldehyde, Formaldehyde, Sodium Bisulfite, and Vinyl Acetate would appear in the Top 20 Chemicals Total Use list if trade secret quantities were included.

Table 4 – 2018 Top 20 Chemicals:
Byproduct Generation and Shipped in Product

Byproduct Generation *These quantities include Trade Secret Data*			**Shipped in Product** *These quantities do not include Trade Secret Data*		
Chemical Name	**CAS #**	**Byproduct Generation (Lbs.)**	**Chemical Name**	**CAS #**	**Shipped in Product (Lbs.)**
Ethyl Acetate	141786	11,222,643	**Methanol**	**67561**	64,592,975
Sodium Hydroxide	1310732	7,443,614	Sodium Hydroxide	1310732	42,344,503
Nitrate Compounds	1090	6,879,240	Sodium Hypochlorite	7681529	33,891,211
Sulfuric Acid	7664939	5,501,489	Potassium Hydroxide	1310583	11,072,082
Toluene	**108883**	4,658,774	**Acetone**	**67641**	9,104,355
Acetone	**67641**	4,125,043	Sulfuric Acid	7664939	8,011,072
Ethylene Glycol	107211	3,685,270	**Methyl Ethyl Ketone**	**78933**	7,012,106
Methyl Ethyl Ketone	**78933**	3,085,385	**Toluene**	**108883**	6,618,336
Methanol	**67561**	3,039,010	Zinc Compounds	1039	5,118,929
Lead	7439921	2,693,273	Toluene Diisocyanate	26471625	4,885,539
Hydrochloric Acid	7647010	2,611,458	Ethylene Glycol	107211	4,265,123
1-Methyl-2-Pyrrolidone	872504	1,920,102	Phosphoric Acid	7664382	3,697,935
Formaldehyde	50000	1,675,607	Methyl Methacrylate	80626	3,181,614
Dimethylformamide	68122	1,337,510	Diisocyanates	1050	2,942,108
Acetonitrile	75058	920,696	Glycol Ethers	1022	2,889,378
Sodium Hypochlorite	7681529	737,815	Ferric Chloride	7705080	2,652,173
Nitric Acid	7697372	709,983	Antimony Compounds	1000	2,398,707
Butyraldehyde	123728	709,830	Dimethylformamide	68122	2,178,396
Dichloromethane	75092	686,760	Xylene Mixed Isomers	1330207	1,778,516
Zinc Compounds	1039	676,488	Dichloromethane	75092	1,746,572

NOTE: Bolded chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

Ethyl Acetate, Hydrochloric Acid, and Sodium Bisulfite would appear in the Top 20 Chemicals Shipped in Product list if trade secret quantities were included.

Table 5 – 2018 Top 20 Chemicals:
Reported On-Site Releases and Transfers Off-Site

On-Site Releases *These quantities include Trade Secret Data*			Transfers Off-Site *These quantities include Trade Secret Data*		
Chemical Name	**(CAS #)**	**On-Site Releases (Lbs.)**	**Chemical Name**	**(CAS #)**	**Transfers Off-Site (Lbs.)**
Acetone	**67641**	550,887	Nitrate Compounds	1090	6,385,504
Hydrochloric Acid	7647010	400,582	Ethylene Glycol	107211	5,057,694
Lead	7439921	357,088	**Acetone**	**67641**	3,015,862
Ethyl Acetate	141786	223,075	**Methanol**	**67561**	2,412,537
Toluene	**108883**	180,481	Lead	7439921	2,347,036
Ammonia	7664417	179,678	1-Methyl-2-Pyrrolidone	872504	1,836,100
Formaldehyde	50000	100,030	Formaldehyde	50000	1,744,571
Methanol	**67561**	76,052	**Toluene**	**108883**	1,621,524
Methyl Ethyl Ketone	**78933**	52,177	**Methyl Ethyl Ketone**	**78933**	1,307,584
Dichloromethane	75092	42,980	Acetonitrile	75058	916,938
Trichloroethylene	79016	39,123	Zinc Compounds	1039	663,734
N Propyl Bromide	106945	36,971	Sodium Hydroxide	1310732	642,119
Butyraldehyde	123728	34,935	Dichloromethane	75092	634,208
Butyl Alcohol	71363	29,553	Copper Compounds	1015	511,117
Sulfuric Acid	7664939	28,370	Ethyl Acetate	141786	501,425
Butyl Acetate-T	540885	28,137	Lead Compounds	1026	431,476
Glycol Ethers	1022	26,798	Ferric Chloride	7705080	400,645
Hexane (N-Hexane)	110543	22,022	Dimethyl Formamide	68122	384,866
Cyclohexane	110827	18,945	Diethylhexylphthalate	117817	262,274
Xylene Mixed Isomer	1330207	18,761	Methyl tert-butyl ether	1634044	211,784

NOTE: Bolded chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

V. 2018 Chemicals of Particular Interest

Certain toxic chemicals are of particular concern because of their higher potential for harm to the environment or public health. These include:

- Chemicals classified as persistent bioaccumulative toxic (PBT) chemicals by the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) Program
- Chemicals designated as Higher Hazard by the TURA Administrative Council
- Chemicals known to promote asthma (Asthmagens)
- Carcinogens

Trends in reported data for each of these groups of substances are discussed below.

Persistent Bioaccumulative Toxic (PBT) Chemicals

PBTs are highly toxic, remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. As a result, relatively small releases of PBT chemicals can pose health and environmental threats and, therefore, the use and release of these chemicals, even in relatively small amounts, warrants public reporting as well as toxics use reduction efforts. Because of these concerns, the threshold for PBTs was lowered by USEPA from 25,000 pounds if the substance is manufactured or processed, and 10,000 pounds if the substance is otherwise used, to between 0.1 grams and 100 pounds, depending on the chemical, for all uses. The threshold was lowered for all PBTs, as of reporting year 2000, with the exception of lead and lead compounds (starting reporting year 2001).

