United States
Environmental Protection
Agency

# The 2012 Annual Effluent Guidelines Review Report

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# PART I: INTRODUCTION

# 1. 2012 ANNUAL REVIEW EXECUTIVE SUMMARY

Effluent limitations guidelines and standards (ELGs) are an essential element of the nation's clean water program, which was established by the 1972 Clean Water Act (CWA). ELGs are technology-based regulations used to control industrial wastewater discharges. EPA issues ELGs for new and existing point source categories that discharge directly to surface waters, as well as those that discharge to publicly owned treatment works (POTWs). These ELGs are applied in permits to limit the pollutants that facilities may discharge. To date, EPA has established ELGs to regulate wastewater discharges from 58 point source categories. This regulatory program substantially reduces industrial water pollution and continues to be a critical aspect of the effort to clean the nation's waters.

In addition to developing new ELGs, the CWA requires EPA to revise existing ELGs when appropriate. Over the years, EPA has revised ELGs in response to developments such as advances in treatment technology and changes in industry processes. To continue its efforts to reduce industrial wastewater pollution and fulfill CWA requirements, EPA has established an annual review and effluent guidelines planning process with three main objectives: (1) review existing ELGs to identify candidates for revision, (2) identify new categories of direct dischargers for possible development of effluent guidelines, and (3) identify new categories of indirect dischargers for possible development of pretreatment standards. To achieve these objectives, EPA conducts a two-phase review. First, EPA screens industrial discharges based on the relative hazard they pose to human health and the environment. Then, for those categories identified as a hazard priority, EPA conducts a more detailed evaluation to determine if the category is a candidate for new or revised ELGs.

Beginning with the 2012 Annual Review, EPA is augmenting the methods and data sources it uses to identify industrial categories for which new or revised effluent limitations guidelines and standards may be developed. This new approach, described in detail in this report, combines the traditional toxicity rankings analysis (TRA) and the analyses of new hazard data sources (not included in the TRA) coupled with an expanded review of new or improved treatment technologies. EPA will perform these review efforts in alternate years—completing the TRA in odd years and the analyses of additional industrial hazard data sources and new treatment technologies in even years. EPA has already completed its review for 2011 using the TRA and published the results in the Preliminary 2012 Plan (78 FR 48159).

For the 2012 Annual Review, EPA is primarily evaluating new hazard data sources and initiating a review of new treatment technologies. These new, even-year reviews will expand EPA's ability to identify new pollutants of concern and to identify wastewater discharges in industrial categories not currently regulated by ELGs. The new reviews will also enhance EPA's ability to screen industrial wastewater discharges based on a broader set of hazard data and enable EPA to account for advances in treatment technologies much earlier in the review process. Both of these factors are keys to improving the effectiveness of the Effluent Guidelines Program.

For the 2012 Annual Review, EPA reviewed public comments submitted on the Preliminary 2012 Plan, continued preliminary category reviews for three categories identified as warranting additional review in the Preliminary 2012 Plan (meat and poultry products (40 CFR Part 432); petroleum refining (40 CFR Part 419); and pulp, paper, and paperboard (40 CFR Part 430)), and investigated and conducted analyses on six new industrial wastewater hazard data sources (described below), the first four of which it had identified during the 2011 Annual Review (78 FR 48159). EPA selected these new hazard data sources based on how likely they are to be useful in identifying unregulated pollutants or industrial discharges, as well as their utility in identifying new wastewater treatment technologies and pollution prevention practices.

- **Identification of Industrial Wastewater Pollutants in Sewage Sludge.** EPA examined the Targeted National Sewage Sludge Survey (TNSSS), which includes data on pollutants of concern in sewage sludge, to determine if the pollutants could be attributed to specific industrial wastewater discharges (or point source categories), particularly for the pollutants that may impact the beneficial use of sewage sludge. For more information on the TNSSS see- *http://water.epa.gov/scitech/wastetech/biosolids/tnsss-overview.cfm*.

