

Releases of Chemicals

Disposal or other releases of Toxics Release Inventory (TRI) chemicals into the environment occur in several ways. Chemicals may be disposed of on a facility's property by being released to the air, water or land. Facilities may also ship (transfer) wastes that contain TRI chemicals to an off-site location for treatment or disposal. Most disposal or other release practices are subject to a variety of regulatory requirements designed to minimize potential harm to human health and the environment. To learn more about what EPA is doing to help limit the release of TRI chemicals into the environment, see [EPA's laws and regulations webpage](#).

Evaluating releases of TRI-listed chemicals can help identify potential concerns and gain a better understanding of potential risks that may be posed by the releases. This evaluation can also help identify priorities and [opportunities for government and communities to work with industry to reduce chemical releases](#) and potential associated risks. However, it is important to consider that the quantity of releases is not an indicator of health impacts posed by the chemicals. Human health risks resulting from exposure to TRI chemicals are determined by many factors, as discussed further in the [Hazard and Potential Risk of TRI Chemicals section](#).

Many factors can affect trends in releases at facilities, including production rates, management practices, the composition of raw materials used, and the installation of control technologies.

As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the [Introduction](#). For more information see

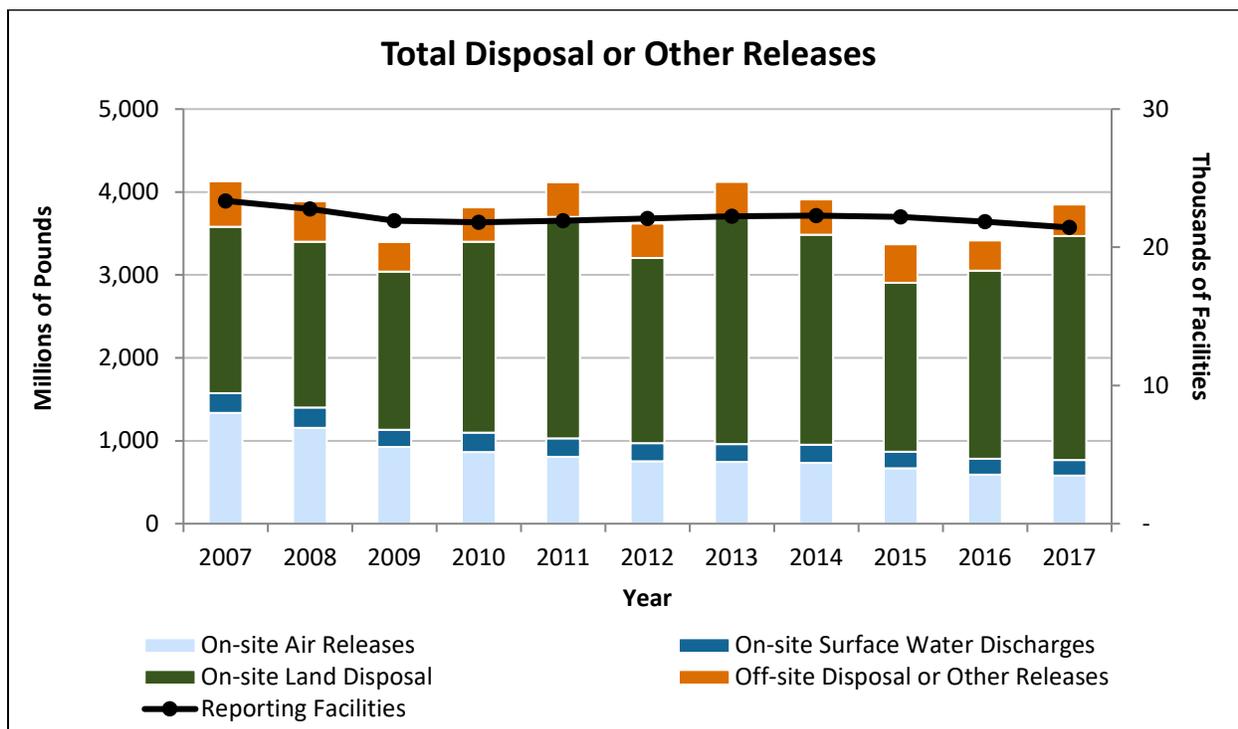
[Factors to Consider When Using Toxics Release Inventory Data](#). Also note that the list of TRI chemicals has changed over the years. For comparability, trend graphs include only those chemicals that were reportable for all years presented. Figures that focus only on the year 2017 include all chemicals reportable for 2017, therefore, values for a 2017-only analysis may differ slightly from results for 2017 in a trend analysis.

The following graph shows the disposal or other releases of TRI chemicals, including on-site disposal to land, water, and air, and off-site transfers for disposal.

Helpful Concepts

What is a release?

In the context of TRI, a "release" of a chemical generally refers to a chemical that is emitted to the air, discharged to water, or disposed of in some type of land disposal unit.



From 2007 to 2017:

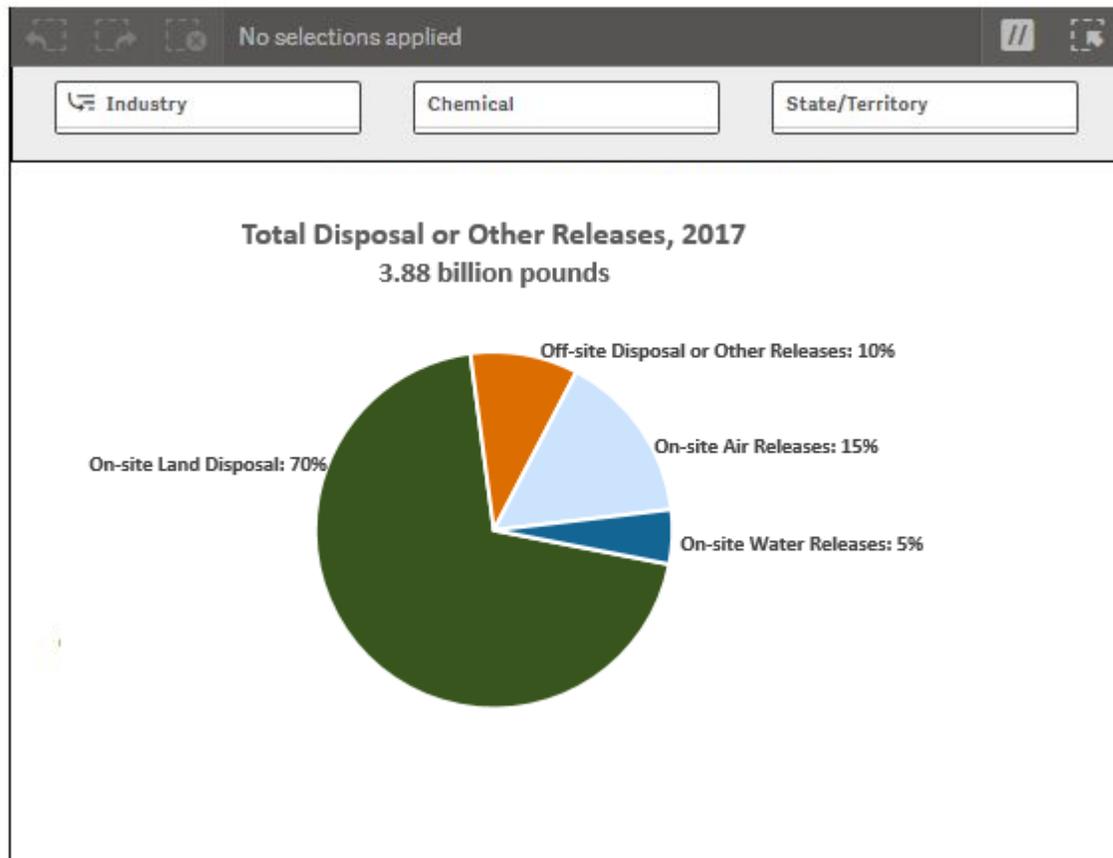
- Total disposal or other releases of TRI chemicals decreased by 7%.
 - Excluding the metal mining sector, releases decreased by 37%.
 - Reduced hazardous air pollutant (HAP) emissions, such as [hydrochloric acid](#), from electric utilities were the most significant contributor to the decline, with additional air emission reductions from the chemical and paper manufacturing sectors.
- On-site air releases (down 57% from 2007), on-site surface water discharges (down 20% since 2007), and off-site releases (down 31% since 2007) declined during this 10-year period.
- The number of facilities reporting to the TRI Program declined by 8% overall, although the count has remained relatively steady since 2010.

From 2016 to 2017:

- On-site air releases and on-site surface water discharges decreased while off-site disposal increased, each with under 5% change. Total releases to the environment increased by 13%, driven by the 21% increase (433 million pounds) in on-site land disposal.

Releases in 2017

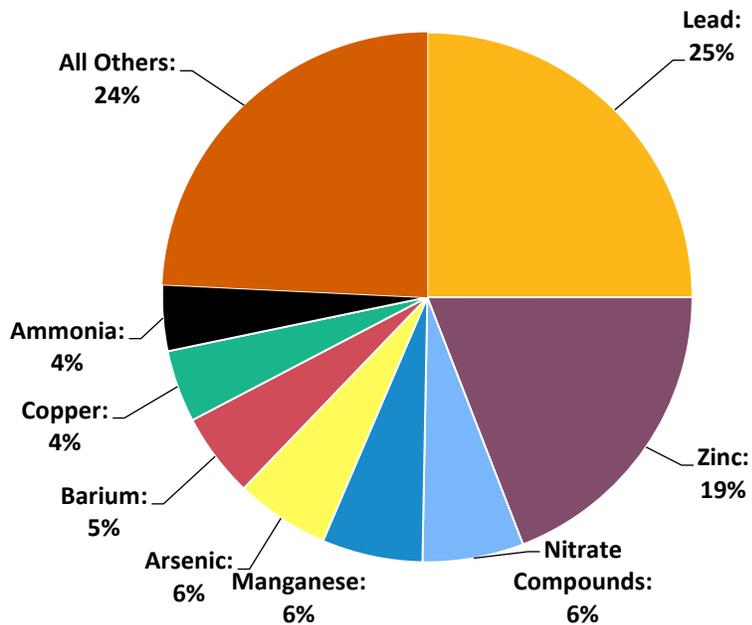
[Visit the full TRI National Analysis Qlik dashboard](#) to explore even more information about releases of chemicals.



Releases by Chemical

Release quantities of 8 chemicals comprised 76% of total releases.

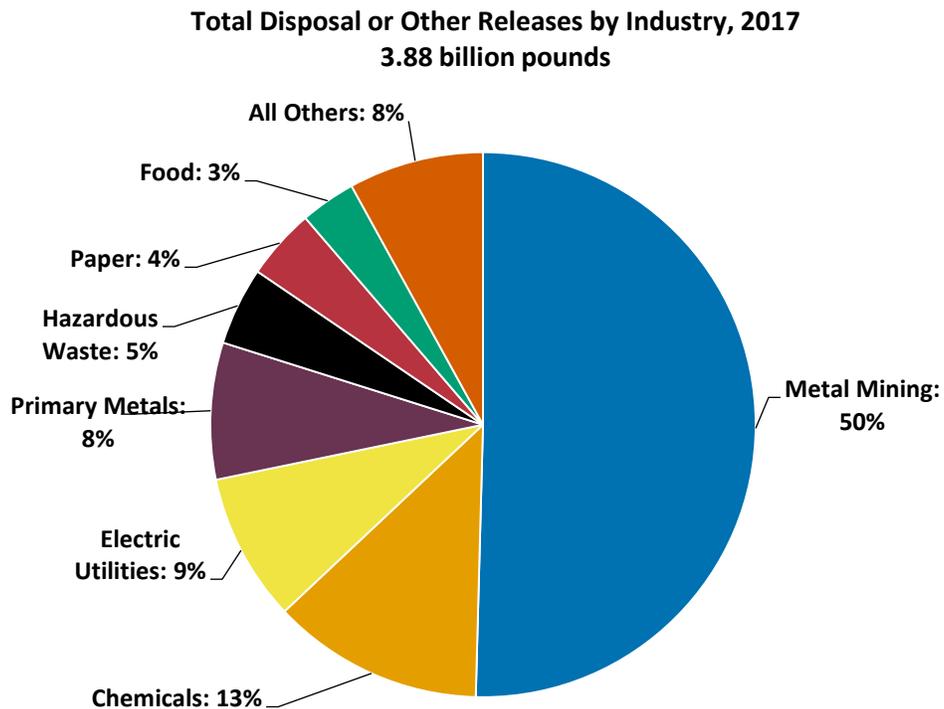
Total Disposal and Other Releases by Chemical, 2017 3.88 billion pounds



Note: In this figure, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds). Percentages may not sum to 100% due to rounding.