Table 6 below shows the 2018 reported data and the number of filers for each PBT (excluding trade secret data). Nine PBTs are reported in Massachusetts. Five of these (dioxin, polycyclic aromatic compounds, benzoperylene and mercury and mercury compounds) are chiefly associated with combustion at resource recovery facilities, power plants, and the manufacture of concrete and asphalt paving.

Table 7 below shows each PBT's chemical use since the year before it was designated as a PBT. The chemical use increased from zero to hundreds of pounds when the PBT designation occurred. The pounds of these combustion related chemicals increased again in 2002 when the municipal waste combustors were required to report. Despite being used primarily to produce power, facilities did eliminate some of these chemicals when they switched from coal and oil to natural gas, and the majority showed that they were using less of the chemical or generating less byproduct per unit of product since the substance was designated as a PBT. However, reporting dropped substantially in 2007 when amendments to the Act exempted facilities that burned fuel for their own use from reporting on chemicals in the fuel or coincidentally manufactured during combustion.

The use of lead and lead compounds stems from a combination of combustion, waste management, paving asphalt manufacture, and traditional manufacturing. Seventy-eight (78) percent of the use of lead is from the combustion of fuel by power plants and the combustion of waste by municipal waste combusters.

Lowering the reporting threshold to 100 in 2001 resulted in an increase in the number of facilities reporting lead from 15 in reporting year 2000, to 152 in 2001, and an increase in the number of facilities reporting lead compounds from 33 in 2000, to 129 in 2001. However, in 2018 the number of lead and lead compounds filers had decreased to 57 and 48, respectively.

Table 6 2018 Persistent Bioaccumulative Toxic (PBT) Chemicals Summary (Excludes Trade Secret Data)							
Substance	Threshold (lbs or grams for dioxin)	# Filers in 2018	Use	Byproduct	Shipped in Product	lbs On-Site Releases	Lbs Transfers Off-Site
Benzo[Ghi]Perylene	10	19	6,528	627	1,558	0	628
Dioxin and Dioxin Compounds	0.1 Gr	7	1,622	1,622	0	192	1,430
Lead	100	57	3,340,991	2,693,273	637,948	357,088	2,347,036
Lead Compounds	100	48	575,113	425,610	136,222	1,545	425,791
Mercury	10	14	7,627	2,983	4,360	570	2,387
Mercury Compounds	10	1	694	5	978	0	5
Polychlorinated Biphenyls	10	1	31,933	28,511	0	0	28,511
Polycyclic Aromatic Compounds	100	21	468,019	6,281	58,843	45	6,384
Tetrabromo-Bisphenol	10	1	179	6	174	0	6

Table 7
Pounds of PBTs Reported Use and Number of Facilities Reporting 2000 – 2018
(Excludes Trade Secret Data)

	Benzo[ghi]-perylene (191242)		Dioxin and Dioxin Compounds (1060)		Mercury (7439976)		Mercury Compounds (1028)		Poly-Chlorinated Biphenyls (1336363)		Polycyclic Aromatic Compounds (1040)		Tetra-bromo-bisphenol A (79947)		Lead (7439921)		Lead Compounds (1026)	
	Lbs Use	#	Grams Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#
1999	0	0	0	0	0		0	0	0	0	37,539,261	6	0	0				
2000	146,531	120	12	8	4,973	11	90,009	6	118,160	2	14,171,986	158	332		1,261,842	15	9,855,146	33
2001	180,326	127	12	8	9,315	13	676	5	83,890	2	13,849,697	151	115	1	1,284,199	152	7,290,727	129
2002	123,429	122	13	8	5,922	13	1,765	5	64,981	2	11,148,250	149	19,057	1	912,922	143	5,146,270	114
2003	125,099	119	11,827	17	11,476	20	1,212	6	37,325	2	11,486,388	136	152	1	3,394,134	140	5,982,308	117
2004	128,874	114	3,033	16	12,629	20	966	7	46,879	2	11,796,370	133	0	0	3,651,671	109	5,279,027	126
2005	128,809	109	6,696	17	10,444	22	1,031	6	21,741	2	11,128,163	127	0	0	3,763,242	114	3,689,910	126
2006	49,376	27	761	15	13,351	19	1,011	6	22,042	2	3,735,104	31	0	0	4,811,219	102	2,279,105	111
2007	49,412	28	1,155	13	13,733	19	1,101	5	110,303	3	5,051,904	29	0	0	4,172,982	90	1,406,092	104
2008	33,393	25	1,523	13	12,231	20	3,421	6	156,170	3	3,275,212	30	0	0	3,799,929	90	1,241,717	93
2009	12,403	24	1,951	11	10,515	17	1,610	5	42,757	3	1,168,637	28	4,596	1	4,130,556	73	971,451	84
2010	4,275	21	1,980	9	11,434	16	1,161	4	71,091	2	382,534	26	4,875	2	3,208,423	75	736,262	73
2011	3,177	23	2,811	9	15,826	17	1,307	5	72,654	2	283,498	27	7,235	3	3,080,576	75	569,666	66
2012	2,712	23	2,650	9	7,795	16	157	2	83,372	2	206,532	26	7,242	3	3,289,441	79	654,024	63
2013	4,832	22	1,847	9	6,619	17	639	4	126,857	3	523,396	26	5,881	2	3,531,726	76	754,176	61
2014	10,570	21	1,841	10	4,451	17	653	3	88,354	2	1,055,061	24	3,015	2	3,653,822	69	835,041	55
2015	10,692	21	1,762	8	6,867	17	1,000	2	59,887	1	1,398,282	24	4,466	2	3,450,622	63	956,565	53
2016	7,318	21	2,094	8	8,479	16	1,365	2	45,621	1	576,833	23	3,418	2	3,237,744	66	730,746	54
2017	5,229	21	2,012	8	8,392	18	703	2	39,383	1	347,984	23	2,760	2	3,201,627	65	709,517	48
2018	6,528	19	1,622	7	7,627	14	694	1	31,933	1	468,019	21	179	1	3,340,991	57	575,113	48

NOTE: The numbers below the dark lines indicate the first year that these chemicals were designated as PBTs and the reporting threshold was lowered.

Higher Hazard Substances (HHS)

Other higher hazard chemicals are also reported under TURA. The 2006 amendments to TURA directed the Council to categorize the TURA list of chemicals into higher or lower hazard substances, or to leave them uncategorized and lowered the reporting threshold for higher hazard substances (HHS) to 1,000 pounds for all uses. Table 8 below shows the pounds of each HHS reported and the number of facilities reporting it from the year before it was designated as an HHS to 2018.

The data shows a similar trend for trichloroethylene and tetrachloroethylene, as that seen with PBTs: a gradual decline in use from 2007, the year before the substance was designated as an HHS, an initial increase in the number of facilities reporting, and the pounds of chemical reported after designation as an HHS, followed by a drop in both measures.

Table 9 below shows the fourteen HHS chemicals reported in 2018, including the number of filers, byproduct generation, shipped in product, on-site releases, and transfers off-site.

Table 8
Higher Hazard Substances (HHS): Total Pounds of Use (Non-Trade Secret Data) and # Filers Before and After HHS Designation

NAME	Toluene -2,4- diisocya -nate	Toluene -2,6- diisocya -nate	Toluene diisocya- nate (mixed isomers)	Hydrogen fluoride	N- Propyl Bromide	Dimethyl- forma- mide	Cyanide Com- pounds	Methyl- ene Chloride (Dichloro- methane)	Formal- dehyde	Hexa- valent Chrom -ium	Tetra- chloro- ethylene	Cadmium	Cadmium Com-pounds	Tri- chloro- ethyl- ene
CAS	584849	91087	26471625	7664393	106945	68122	1016	75092	50000	1216	127184	7440439	1004	79016
HHS Start Year	**2017**	**2017**	**2017**	**2016**	**2016**	**2016**	**2016**	**2014**	**2012**	**2012**	**2009**	**2008**	**2008**	**2008**
				POUNDS OF USE (NON-TRADE SECRET)										
2007													184,400	604,671
2008											230,345	**29,429**	**167,355**	**536,073**
2009											**176,186**	28,969	145,324	556,457
2010											151,918	23,970	242,702	294,836
2011									4,027,226	*	163,773	26,878	180,654	303,076
2012									**4,119,146**	**121,504**	89,216	29,805	181,666	354,351
2013								3,496,421	4,011,427	113,466	110,550	20,447	210,550	176,891
2014								**3,031,438**	3,276,305	103,595	164,606	16,655	217,235	262,811
2015				365,928	30,295	3,518,824	71,695	2,629,094	3,017,674	92,490	320,950	20,312	128,953	243,143
2016	456,803	114,201	5,669,556	**483,633**	**102,998**	**3,845,720**	**118,955**	2,628,375	3,154,185	77,657	909,566	17,707	155,687	236,683
2017	**510,809**	**127,702**	**5,392,008**	235,995	90,008	3,871,715	142,450	2,781,125	3,066,368	89,696	346,348	16,991	153,463	221,582
2018	403,297	100,824	5,126,282	207,848	91,828	3,588,673	146,777	2,496,895	3,354,468	77,103	73,318	20,162	142,058	271,576
				Number of TURA Filers										
2007													1	9
2008											4	**5**	**6**	**27**
2009											**23**	4	7	23
2010											18	4	7	16
2011									9	*	19	4	5	17
2012									**25**	**16**	16	6	5	14
2013								11	27	16	18	6	6	15
2014								**24**	25	15	16	4	6	14
2015				6	2	9	3	25	23	14	11	3	6	13
2016	1	1	3	**25**	**23**	**13**	**14**	20	21	14	12	3	6	14
2017	**1**	**1**	**5**	27	22	12	15	20	22	14	12	3	5	12
2018	1	1	4	23	18	11	14	17	22	13	9	4	7	12

*note: When hexavalent chromium was designated high hazard, the existing chromium compounds category was broken into two categories: hexavalent chromium and non-hexavalent chromium. As a result, there is no data for hexavalent chromium prior to 2012.

Table 9 2018 Higher Hazard Substances (HHS) Summary (Excludes Trade Secret Data)						
Substance and Year Designated as HHS	# Filers in 2018	Use	Byproduct	Shipped in Product	On-Site Releases	Transfers Off-Site
Cadmium/2008	4	20,162	1,706	18,376	9	1,685
Cadmium Compounds/2008	7	142,058	6,650	20,536	15	6,634
Trichloroethylene/2008	12	271,576	96,036	201,487	39,123	18,042
Tetrachloroethylene/2009	9	73,318	19,948	47,899	11,976	4,917
Formaldehyde/2012	22	3,354,468	178,032	350,184	97,795	249,231
Hexavalent Chromium Compounds/2012	13	77,103	23,140	55,157	132	13,557
Methylene Chloride/ Dichloromethane/2014	17	2,496,895	686,760	1,746,572	42,980	634,208
Cyanide Compounds/2016	14	146,777	52,936	8,829	79	22,933
Dimethylformamide/2016	11	3,588,673	1,337,510	2,178,396	11,155	384,866
Hydrogen Fluoride/2016	23	207,848	156,910	16,069	1,092	26,452
N-Propyl Bromide/2016	18	91,828	78,303	15,233	36,971	37,870
Toluene-2,4- diisocya-nate/2017	1	403,297	9,318	0	1	9,316
Toluene-2,6- diisocya-nate/2017	1	100,824	2,337	0	11	2,326
Toluene diisocyaate/2017	4	5,126,282	598	4,885,539	149	126