Releases by Industry

The metal mining sector accounted for 50% of releases (1.95 billion pounds), which were primarily in the form of on-site land disposal.

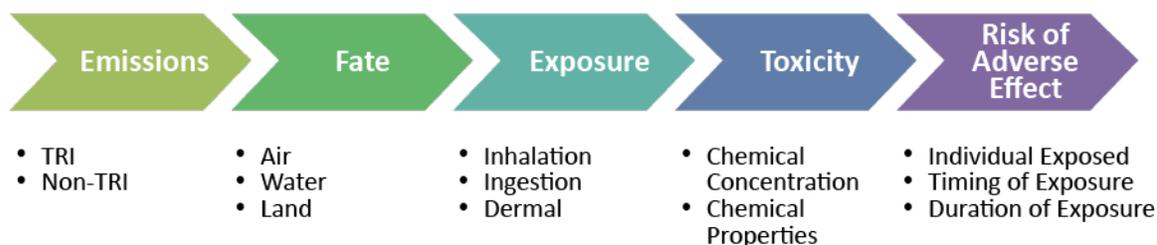


Hazard and Potential Risk of TRI Chemicals

Among other information, the Toxics Release Inventory (TRI) Program provides data about environmental releases of TRI chemicals from industrial facilities throughout the United States, measured in pounds. Pounds of releases, however, is not an indicator of health risks posed by the chemicals, as described in EPA’s [Factors to Consider When Using Toxics Release Inventory Data](#). Although TRI data generally cannot indicate to what extent individuals have been exposed to chemicals, TRI can be used as a starting point to evaluate exposure and potential risks TRI chemicals pose to human health and the environment.

The human health risks resulting from exposure to chemicals are determined by many factors, as shown in the figure below. TRI contains some of this information, including what chemicals are released from industrial facilities; the amount of each chemical released; and the amounts released to air, water, and land.

Overview of Factors that Influence Risk



It is important to keep in mind that while TRI includes information on many chemicals used by industry, it does not cover all facilities, all chemicals, or all sources of TRI chemicals in communities. For example, potential sources of exposure to chemicals not tracked by TRI include exhaust from cars and trucks, chemicals in consumer products, and chemical residues in food and water.

To provide information on the potential hazard and risk posed by disposal or other releases of TRI chemicals, the TRI Program uses EPA’s [Risk-Screening Environmental Indicators \(RSEI\) model](#). RSEI is a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations to quickly evaluate large amounts of data. RSEI includes TRI data for on-site releases to air and water, transfers to Publicly Owned

Helpful Concepts

The *hazard* of a toxic chemical is its ability to cause an adverse health effect(s) (e.g., cancer, birth defects). *Toxicity* is a way to measure the hazard of a chemical.

The *risk* of a toxic chemical is the chance of adverse health effects occurring as a result of exposure to the chemical. Risk is a function of hazard and exposure.

Treatment Works (POTWs), and transfers for off-site incineration. RSEI does not currently model other release pathways, such as land disposal.

RSEI produces hazard estimates and unitless risk “scores,” which represent relative risks to human health following chronic exposure to a TRI chemical. Each type of result can be compared to other results of the same type.

- RSEI **hazard** estimates consist of the pounds released multiplied by the chemical's toxicity weight. They do not include any exposure modeling or population estimates.
- A RSEI **risk** score is an estimate of potential risk to human health. It is a unitless value that accounts for the magnitude of the release quantity of a chemical, the fate and transport of the chemical throughout the environment, the size and locations of potentially exposed populations, and the chemical’s inherent toxicity.

RSEI: Risk–Screening Environmental Indicators

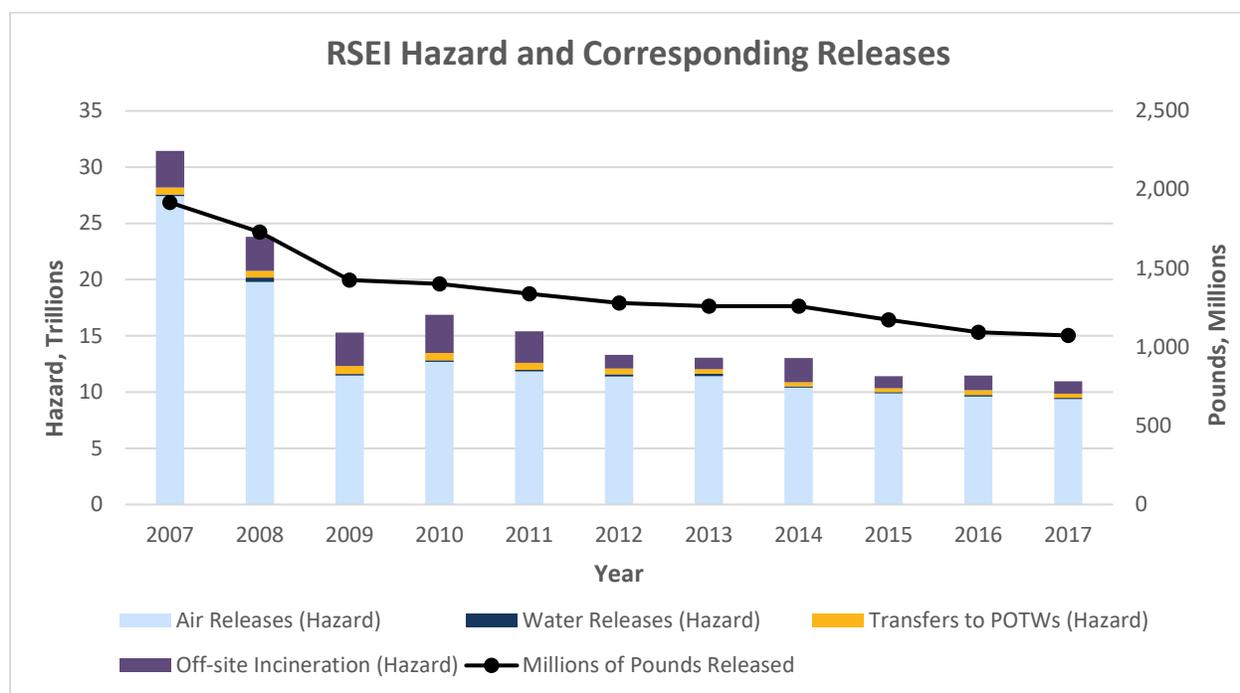
RSEI results consider more than just chemical quantities released.

- **RSEI hazard** results also consider:
 - Toxicity of the chemical
- **RSEI scores** also consider:
 - Location of releases
 - Toxicity of the chemical
 - Fate and transport
 - Human exposure pathway

Note that the RSEI model should only be used for screening-level activities such as trend analyses that compare potential relative risks from year to year, or ranking and prioritization of chemicals or industry sectors for strategic planning. RSEI does not provide a formal risk assessment, which typically requires site-specific information, more refined exposure information, and detailed population distributions.

Hazard Trend

RSEI hazard estimates provide greater insight on potential impacts of the quantities of releases of TRI chemicals than the mass quantities alone. RSEI hazard considers the amounts of chemicals released on site to air and water by TRI facilities or transferred off site to Publicly Owned Treatment Works (POTWs) or incinerators, and the toxicity of the chemicals. The following graph shows the trend in RSEI hazard compared to the trend in the corresponding pounds of TRI chemical releases.

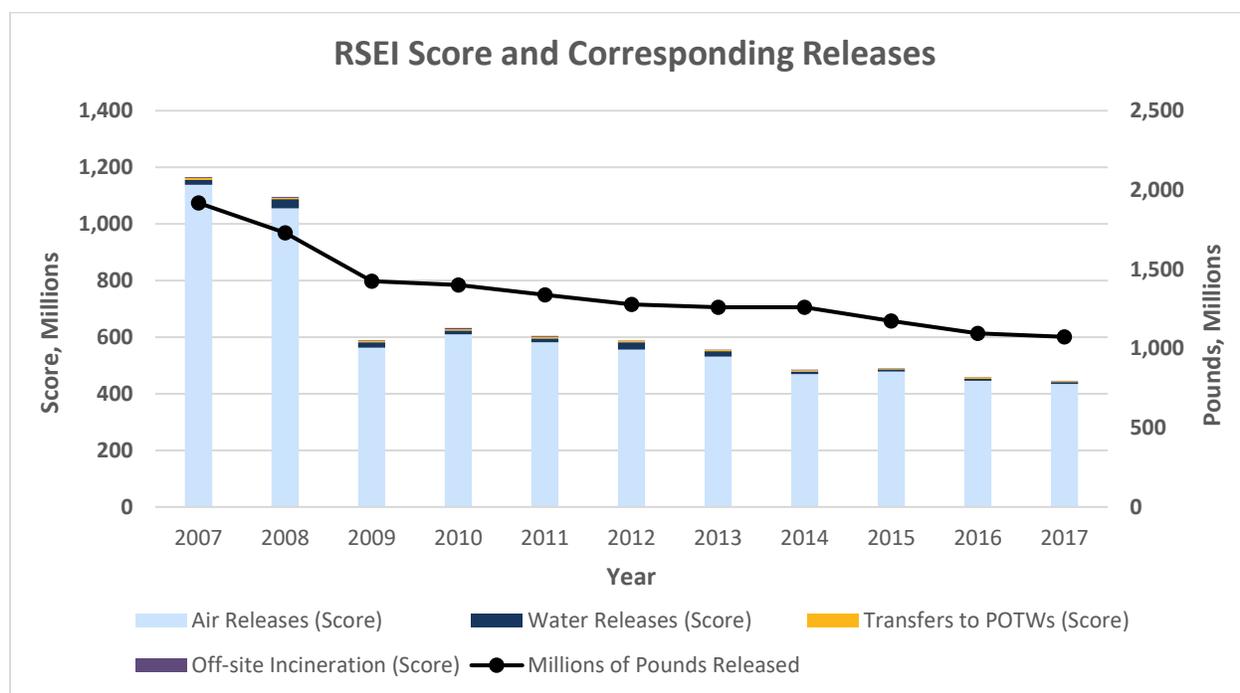


From 2007 to 2017:

- The overall RSEI hazard estimate decreased by 65%, while corresponding pounds released decreased by 44%. This indicates that the facilities that reported to TRI from 2007 through 2017 may be releasing fewer pounds of chemicals that have greater toxicities.
- The decrease in the hazard estimate from 2008 to 2009 is driven by a large decrease in [chromium](#) releases from three facilities.

Risk Trend

EPA's RSEI model also estimates risk "scores" that represent relative human health risk from chronic exposure to TRI chemicals. These risk scores can be compared to RSEI-generated risk scores from other years. RSEI scores are different from RSEI hazard estimates in that RSEI scores consider the location of the release, its fate and transport through the environment, and the route and extent of potential human exposure. The following graph shows the trend in the RSEI score compared to the trend in the corresponding pounds of TRI chemical releases.