Asthmagens

In 2009 the Lowell Center for Sustainable Production (LCSP) published *Asthma-Related Chemicals in Massachusetts: an Analysis of Toxics Use Reduction Data* (available on TURI's website www.turi.org). The purpose of this project was to understand the extent to which chemicals that can cause the initial onset of asthma or trigger subsequent asthma attacks are being used by Massachusetts industries who report under the TURA program (using 1990 to 2005 data). The report identified 335 chemicals that can cause or exacerbate asthma, of which 68 are reportable under TURA and of which 41 have been reported at some point during the program's history.

The TURA program has begun working to better understand the uses of these chemicals in relation to potential exposures and toxics use reduction opportunities. Table 10 below summarizes 2018 data on some of the chemicals identified in the LCSP report that were reported under TURA. In 2018, 15 chemicals identified as asthmagens by the Association of Occupational and Environmental Clinics (AOEC) were reported under TURA. In 2018, sulfuric acid was reported with the largest amount of use.

Table 10 Asthma-Related Toxics (in pounds) (Excludes Trade Secret Data)		
Chemical Name (Number of Facilities)	**Use**	**On-Site Releases**
Acetic Acid (14)	1,675,116	1,738
Aluminum (1)	74,979	12
Chlorine (5)	1,513,227	143
Chromium (2)	182,808	19
Ethylene Oxide (1)	187,498	196
Formaldehyde (22)	3,354,468	97,795
Hydrazine (2)	195,081	0
Maleic Anhydride (1)	389,480	332
Methyl Methacrylate (5)	5,621,574	16,548
Nickel (4)	370,133	47
Nickel Compounds (5)	1,281,191	2,452
Phthalic Anhydride (1)	199,513	40
Styrene Monomer (7)	5,266,315	16,024
Sulfuric Acid (93)	22,187,664	28,370
Toluene Diisocyanate (6)*	5,630,403	161

* Toluene Diisocyanate includes CAS numbers 91087, 584849, and 26471625.

Carcinogens

Several TURA chemicals are identified as Group 1 carcinogens (i.e., carcinogenic to humans) by the International Agency for Research on Cancer (IARC). In 2018, six IARC Group 1 carcinogens were reported under TURA (see Table 11). Formaldehyde and nickel compounds were reported with the largest amounts of use. Formaldehyde was reported with the largest amount of releases and was reported by the most facilities. Releases were primarily air releases; however, there were also releases to water and land.

Table 11 IARC Group 1 Carcinogens (in pounds unless otherwise noted) (Excludes Trade Secret Data)		
Chemical Name (Number of Facilities)	**Use**	**On-Site Releases**
Cadmium (4)	20,162	9
Dioxin (7)*	1,622	192
Ethylene Oxide (1)	187,498	196
Formaldehyde (22)	3,354,468	97,795
Hexavalent Chromium Compounds (13)	77,103	132
Nickel Compounds (5)	1,281,191	2,452

* 2,3,7,8-Tetrachlorodibenzo-*para*-dioxin are the agents specifically listed as Group 1 by IARC (in grams).

New Chemicals Reported in 2018

The following chemicals were reported for the first time in 2018:

Table 12 New Chemicals Reported in 2018 (in pounds) (Excludes Trade Secret Data)	
Chemical Name (Number of Facilities)	**Use**
Nonylphenol Category (2)	125,646
Nonylphenol Ethoxylates (1)	94,676
Bifenthrin (1)	30,022

VI. 2018 Significant Industrial Sectors

Under TURA, facilities in the Manufacturing Standard Industrial Classification (SIC) codes 20-39 inclusive and those in SIC codes 10-14, 40, 44-51, 72, 73, 75 and 76, or the corresponding NAICS code must report their chemical use if they meet or exceed certain thresholds.

Figures 1 through 4 present, by sector, the 2018 numbers of facilities reporting, reported amount of use, byproduct, and releases on-site by industrial sector.

The charts demonstrate that the chemical manufacturing sector dominates chemical use in the Commonwealth. This sector had the greatest percentage of filers (Figure 5) 20%. The chemical manufacturing sector also had the greatest percentage of use at 57% (Figure 6), the largest percentage of byproduct at 39% (Figure 7), and the second largest percentage, along with utilities, of on-site releases at 15% (Figure 8). This sector is a diverse group of industries and includes facilities that "manufacture" chemicals according to the TURA definition as well as facilities that "process" chemicals to formulate adhesives, paints, pharmaceuticals, and plastic materials and resins. The chemical manufacturing sector is broken into further sectors in Figure 6.

Chemical distributors at (Figure 6) 16% were the second largest contributor to use, but had virtually no impact on byproduct and releases. Paper manufacturing, waste management and remediation services, utilities, and fabricated metal processors, were other sectors with substantial contributions to byproduct and releases. The paper manufacturing sector, which accounted for 2% of total statewide use (Figure 6), accounted for 18% of total byproduct generated (Figure 7). Likewise, waste management and remediation services, which accounted for 3% of total statewide use (Figure 6), had the highest contribution of on-site releases at 21% (Figure 8).

Figure 5 –2018 Number of Facilities by Industrial Sector
Total Number of Facilities = 453
(Includes Trade Secret Data)

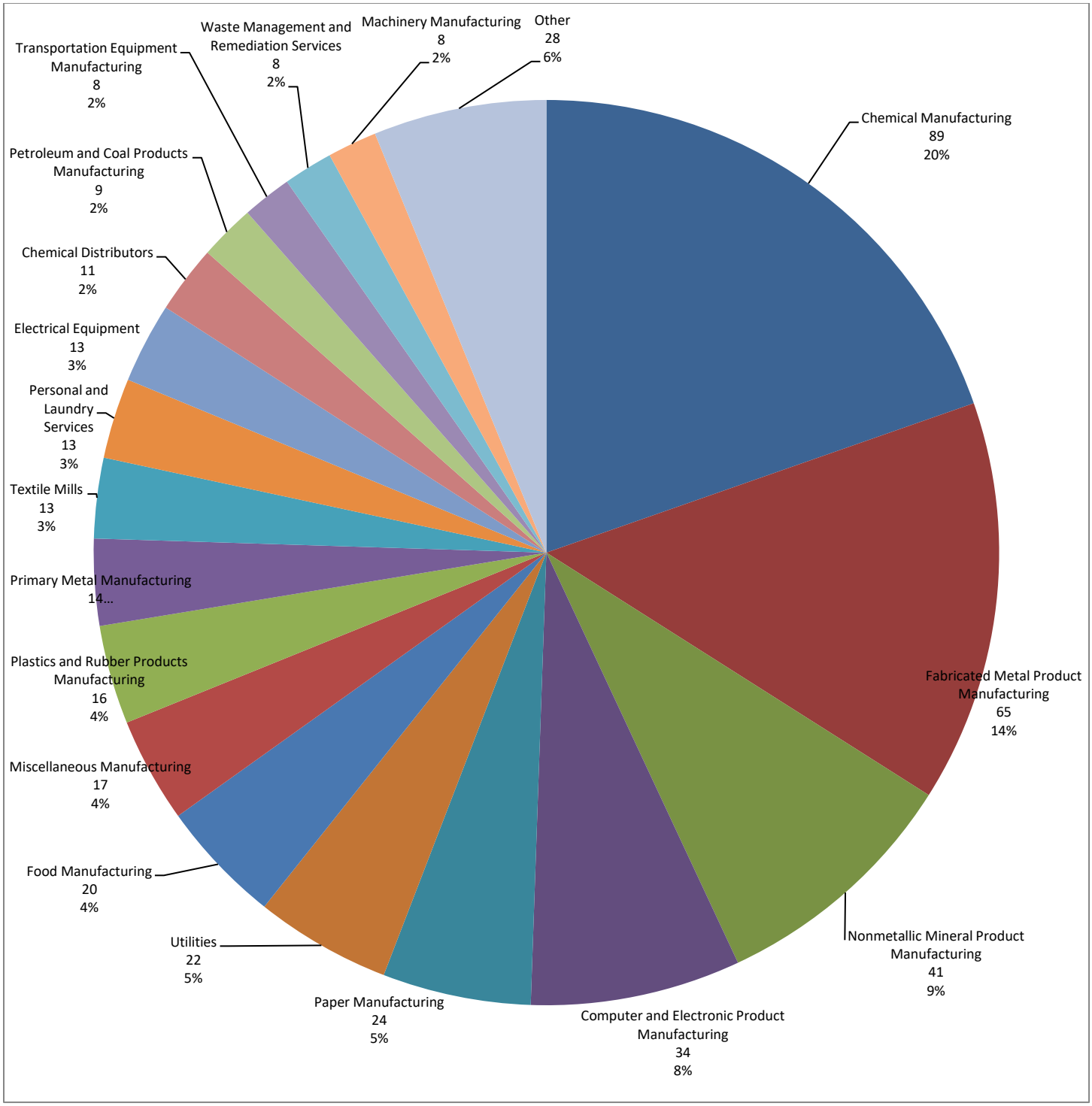


Figure 6 – All Reported Data: 2018 Chemical Use by Industrial Sector
Total Use = 691,000,000 Pounds
(Includes Trade Secret Data)