From 2007 to 2017:

- The overall RSEI score estimate decreased by 62%, while corresponding pounds released decreased by 44%.
- Of the types of releases modeled by RSEI, air releases, by far, contribute the most to the RSEI scores.

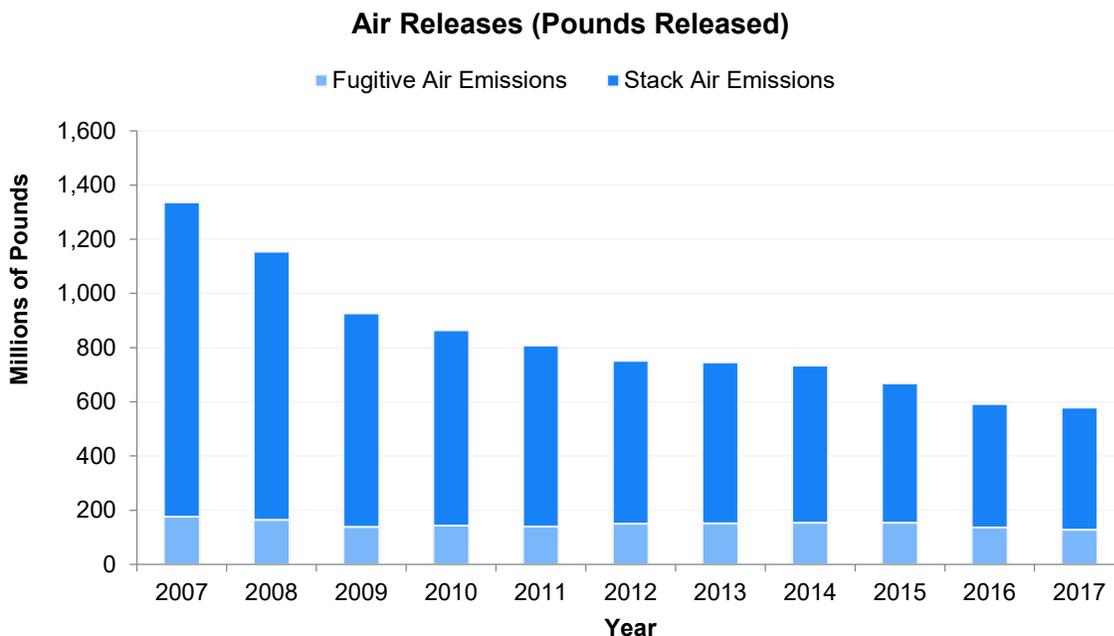


RSEI Dashboard

- Use the EPA's [Risk-Screening Environmental Indicators \(RSEI\) EasyRSEI dashboard](#) to view the national trend in RSEI hazard and RSEI score, or use the Dashboard's filter capabilities to view RSEI information for a specific chemical or location of interest.

Air Releases

Air emissions reported to TRI continue to decline, serving as a primary driver of decreased total releases. Air releases include both [fugitive air emissions](#) and [point source air emissions](#). This graph shows the trend in the pounds of chemicals released to air.



From 2007 to 2017:

- Air releases declined significantly, serving as a primary driver of decreases in total releases.
- Air releases decreased by 57% (757 million pounds).
 - [Hydrochloric acid](#), [sulfuric acid](#), [hydrogen fluoride](#), [methanol](#), [toluene](#), and [styrene](#) were the chemicals with the greatest reductions in air releases since 2007.
 - The decrease is driven by electric utilities due to: decreased emissions of Hazardous Air Pollutants (HAPs), such as hydrochloric acid; a shift from coal to other fuel sources (e.g., natural gas); and the installation of control technologies at coal-fired power plants. Note that only those electric utilities that combust coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Therefore, electric utilities that shift from combusting

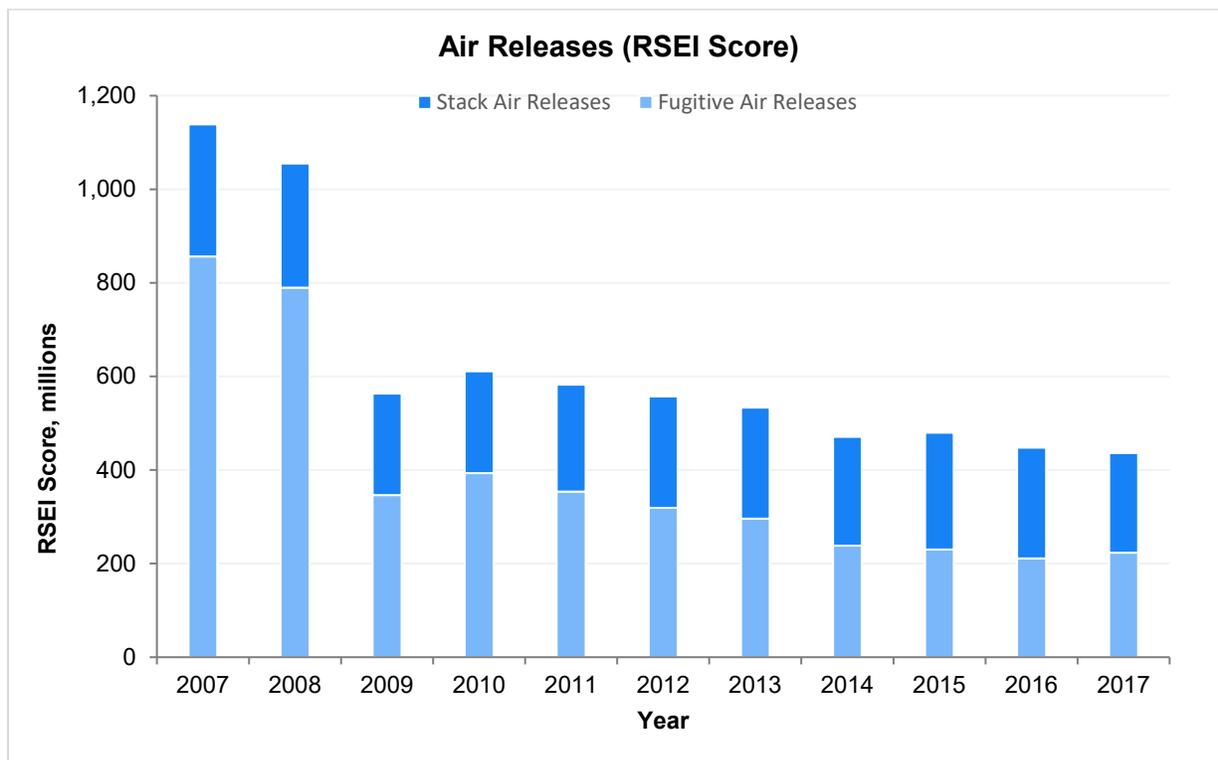
coal or oil to entirely using other fuel sources (such as natural gas) no longer report to TRI.

- Electric utilities accounted for 92% of nationwide reductions in air releases of hydrochloric acid and sulfuric acid from 2007 to 2017.
- Air releases of Occupational Safety and Health Administration (OSHA) carcinogens also decreased; see the [Air Releases of OSHA Carcinogens figure](#).
- Air releases of other chemicals of special concern, including [lead](#) and [mercury](#), also decreased; [see the Chemicals of Special Concern section](#).
- Air releases are often regulated by other programs as well, such as under [Title V of the Clean Air Act](#), which requires major sources of air pollutants to obtain and comply with an operating permit.

In 2017:

- [Ammonia](#), followed by [methanol](#), accounted for the greatest air releases of TRI chemicals.
- Since 2016, air releases decreased by 2%.

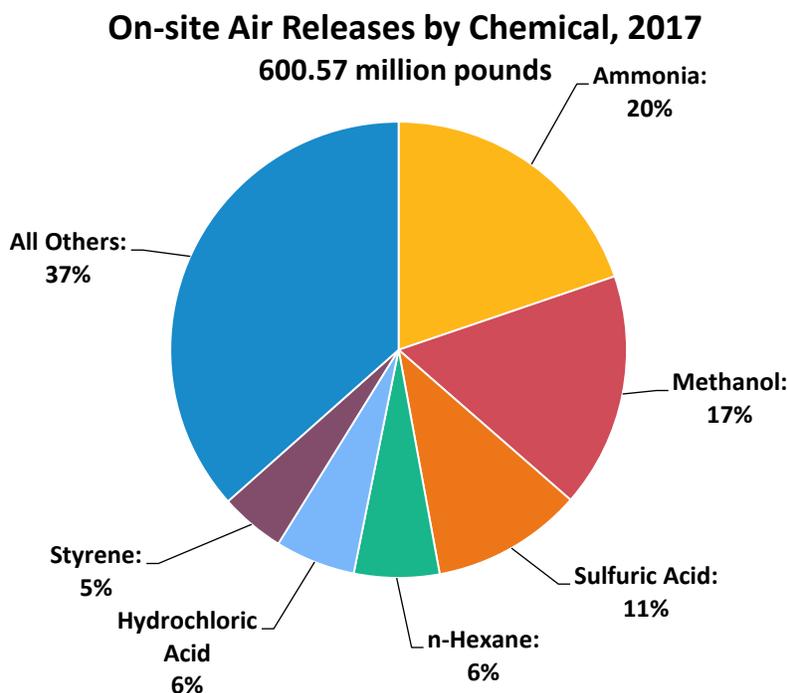
This graph shows the trend in the RSEI Score for air releases.



- The top chemicals by RSEI score for air releases were [chromium](#) and [ethylene oxide](#).
- Stack air releases tend to contribute relatively less to the RSEI score than fugitive releases because chemicals released through stacks tend to get dispersed over a wider area than fugitive air releases, resulting in lower average concentrations.
- For a complete, step-by-step description of how RSEI models air releases and derives RSEI Scores from stack air emissions and fugitive air emissions, see “Section 5.3 Modeling Air Releases” in Chapter 5 (“Exposure and Population Modeling”) of [EPA’s Risk-Screening Environmental Indicators \(RSEI\) Methodology, RSEI Version 2.3.6](#).
- For general information on how RSEI Scores are estimated, see [Hazard and Potential Risk of TRI Chemicals](#).

Air Releases by Chemical

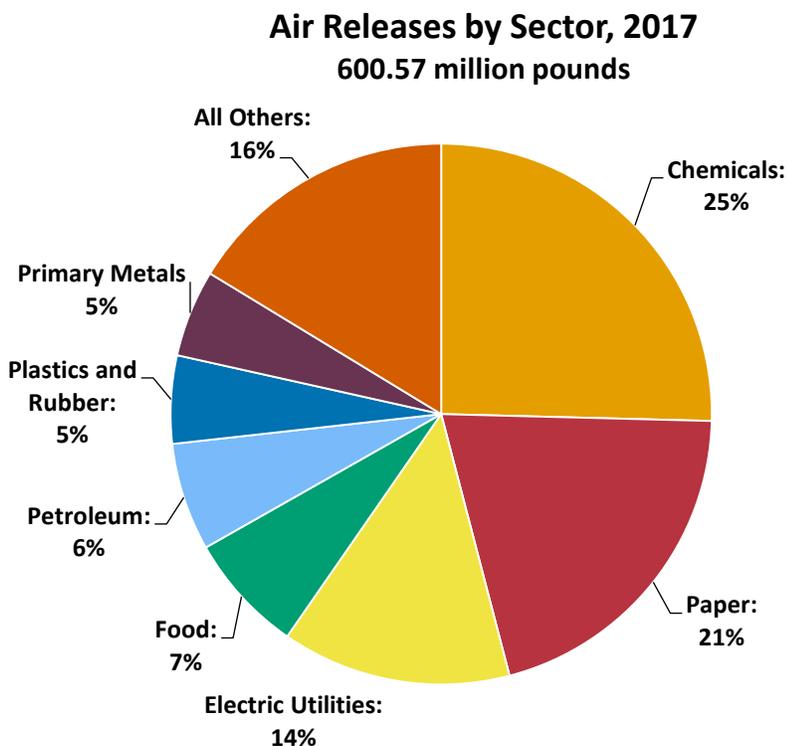
This pie chart shows which TRI chemicals were released to air in the greatest quantities during 2017.