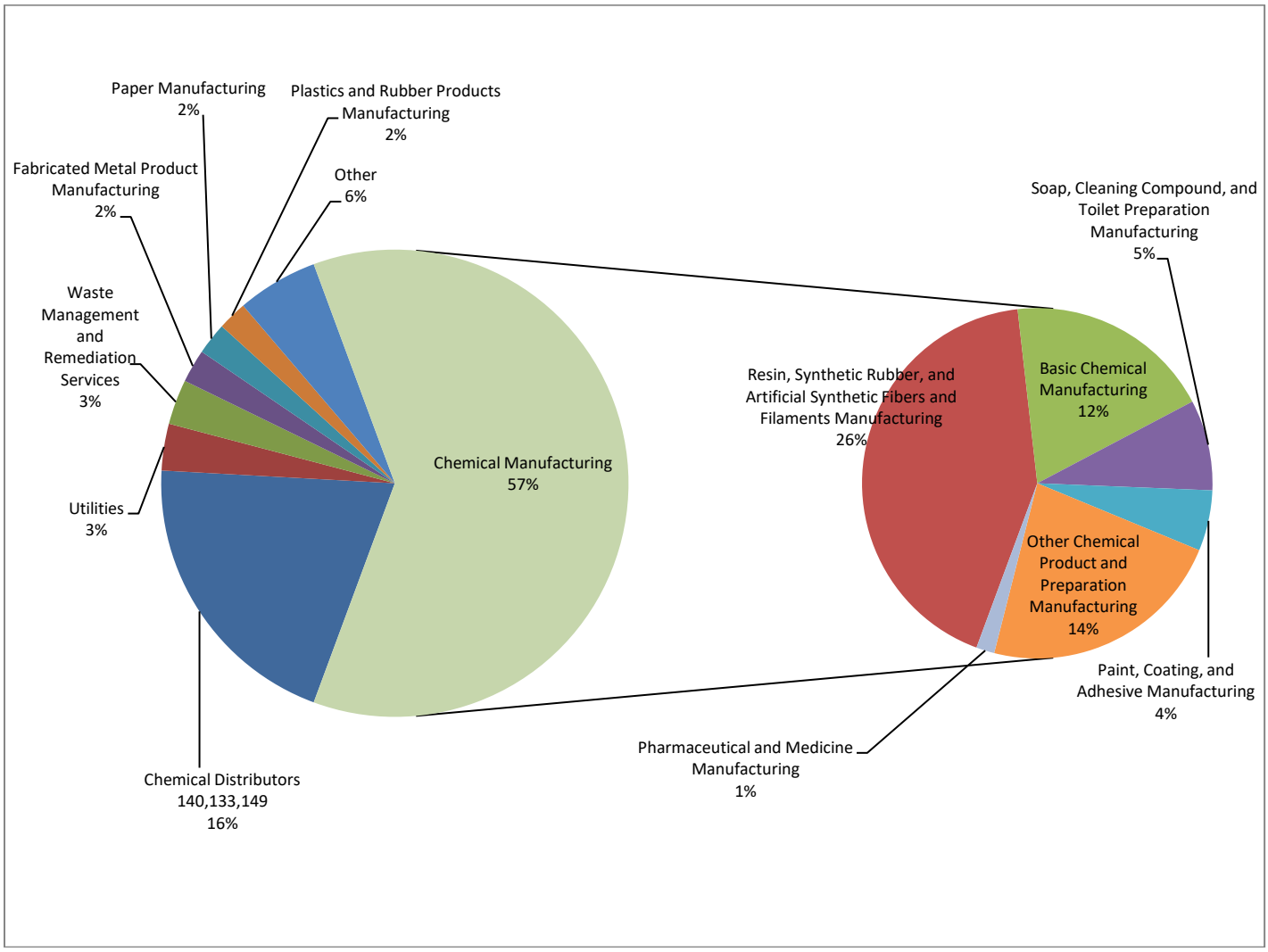


Figure 7 – All Reported Data: 2018 Byproduct Generation by Industrial Sector
Total Byproduct = 73,000,000 Pounds
(Includes Trade Secret Data)