- Facilities manufacturing nitrogen fertilizers accounted for about one third of the air releases of [ammonia](#) reported to TRI for the past five years.
- Air releases of [methanol](#) are primarily from pulp, paper, and paperboard mills and have decreased by 24% since 2007.
- Thirty-four percent of [hydrochloric acid](#) and 79% of [sulfuric acid](#) emissions result from generating electricity from combustion of coal and oil. Air releases of these two chemicals reported to TRI have decreased consistently since 2007. One reason for the decrease in air releases of these chemicals is the increase in the use of natural gas as a fuel for electricity generation. Natural gas power plants are not required to report to TRI.

Air Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to air during 2017.

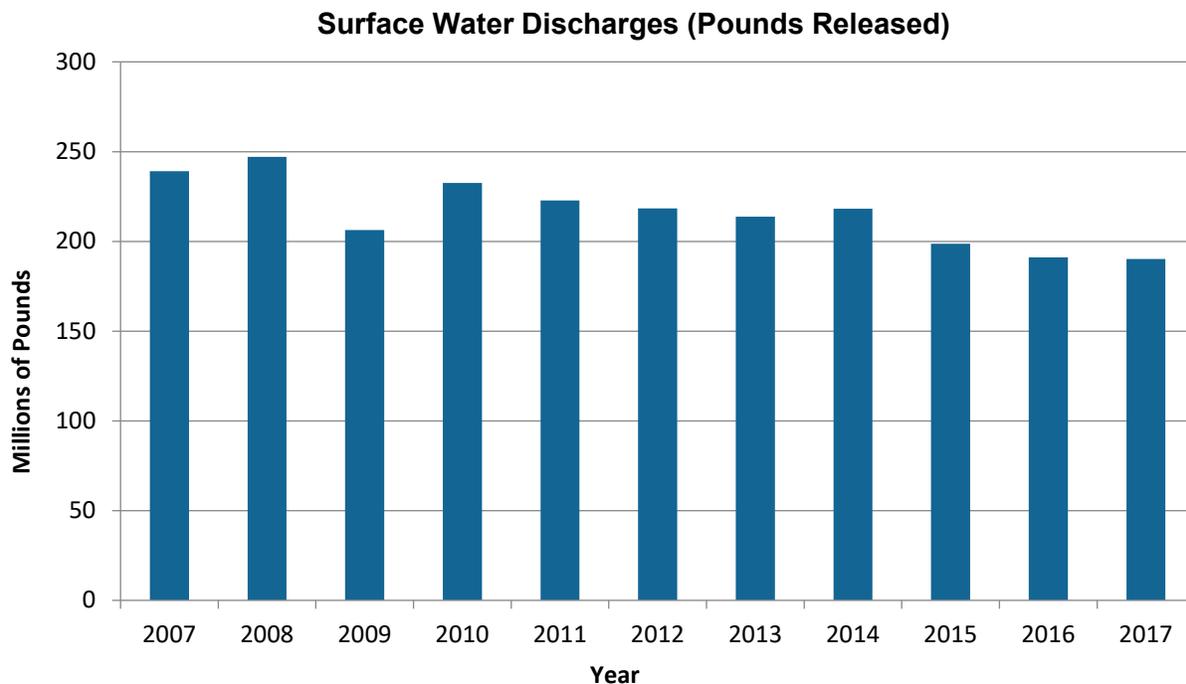


Note: Percentages may not sum to 100% due to rounding.

- Chemical manufacturing, paper manufacturing, and the electric utility sectors accounted for the greatest releases to air in 2017. Air releases in these three industries have decreased since 2016:
 - Chemicals: 4% decrease (7.1 million pounds)
 - Paper: 2% decrease (2.5 million pounds)
 - Electric utilities: 5% decrease (4.4 million pounds)

Water Releases

Facilities are required to report the quantity of Toxics Release Inventory (TRI) chemicals they release to receiving streams or other water bodies. The following graph shows the trend in the pounds of chemicals released to water bodies as reported to TRI.



From 2007 to 2017:

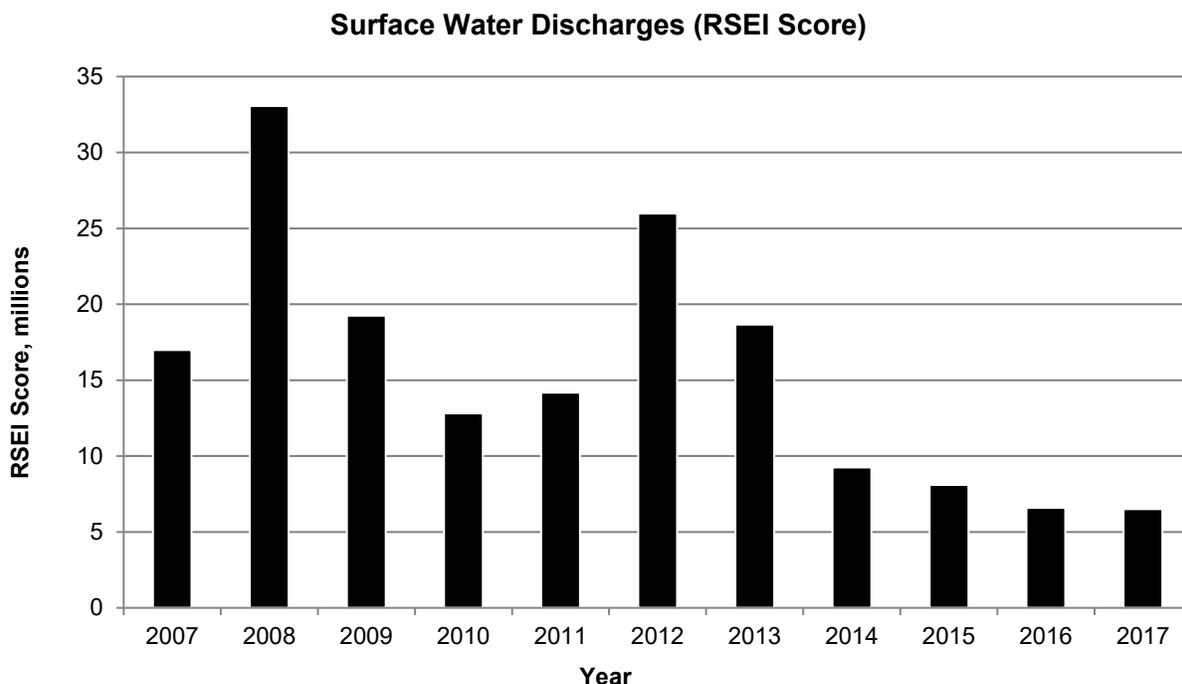
- Surface water discharges decreased by 20% (49 million pounds). Most of this decline is due to reduction in releases of [nitrate compounds](#) to water, which decreased by 21% (44 million pounds).
 - Nitrate compounds are often formed as byproducts during wastewater treatment processes such as when [nitric acid](#) is neutralized, or when nitrification takes place to meet standards under EPA's effluent guidelines. Nitrate compounds are released to water in quantities that are larger than any other TRI chemical released to water.
- Surface water discharges are often regulated by other programs and require permits such as the [Clean Water Act National Pollutant Discharge Elimination System \(NPDES\) permits](#).



In 2017:

- [Nitrate compounds](#) alone accounted for 90% of the total quantity of all TRI chemicals discharged to surface waters.

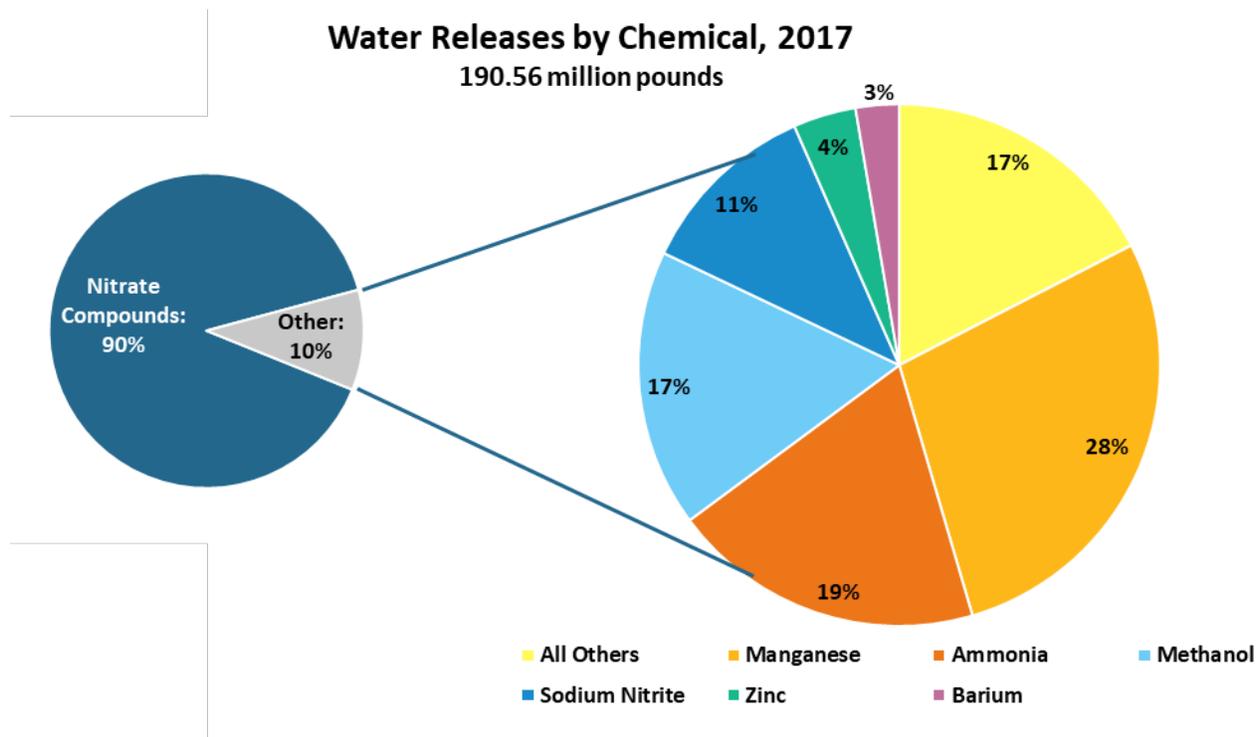
The following graph shows the trend in the RSEI Scores for chemicals released to water bodies as reported to TRI.



- The biggest contributor to RSEI water scores is [arsenic compounds](#).
- The high RSEI score for water discharges in 2008 includes a large one-time release of arsenic compounds due to a coal fly ash slurry spill, and a release of [benzidine](#), which has a relatively high toxicity.
- For a complete, step-by-step description of how RSEI derives RSEI Scores from surface water discharges of TRI chemicals see “Section 5.4 Modeling Surface Water Releases” in Chapter 5 (“Exposure and Population Modeling”) of [EPA’s Risk-Screening Environmental Indicators \(RSEI\) Methodology, RSEI Version 2.3.6](#).
- For general information on how RSEI Scores are estimated, see [Hazard and Potential Risk of TRI Chemicals](#).

Water Releases by Chemical

This pie chart shows which TRI-listed chemicals were released to water bodies in the greatest quantities during 2017.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

Note: Percentages may not sum to 100% due to rounding.