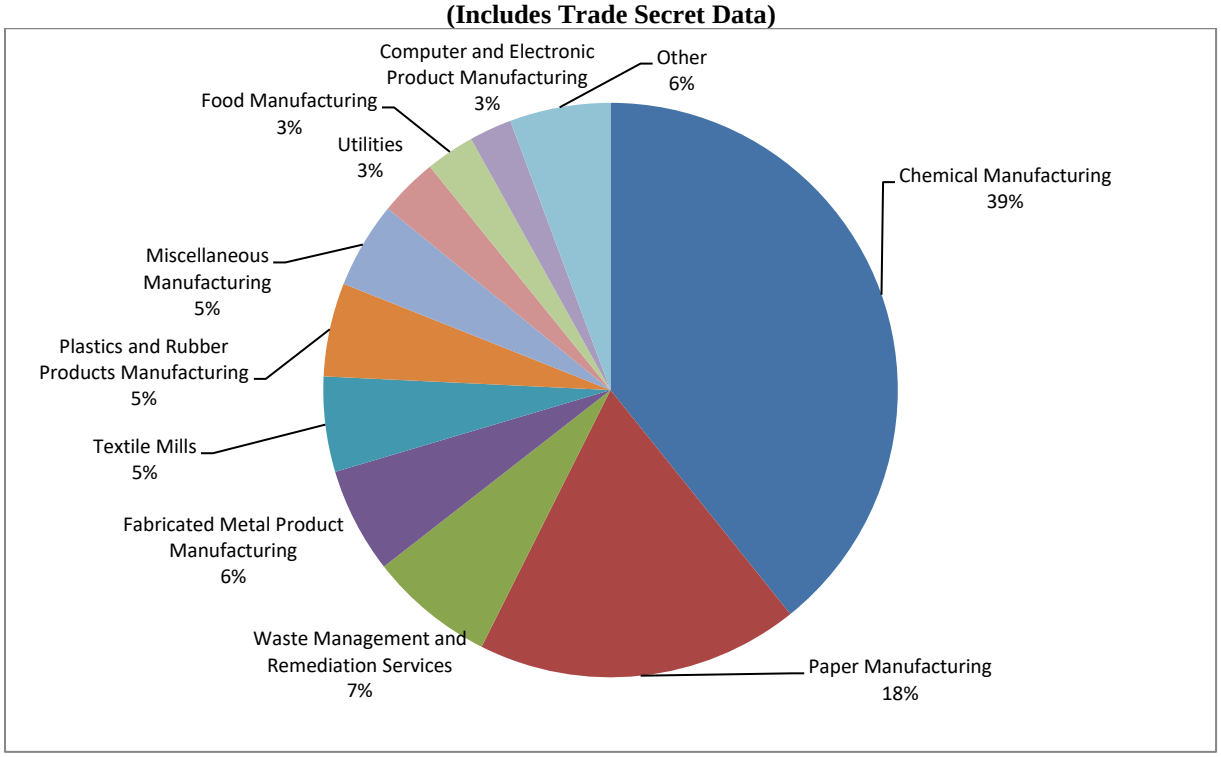
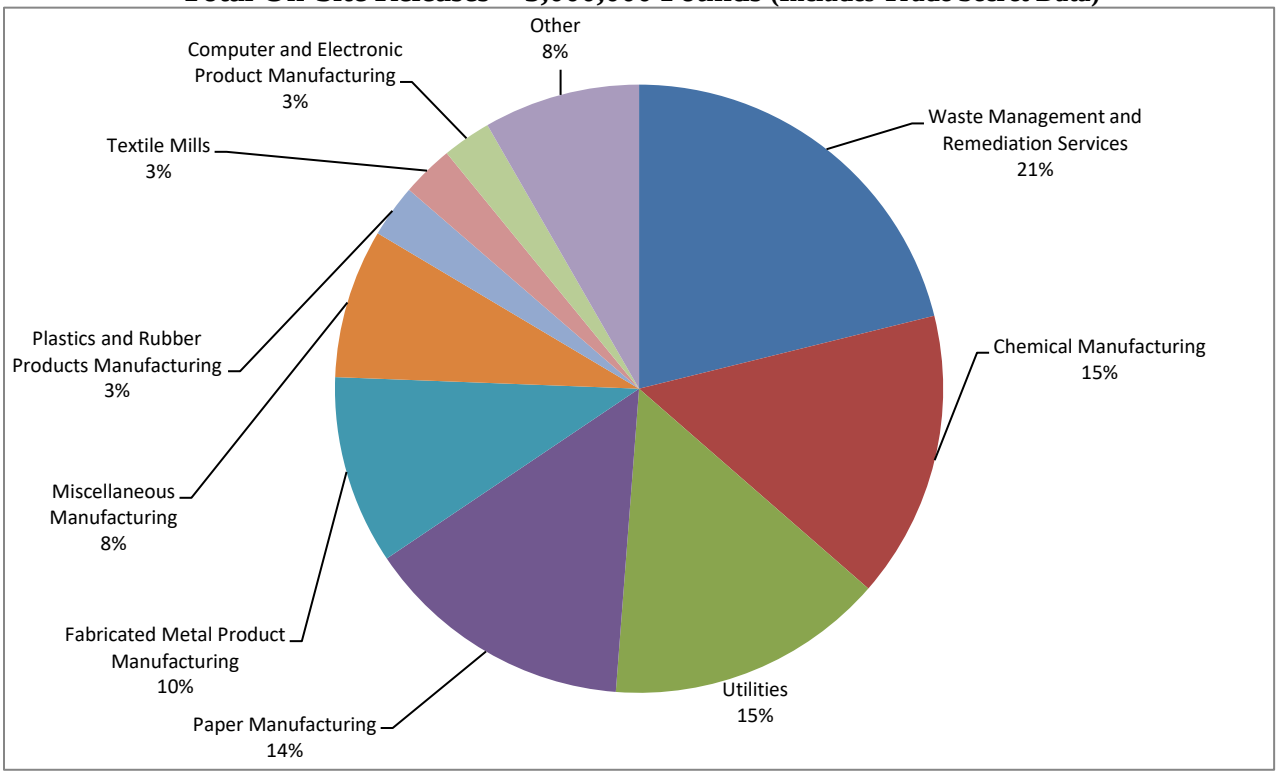


Figure 8 – All Reported Data: 2018 On-Site Releases by Industrial Sector
Total On-Site Releases = 3,000,000 Pounds (Includes Trade Secret Data)



VII. 2018 Major TURA Facilities

Tables 13 through 15 show the top 20 facilities for the quantities of reported chemical used, generated as byproduct, shipped in or as product, released on-site, and transferred off-site.

- Table 13 lists the 20 facilities that reported the largest total quantity of TURA chemicals used. These 20 facilities used 510 million pounds, or 74% of total statewide use.

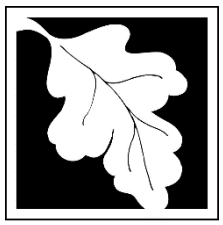
- Table 14 lists the 20 facilities that generated the largest reported quantity of byproduct generated and shipped in product. These facilities generated 44 million pounds of byproduct or 60% of the statewide total. The 20 facilities with the largest quantity shipped in product, shipped 320 million pounds in product, or 90% of the statewide total.
- Table 15 lists the 20 facilities that reported the largest quantity of on-site releases and the 20 facilities that had the largest quantity of transfers off-site. These facilities released almost 2 million pounds, or 61% of total releases statewide. Four of the Top 20 facilities of reported on-site releases were municipal waste combustors (MWCs) that also reported combustion-related emissions. Of the 700,000 pounds of on-site releases reported by these MWCs, 49% was due to the coincidental manufacture of hydrochloric acid during combustion, and 51% was due to lead in ash disposed in an on-site lined landfill at one facility. The 20 facilities with the largest reported quantity of transfers off-site transferred 25 million pounds, or 74% of the total statewide transfers off-site.