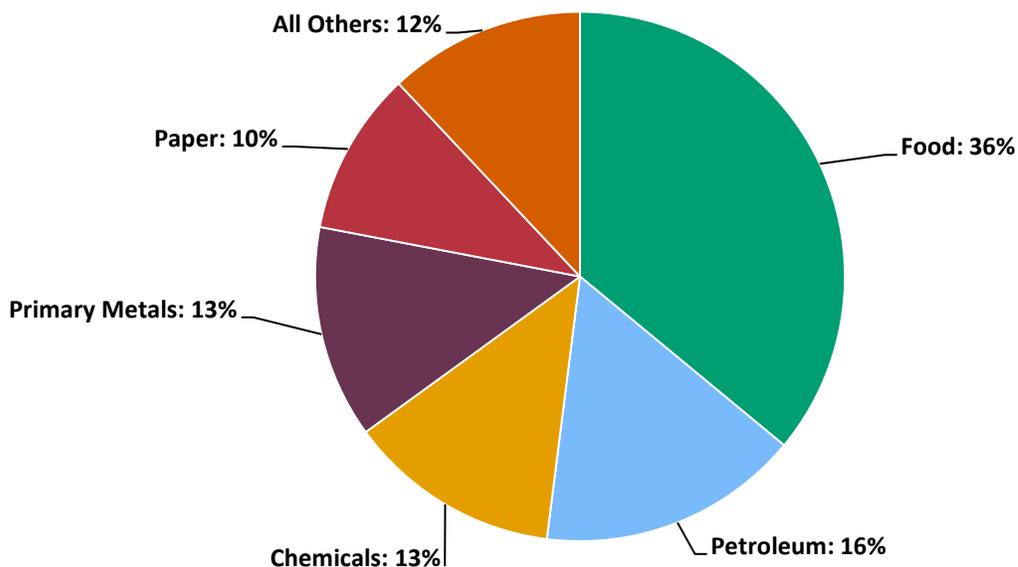
- [Nitrate compounds](#) accounted for 90% of the total quantities of TRI chemicals released to water in 2017. Nitrate compounds are soluble in water and commonly formed as part of facilities' on-site wastewater treatment processes. The food manufacturing sector contributed 40% of total nitrate compound releases to water, due to the treatment required for large quantities of biological materials in wastewaters from meat processing facilities.
 - While nitrate compounds are less toxic to humans than many other TRI chemicals, in nitrogen-limited waters, nitrates have the potential to cause increased algal growth leading to eutrophication in the aquatic environment. [See EPA's Nutrient Pollution webpage for more information about the issue of eutrophication.](#)

- [Manganese and manganese compounds](#), [ammonia](#), and [methanol](#) are the next most commonly released chemicals, and, in terms of combined mass quantities, account for 7% of releases to water.

Water Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to water bodies during 2017.

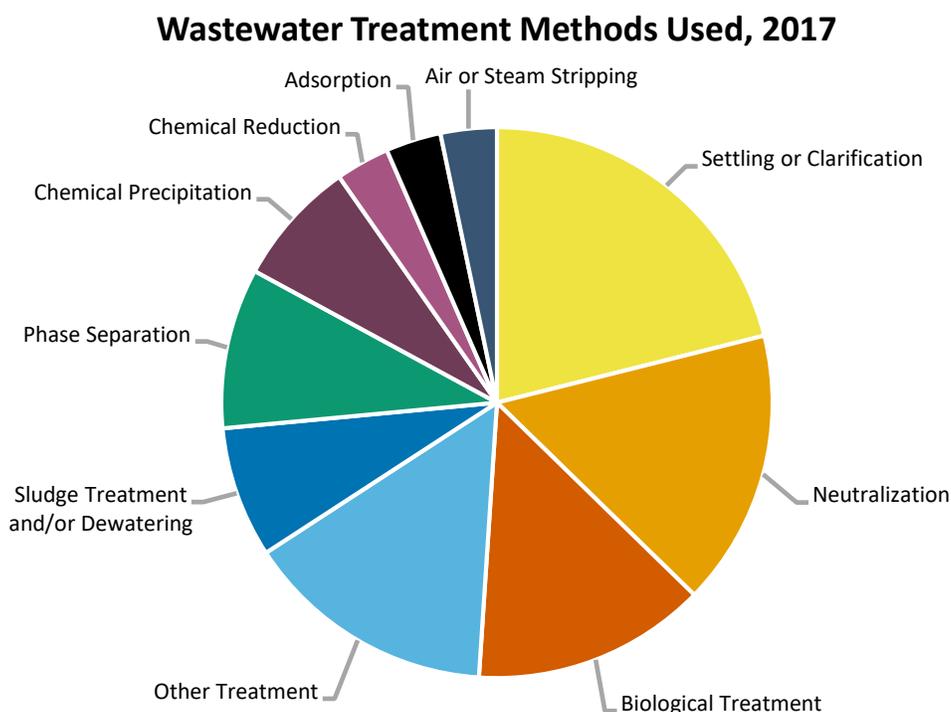
Water Releases by Industry, 2017
 190.56 million pounds



- The food manufacturing sector accounted for 36% of the total quantities of TRI chemicals released to water during 2017, which is similar to its contribution over the past 10 years.
- [Nitrate compounds](#) accounted for 99% of the total quantities of TRI chemicals released to water from the food manufacturing sector. Nitrate compounds are relatively less toxic to humans than many other TRI chemicals discharged to surface waters but are formed in large quantities by this sector during wastewater treatment processes due to the high biological content of wastewater.
- Surface water discharges are often regulated by other EPA programs, such as the program established under the Clean Water Act that issues [National Pollutant Discharge Elimination System \(NPDES\) permits](#).

Wastewater Treatment Methods

In 2017, one-third of TRI facilities reported that their operations generated wastewater. Importantly, facilities treat their wastewater prior to discharging it into nearby waterways or sending it to publicly owned treatment works (POTWs) where further treatment occurs. The treatment techniques they use are designed to reduce the concentration of chemicals in the wastewater and can even eliminate chemicals in discharges altogether. Facilities reporting to TRI are required to provide details on the types of treatment techniques they use and to also estimate the removal or destruction efficiency of treatment.



In 2017:

- Eighteen different types of physical, chemical, and biological treatment methods were reported, with two-thirds of facilities reporting they used multiple treatment methods (up to 11) for the same waste stream.
- The most common wastewater treatment methods were:
 - physical separation techniques (settling or clarification and phase separation), which remove both solids and TRI chemicals from the wastewater;

- chemical treatment such as neutralization, which alters extreme pH values, rendering the wastewater less acidic or alkaline and thus less damaging to the ecosystems of receiving waters and biological treatment systems at POTWs; and
- biological treatment, during which bacteria are used to digest and break down organic chemicals.

The types and efficacy of wastewater treatment methods used by each industry sector differ according to the chemicals and other pollutants in the wastewater. For example, neutralization was the most prevalent type of treatment in the Food Processing sector, likely due to operations that involve neutralizing the acids (e.g., [nitric acid](#)) used for cleaning and sanitation. In contrast, wastewater from Petroleum Refining is more often subject to phase separation and air or steam stripping, two processes that involve physically separating chemicals and other pollutants from the wastewaters generated during removal of water from crude petroleum.

Land Disposal

This graph shows the trend in the pounds of chemicals reported to TRI as disposed of to land. The metal mining sector accounts for most of the TRI chemical quantities disposed of to land.



From 2007 to 2017:

- On-site land disposal increased by 35% (from 2.0 to 2.7 billion pounds).
- Recent fluctuations are primarily due to changes in TRI chemical quantities disposed of to land on site by metal mines.
- “All Other land disposal” in the figure includes disposal: in landfills and surface impoundments that are not regulated under RCRA Subtitle C; to soil (land

treatment/application farming); and any other land disposal. Most of the TRI chemical quantities reported as “other land disposal” are from the disposal of waste rock at metal mines.

- Disposal to land is often regulated by other programs such as the [Resource Conservation and Recovery Act \(RCRA\)](#).

In 2017:

- Land disposal trends are largely driven by the metal mining sector, which accounted for 72% of land disposal quantities. Select the “Land Disposal, Excluding Metal Mining” button to view the land disposal trend with metal mines excluded from the analysis.
 - Most of these quantities were made up of either [lead and lead compounds](#) (35%) or [zinc and zinc compounds](#) (23%).

Metal mining facilities typically handle large volumes of material. In this sector, even a small change in the chemical composition of the mineral deposit being mined can lead to big changes in the amount of TRI-listed chemicals reported. In recent years mines have cited changes in production of waste rock, changes in the chemical composition of waste rock, and the closure of a heap leach pad as the primary reasons for the reported variability in land disposal of TRI chemicals. Changes in waste rock composition can have an especially pronounced effect on TRI reporting because of a regulatory exemption that applies based on a chemical’s concentration in the rock, regardless of total chemical quantities generated.

Regulations require that waste rock, which contains contaminants, be placed in engineered piles, and may also require that waste rock piles, tailings impoundments, and heap leach pads be stabilized and re-vegetated to provide for productive post-mining land use.

For more information on the mining industry, see the [Metal Mining sector profile](#).

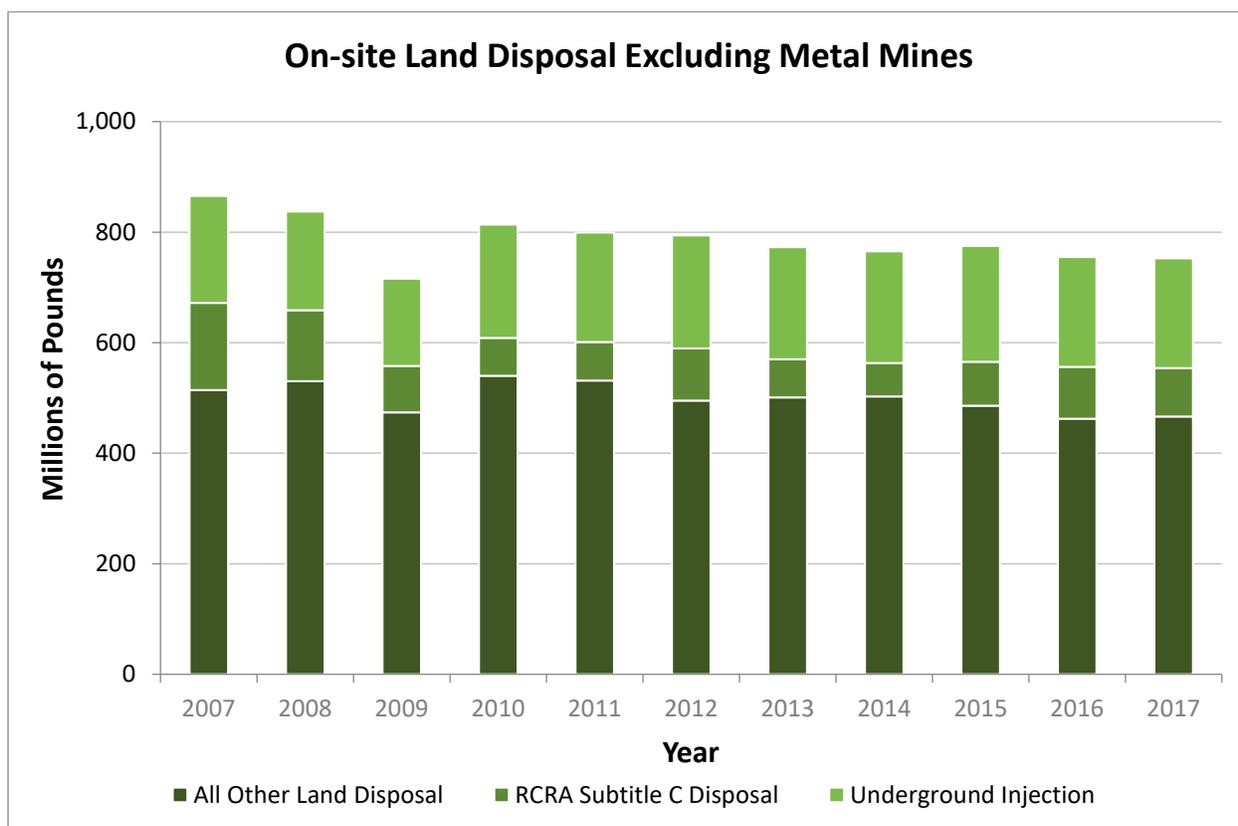
Helpful Concepts

[What is underground injection?](#)

Underground injection involves placing fluids underground in porous formations through wells.

[What is RCRA Subtitle C disposal?](#)

The RCRA Subtitle C Disposal category in TRI includes disposal to landfills and surface impoundments authorized to accept hazardous waste under the Resource Conservation and Recovery Act (RCRA). RCRA design standards include a double liner, a leachate collection and removal system, and a leak detection system. Operators must also comply with RCRA inspection, monitoring, and release response requirements.



From 2007 to 2017:

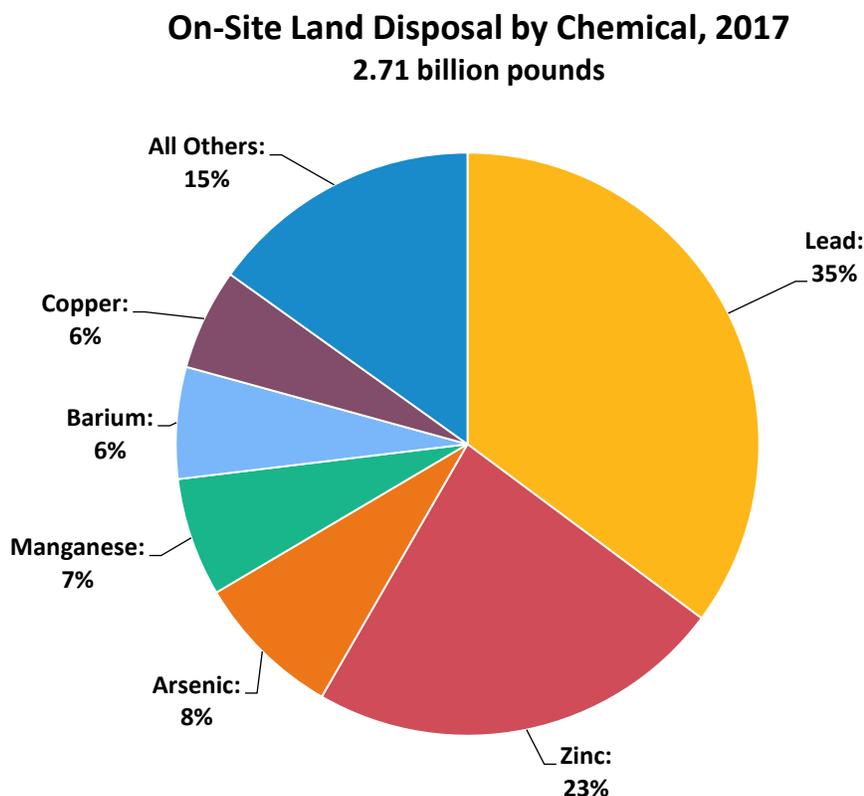
- Total on-site land disposal for all industries other than metal mining decreased by 13%.

In 2017:

- Excluding releases reported by metal mines, the chemicals disposed of to land in the largest quantities are: [barium and barium compounds](#) (18%), [manganese and manganese compounds](#) (13%), and [zinc and zinc compounds](#) (11%).
- While disposal to land has decreased in many sectors, the metal mining sector drives overall land disposal trends. See the graphic [Land Disposal by Industry](#) for more information.

Land Disposal by Chemical

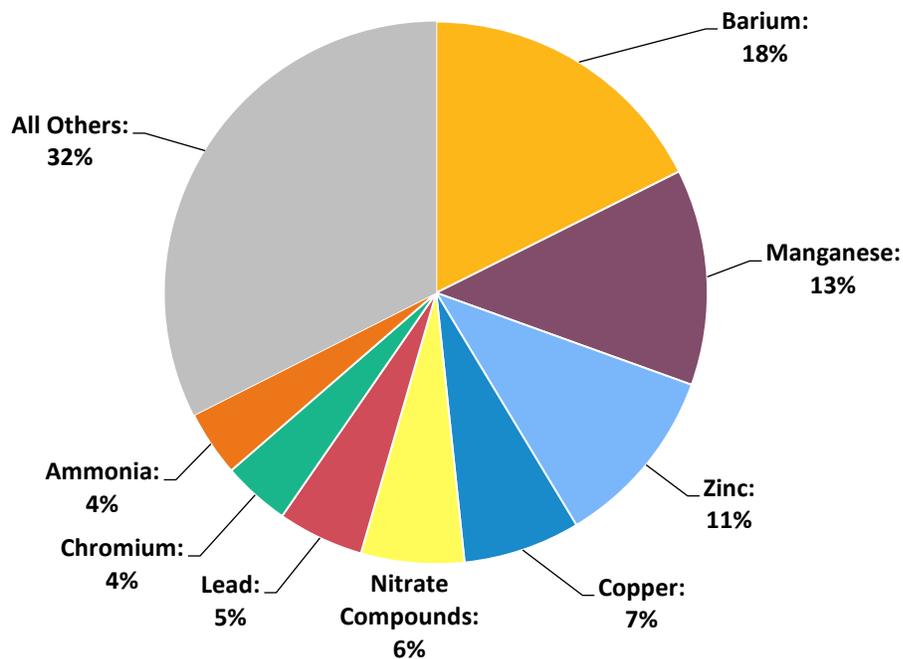
This pie chart shows the chemicals disposed of to land on site in the greatest quantities during 2017.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

The metal mining sector alone was responsible for 87% of the total quantities of [zinc](#) and 96% of the total quantities of [lead](#) disposed of to land in 2017. Annual fluctuations occur in land disposal quantities reported by metal mines because even a small change in the chemical composition of the mineral deposit being mined can lead to big changes in the amount of TRI-listed chemicals reported nationally.

On-Site Land Disposal Excluding Metal Mining, by Chemical 761 million pounds



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

From 2007 to 2017:

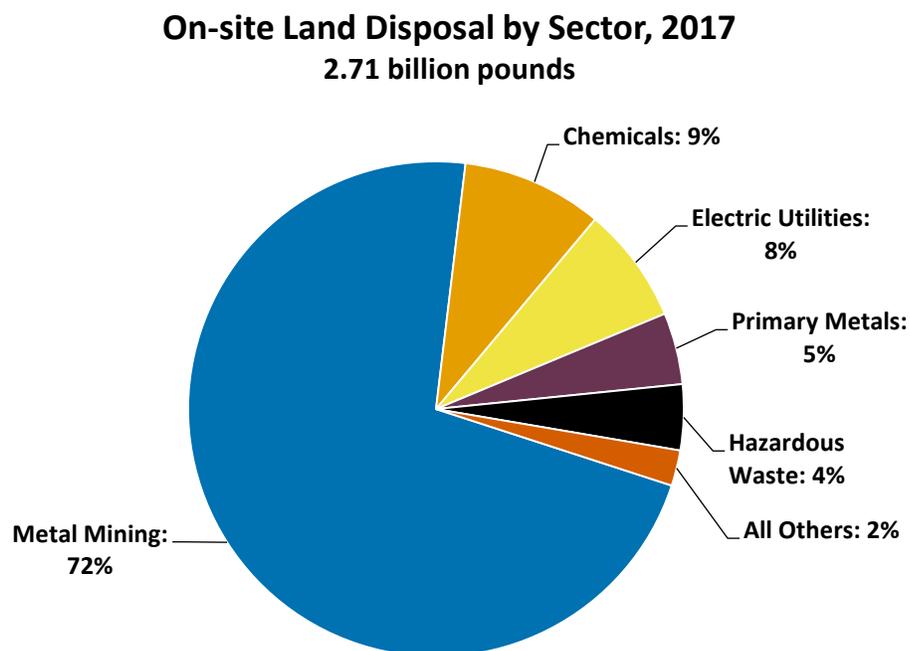
- [Barium](#): Releases decreased 28%.
- [Manganese](#): Releases decreased 5%.
- [Zinc](#): Releases decreased 10%.

In 2017:

- When the metal mining sector is excluded, a wider variety of chemicals contribute to most of the land releases. Excluding metal mining, eight different chemicals comprised 68% of land releases, as opposed to three chemicals comprising a comparable 66% of releases when mining is included.

Land Disposal by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest quantities of TRI chemicals disposed of to land on site during 2017.



- The metal mining sector accounted for most of the TRI chemicals disposed of to land in 2017, mostly due to chemicals contained in waste rock.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Chemicals of Special Concern

In this section, we take a closer look at some Toxics Release Inventory (TRI) chemicals that are of special concern: 1) persistent, bioaccumulative, and toxic (PBT) chemicals; and 2) known or suspected human carcinogens.

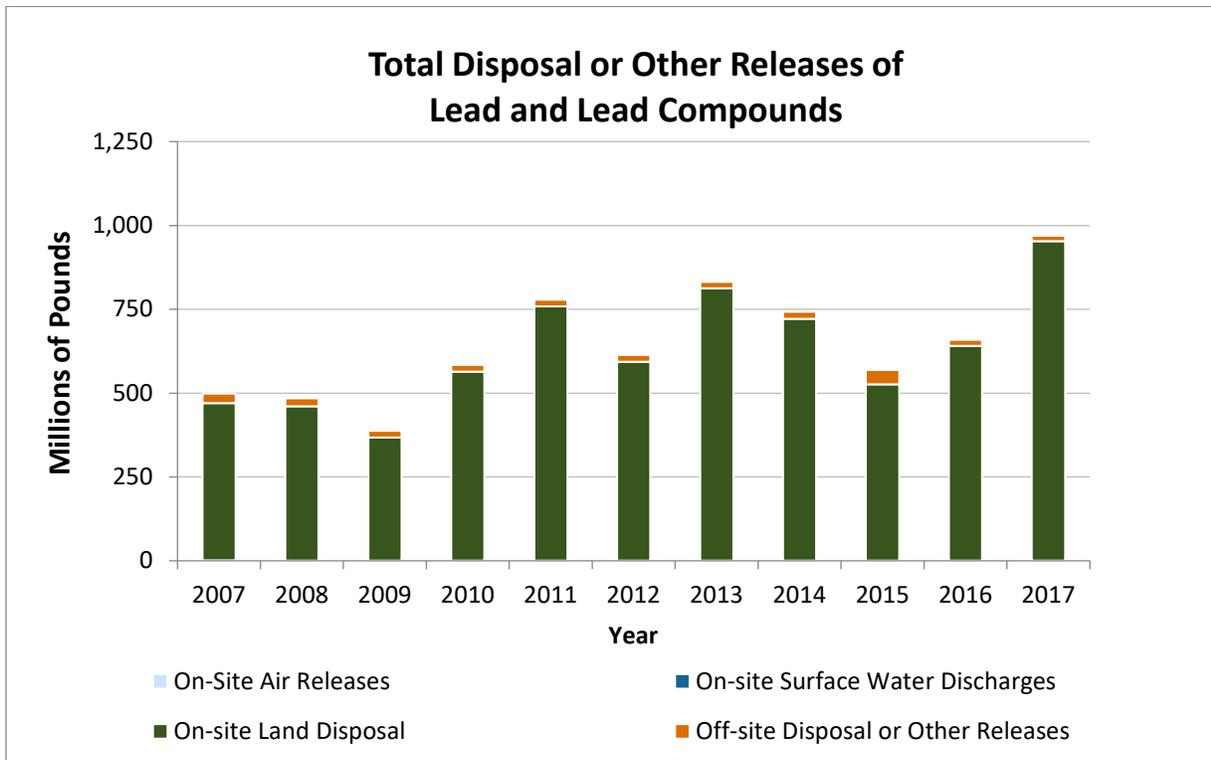
Chemicals designated as PBTs are toxic and remain in the environment for a long time where they tend to build up in the tissue of organisms throughout the food web. These organisms serve as food sources for other organisms, including humans, that are sensitive to the toxic effects of PBT chemicals.