Table 13 2018 Top 20 Facilities: Reported Total Use (Includes trade secret data)		
Facility Name	Town	Total Use (Lbs.)
Solutia Inc	Springfield	114,732,400
Holland Company Inc	Adams	77,039,300
Borden & Remington	Fall River	70,433,417
Astro Chemicals Inc	Springfield	39,050,943
Prefere Melamines	Springfield	32,547,356
Rousselot Peabody Inc	Peabody	32,397,610
Southwin Ltd	Leominster	26,070,087
James Austin Co	Ludlow	22,240,799
Camco Manufacturing Inc	Leominster	16,760,624
Roberts Chemical Co Inc	Attleboro	10,012,078
Omnova Solutions Inc	Fitchburg	9,629,478
Semass Partnership	Rochester	9,549,344
Metalor Technologies USA	North Attleborough	8,086,596
Webco Chemical Corp	Dudley	6,497,548
Houghton Chemical Corporation	Boston	6,220,245
Metalor Technologies USA	Attleboro	6,198,809
Covanta Haverhill Inc	Haverhill	5,964,076
Wheelabrator Millbury Inc	Millbury	5,930,008
DSM Coating Resins Inc	Wilmington	5,682,971
Univar Solutions USA Inc	Tewksbury	5,407,673

Table 14 2018 Top 20 Facilities: Reported Byproduct and Shipped in Product (Includes trade secret data)					
Byproduct			**Shipped in Product**		
Facility Name	Town	Byproduct Generation (Lbs.)	Facility Name	Town	Shipped in Product (Lbs.)
Solutia Inc	Springfield	7,002,847	Holland Company Inc	Adams	77,039,300
Rousselot Peabody Inc	Peabody	4,954,618	Borden & Remington	Fall River	58,287,093
AR Metallizing Ltd	Franklin	4,672,506	Astro Chemicals Inc	Springfield	34,640,877
3M	Rockland	4,079,540	Solutia Inc	Springfield	27,694,637
Flexcon Company Inc	Spencer	3,303,552	Southwin Ltd	Leominster	26,063,187
Prefere Melamines	Springfield	2,627,965	James Austin Co	Ludlow	22,189,731
Safety Kleen Systems Inc	Marlborough	2,223,563	Camco Manufacturing Inc	Leominster	16,759,237
Crane & Co Inc Pioneer Mill	Dalton	1,424,953	Roberts Chemical Co Inc	Attleboro	10,012,078
DSM Coating Resins Inc	Wilmington	1,424,846	Webco Chemical Corp	Dudley	6,495,074
Koch Membrane Systems Inc	Wilmington	1,394,555	Houghton Chemical Corporation	Boston	5,793,445
Thermo Fisher Scientific	Bedford	1,305,271	Univar Solutions USA Inc	Tewksbury	5,375,706
Waters Corp	Taunton	1,234,504	ITW Polymers Sealants North America	Rockland	5,182,684
PCI Synthesis Inc	Newburyport	1,127,762	Innocor Foam Technologies	Newburyport	4,883,882
ITW Foils	Newburyport	1,108,470	Univar Solutions USA - Salem Branch	Salem	4,735,253
Nitto Denko Avecia Inc	Milford	1,025,279	ITW Polymers Adhesives North America	Danvers	3,278,841
Haartz Corporation	Acton	1,020,560	Alpha Chemical Services Inc	Stoughton	2,576,881
Semass Partnership	Rochester	1,014,480	Savogran Company	Norwood	2,235,056
Bostik Inc	Middleton	999,995	Callahan Company	Walpole	2,207,216
Johnson Matthey Pharma Services	Devens	945,904	Bostik Inc	Middleton	2,160,501
Community Eco Springfield LLC	Agawam	848,265	Clean Harbors of Braintree Inc	Braintree	2,128,854

Table 15
2018 Top 20 Facilities: Reported On-Site Releases and Transfers Off-Site
(Includes trade secret data)

On-Site Releases			**Transfers Off-Site**		
Facility Name		On-Site Releases (Lbs.)	Facility Name	Town	Transfers Off-Site (Lbs.)
Covanta Haverhill Inc	Haverhill	476,377	Solutia Inc	Springfield	5,195,182
Ideal Tape Company	Lowell	126,563	Prefere Melamines	Springfield	2,243,769
Callaway Golf Ball Operations Inc	Chicopee	105,785	Safety Kleen Systems Inc	Marlborough	2,223,563
Solutia Inc	Springfield	105,587	Clean Harbors of Braintree Inc	Braintree	1,424,887
AR Metallizing Ltd	Franklin	97,481	DSM Coating Resins Inc	Wilmington	1,336,412
Wheelabrator Millbury Inc	Millbury	83,969	Koch Membrane Systems Inc	Wilmington	1,299,301
Wheelabrator North Andover Inc	North Andover	76,238	Thermo Fisher Scientific	Bedford	1,291,771
Mystic Station	Everett	71,400	Waters Corp	Taunton	1,167,616
SEMASS Partnership	Rochester	62,047	PCI Synthesis Inc	Newburyport	1,116,340
Jen Mfg Inc	Millbury	53,319	Nitto Denko Avecia Inc	Milford	1,023,153
Hazen Paper Co	Holyoke	51,662	Bostik Inc	Middleton	962,304
Thermal Circuits Inc	Salem	39,052	Semass Partnership	Rochester	952,432
3M	Rockland	38,482	Johnson Matthey Pharma Services	Devens	943,077
Bostik Inc	Middleton	37,841	Genzyme Corporation	Framingham	652,837
Flexcon Company Inc	Spencer	35,397	Ideal Tape Company	Lowell	651,500
Smith & Wesson Inc	Springfield	33,929	Electronic Recyclers International	Holliston	602,254
Nylco Divison Worthen Industries Inc	Clinton	32,916	Genzyme A Sanofi Company	Allston	555,653
ITW Polymers Sealants North America	Rockland	32,481	Callaway Golf Ball Operations Inc	Chicopee	524,023
The Duncan Group	Everett	30,614	Skyworks Solutions Inc	Woburn	522,286
Waters Corp	Taunton	29,638	Johnson Matthey Pharma Services Inc	North Andover	518,987



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Executive Office of Energy and Environmental Affairs
Kathleen A. Theoharides, Secretary

Department of Environmental Protection
Martin Suuberg, Commissioner