Reporting requirements for the 16 chemicals and 5 chemical categories designated as [PBTs on the TRI chemical list](#) for Reporting Year 2017 are more stringent than for other TRI chemicals. This section focuses on the following PBT chemicals: [lead and lead compounds](#); [mercury and mercury compounds](#); and [dioxin and dioxin-like compounds](#).

There are also chemicals included on the TRI chemical list that the Occupational Safety and Health Administration (OSHA) includes on its list of carcinogens. These chemicals also have different TRI reporting requirements. This section presents the trend in air emissions for the OSHA carcinogens reported to TRI. A list of these chemicals can be found on the [TRI basis of OSHA carcinogens webpage](#).

Lead Releases Trend

This graph shows the trend in the pounds of [lead and lead compounds](#) disposed of or otherwise released by TRI reporting facilities including manufacturing facilities, metal mines, electric utilities, and hazardous waste treatment and disposal facilities.



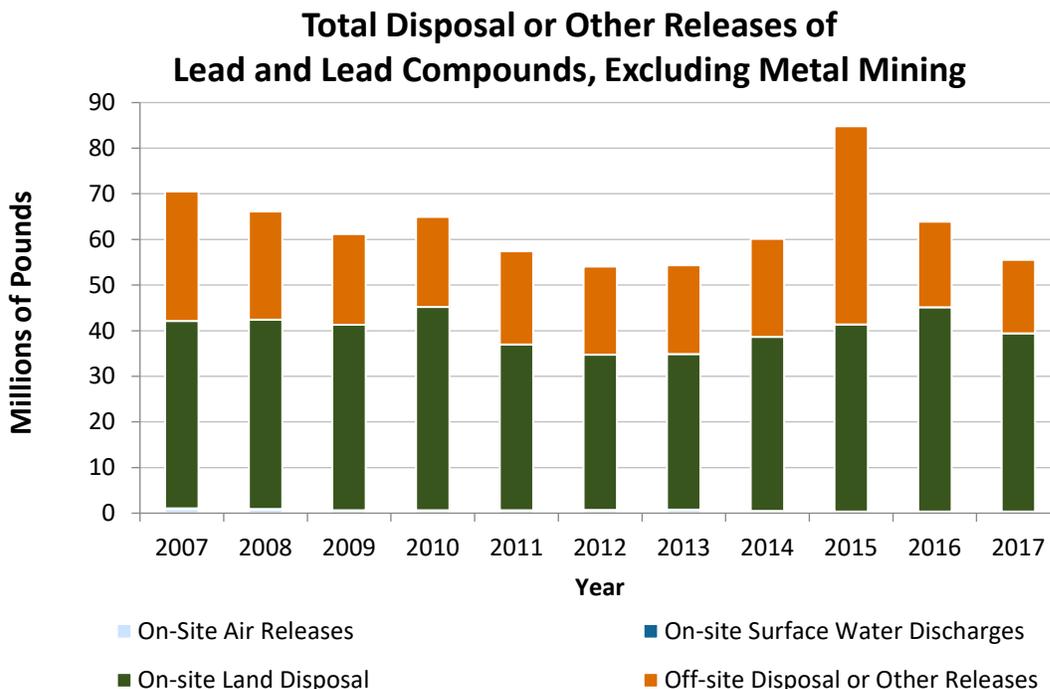
From 2007 to 2017:

- Releases of [lead and lead compounds](#) rose and fell between 2007 and 2017, with an overall increase of 94%.
- The metal mining sector accounts for most of the lead and lead compounds disposed of on site to land, driving the overall trend. For 2017, for example, metal mines reported 94% of total lead and lead compound releases.

From 2016 to 2017:

- Total releases of [lead and lead compounds](#) increased by 47% (310 million pounds).

This graph shows the trend in [lead and lead compounds](#) disposed of or otherwise released, but excludes quantities reported by the metal mining sector.

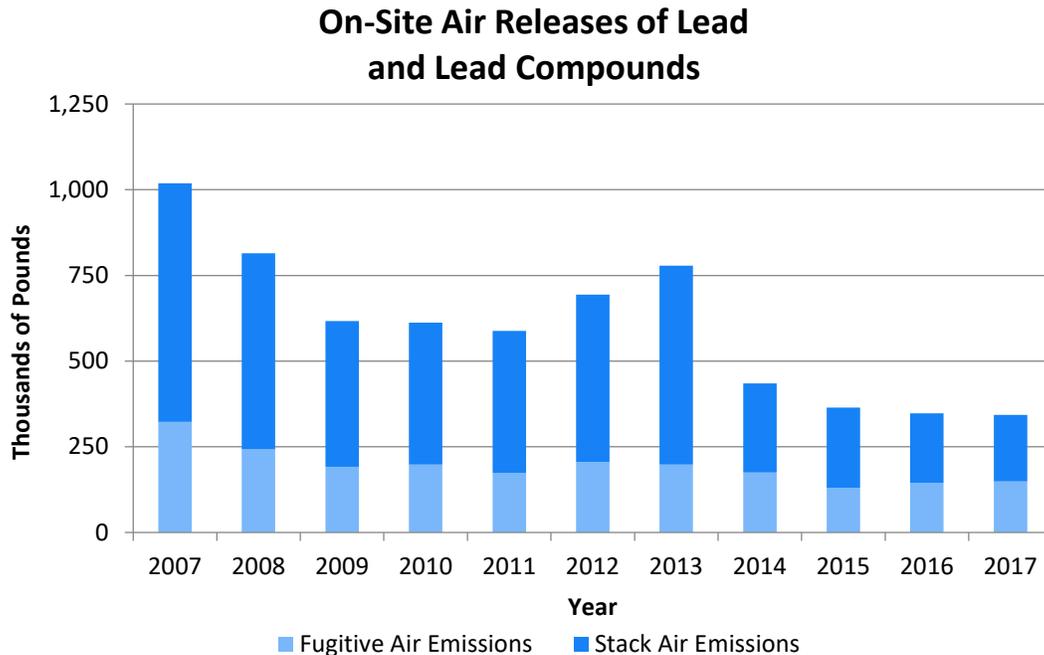


From 2007 to 2017:

- Metal mining accounts for the majority of [lead and lead compounds](#) disposed of to land.
- Releases of lead and lead compounds have decreased by 13% (8.4 million pounds) among the other sectors. The increase in 2015 was primarily due to one [hazardous waste management facility](#) that reported releases of 24.9 million pounds of lead compounds, compared to less than 0.5 million pounds for 2014 and 2016.

Lead Air Releases Trend

This graph shows the trend in the pounds of [lead and lead compounds](#) released to air.



From 2007 to 2017:

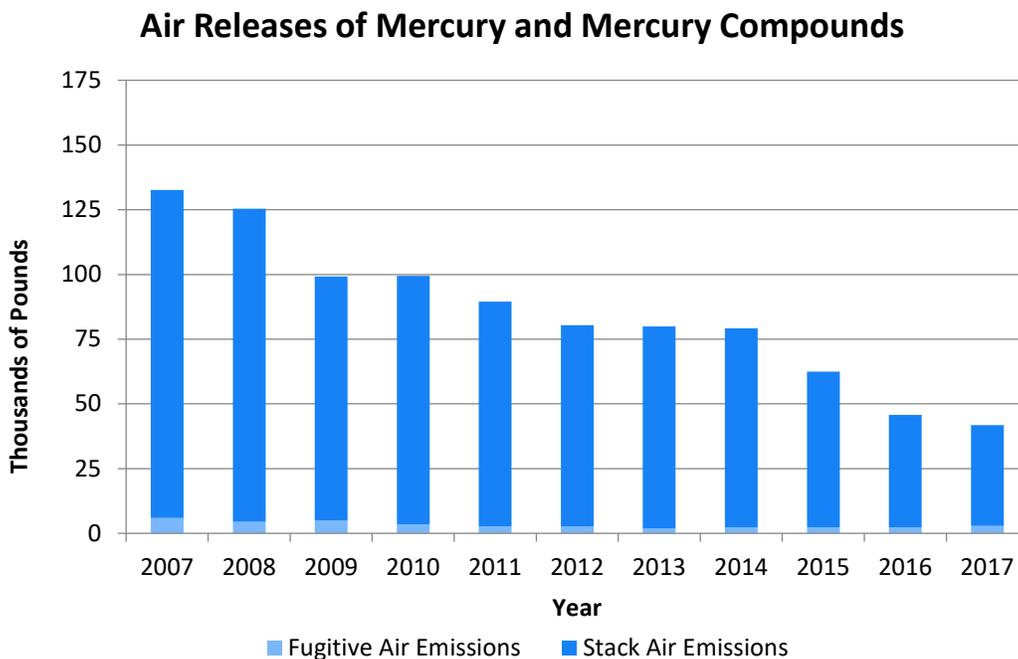
- Air releases of [lead and lead compounds](#) decreased by 66%. The primary metals and electric utilities industry sectors have driven this decrease.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, reported the greatest quantities of releases of lead and lead compounds to air.

From 2016 to 2017:

- Air releases of [lead and lead compounds](#) decreased by 1%.
- In 2017, 30% of air releases of lead were from the primary metals industry sector.

Mercury Air Releases Trend

This graph shows the trend in the pounds of [mercury and mercury compounds](#) released to air by TRI reporting facilities.



From 2007 to 2017:

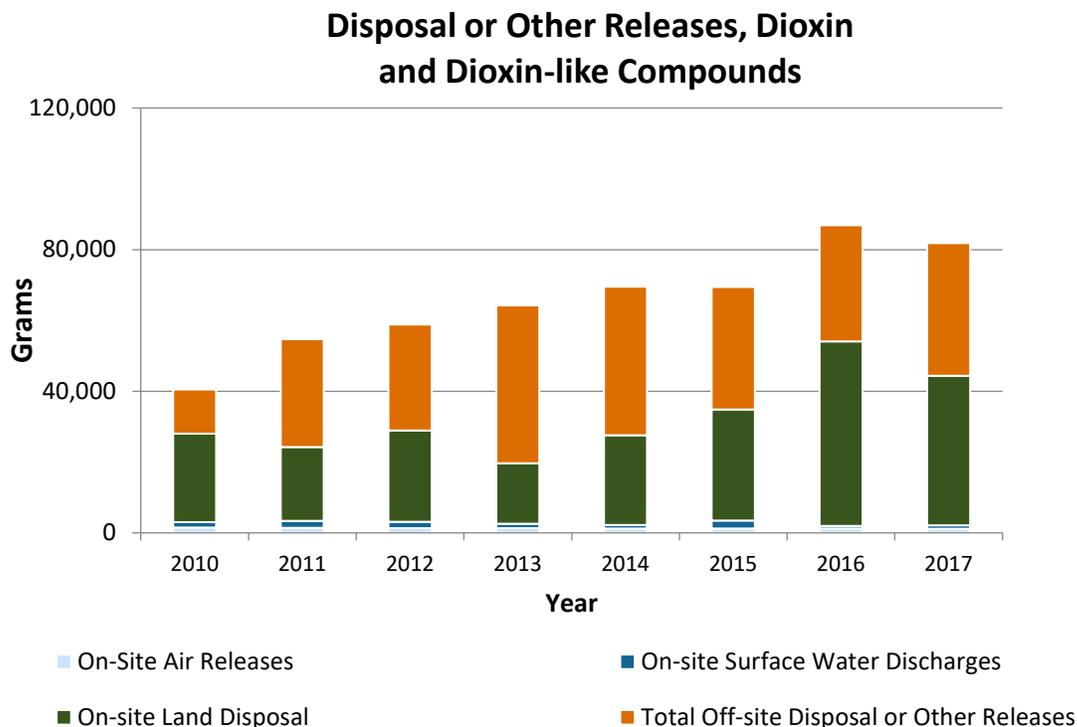
- Releases of [mercury and mercury compounds](#) to air decreased by 68%.
- Electric utilities are driving the decline in mercury air emissions, with an 89% reduction (83,000 pounds).

From 2016 to 2017:

- Air releases of mercury and mercury compounds decreased by 9%.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, accounted for 34% of the air emissions of [mercury and mercury compounds](#) reported to TRI for 2017.

Dioxin and Dioxin-like Compound Releases Trend

This graph shows the trend in the grams of [dioxin and dioxin-like compounds](#) disposed of or otherwise released by TRI-reporting facilities from 2010 to 2017.



[Dioxin and dioxin-like compounds](#) ("dioxins") are persistent, bioaccumulative, and toxic chemicals (PBTs) characterized by EPA as probable human carcinogens. Dioxins are the byproducts of many forms of combustion and several industrial chemical processes.

From 2010 to 2017:

- Since 2010, [dioxin](#) releases increased by 102%.
 - This increase in dioxin releases is largely driven by increased on-site land disposal from a non-ferrous metal smelting and refining facility.

From 2016 to 2017:

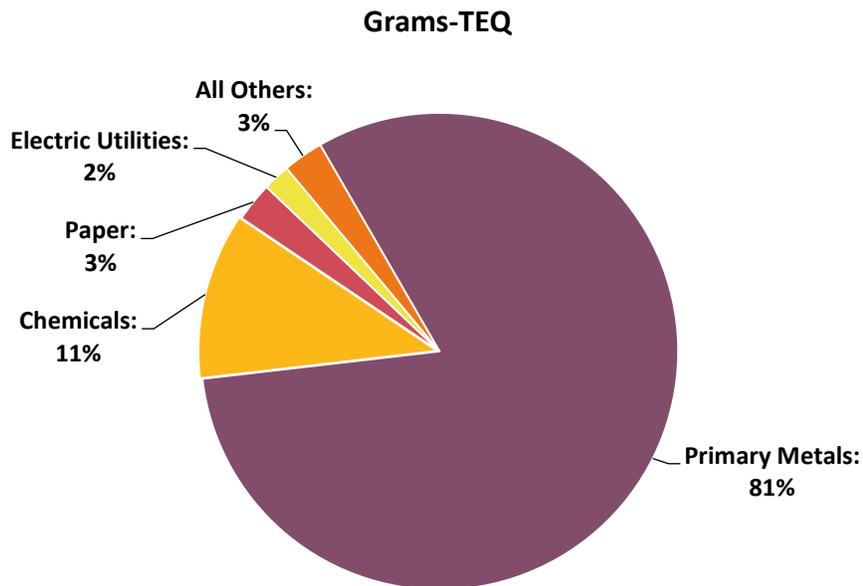
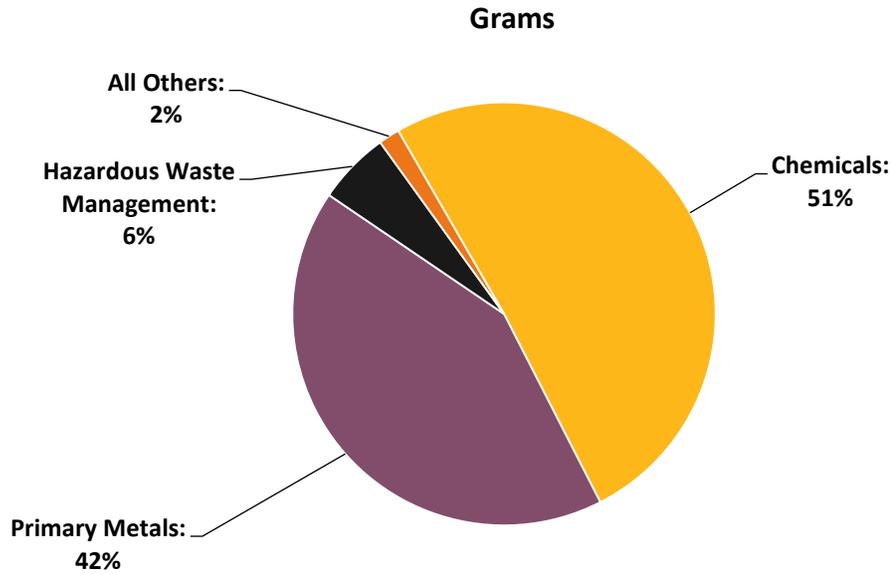
- Releases of [dioxins](#) decreased by 6%.
- In 2017, most (52%) of the quantity released was disposed on site to land.

Dioxins Releases by Industry

TRI also requires facilities to report data on 17 types, or congeners, of [dioxin](#). These congeners have a wide range of toxic potencies. The mix of dioxins from one source can have a very different level of toxicity than the same total amount, but different mix, from another source. These varying toxic potencies can be taken into account using Toxic Equivalency Factors (TEFs), which are based on each congener's toxic potency. EPA multiplies the total grams of each congener reported by facilities by the associated TEF to obtain a toxicity weight and sums all congeners for a total of grams in toxicity equivalents (grams-TEQ). Analyzing dioxins in grams-TEQ is useful when comparing disposal or other releases of dioxin from different sources or different time periods, where the mix of congeners may vary.

The following two pie charts show: 1) the TRI-covered industry sectors that reported the greatest releases of dioxin and dioxin-like compounds in *grams*, compared to 2) the industry sectors that reported the greatest releases of grams in toxicity equivalents (*grams-TEQ*). Note that only those TRI reports that included the congener detail for calculating grams-TEQ are included in these charts.

Releases of Dioxin and Dioxin-like Compounds by Industry, 2017

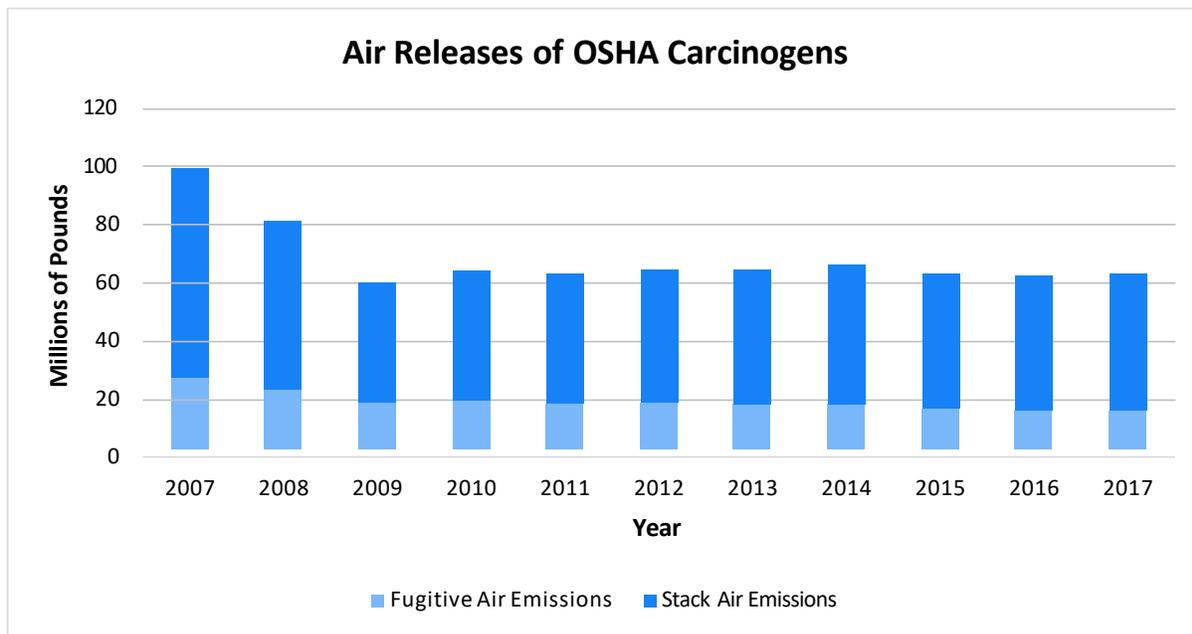


Note: Percentages may not sum to 100% due to rounding.

- Various industry sectors may dispose of or otherwise release very different mixes of [dioxin](#) congeners.
- The chemical manufacturing industry accounted for 51% and the primary metals sector for 42% of total grams of dioxins released.
- However, when TEFs are applied, the primary metals sector accounted for 81% and the chemical manufacturing sector for just 11% of the total grams-TEQ released.

Occupational Safety and Health Administration (OSHA) Carcinogens Air Releases

Among the chemicals that are reportable to the TRI Program, some are also included on OSHA's list of carcinogens. EPA refers to these chemicals as TRI OSHA carcinogens. This graph shows the trend in the pounds of TRI chemicals that are OSHA carcinogens released to air.

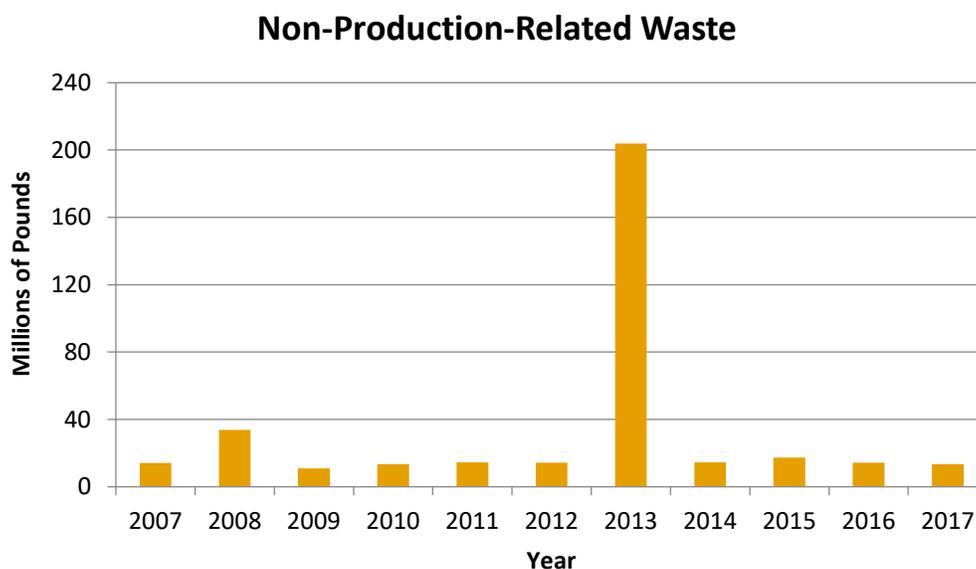


From 2007 to 2017:

- Air releases of these carcinogens decreased by 37%.
- The long-term decreases in air releases of OSHA carcinogens were driven mainly by decreases in releases of [styrene](#) to air from the plastics and rubber and transportation equipment industries.
- In 2017, air releases of OSHA carcinogens consisted primarily of [styrene](#) (43% of the air releases of all OSHA carcinogens), [acetaldehyde](#) (13%) and [formaldehyde](#) (8%).

Non-Production-Related Waste

Non-production-related waste refers to quantities of Toxics Release Inventory (TRI) chemicals disposed of or released, or transferred off site, as the result of one-time events, rather than due to standard production activities. These events may include remedial actions, catastrophic events, or other one-time events not associated with normal production processes. Non-production-related waste is included in a facility's total disposal or other releases, but not as part of its production-related waste managed. The following graph shows the annual quantities of non-production-related waste reported to TRI.



- Non-production-related waste from all facilities was below 35 million pounds in all years except for 2013 when a mining facility reported a one-time release of 193 million pounds. The facility reported zero releases in 2014 and has not reported to TRI since.
- For 2017, facilities reported 13 million pounds of one-time, non-production-related releases of TRI chemicals.