- **Review of Chemical Action Plans.** EPA reviewed data and plans from its Toxic Chemical Control Programs, specifically the Office of Pollution Prevention and Toxics (OPPT) Chemical Action Plans (CAPs), to determine whether the information identified new pollutants of concern or industrial wastewater discharges that are not currently regulated.

- **Identification of Wastewater Discharges Related to Air Pollution Control Not Currently Covered by ELGs.** Changes to or implementation of new air regulations may lead to new air pollution control requirements. As a result, some of these regulations have the potential to generate new or changed wastewater discharges with new pollutants of interest, depending upon the type of pollutants removed from the air and whether the affected industry adopts wet air pollution controls. For example, the wet scrubbers for flue-gas desulfurization at steam electric generating plants generate a wastewater discharge that is regulated by 40 CFR Part 423 (Steam Electric Power Generation); however, the only pollutants currently regulated are total suspended solids, oil and grease, and pH. Discharges of flue-gas desulfurization wet scrubber blowdown contain toxic metal pollutants, which are now the focus of the proposed Steam Electric Rulemaking (78 FR 34432). EPA assessed current federal air regulations to identify industries that, as a result, may be discharging new wastestreams or specific pollutant discharges not currently regulated.

- **Review of Toxic Release Inventory (TRI) Industry Sectors Expansion.** EPA's Office of Environmental Information (OEI) is currently evaluating expanding the TRI Program to include several new industrial sectors including Iron Ore Mining, Phosphate Mining, Steam Generation from Coal and/or Oil, Petroleum Bulk Storage, Solid Waste Combustors and Incinerators, and Large Dry Cleaning (the TRI expansion is schedule to be proposed in December 2014). This expansion would require covered facilities in these industries to report data for specific toxic chemicals or other waste released. EPA reviewed publically available industry profile information, pollutants of concern, and public comments submitted on the rulemaking to date to determine if these industries represent new wastestreams and/or discharge pollutants not currently regulated.

- **Review of Analytical Methods.** EPA periodically develops new analytical methods, or updates existing ones, in response to developments, such as the identification of a new class of pollutants, or impairments to water bodies that indicate the need for altered or new methods. EPA focused its review on recent updates to the wastewater analytical methods listed in 40 CFR Part 136 as well as drinking water methods developed by EPA's Office of Ground Water and Drinking Water and Office of Research and Development to determine whether new methods are available that apply to unregulated pollutants in industrial wastewater discharges, or if changes to existing analytical methods provide for increased sensitivity. Such new or altered methods might allow EPA to identify previously undetected pollutants or regulate the discharge of currently-regulated pollutants to more stringent levels.

- **Review of Wastewater Treatment Technologies.** EPA began reviewing technical papers and research articles regarding the performance of new and improved industrial wastewater treatment technologies. EPA is working to capture this data and information in a searchable industrial wastewater treatment technology database to facilitate screening of industrial categories for new or revised ELGs based on the availability and effectiveness of technologies for removing pollutants of concern from the specific industrial wastewater discharges.

Based on the data and analyses conducted for the 2011 and 2012 Annual Reviews, and public comment and stakeholder input, EPA has identified the following:

- EPA's TRA in 2011 identified a recent increase in dioxins and dioxin-like compounds as well as metals discharges from petroleum refineries (40 CFR Part 419) (U.S. EPA, 2012). In the 2012 Annual Review, EPA's preliminary category review for petroleum refineries indicated that the metals discharges may be attributed to new air pollution control requirements and a change in feedstock (see Section 5.2). EPA's review of air regulations in the 2012 Annual Review confirmed that new and revised regulations for petroleum refineries may result in a new wastestream containing metals, resulting from the use of wet air pollution controls (see Section 6.3). In addition, from EPA's preliminary category review for petroleum refineries in 2012 EPA has not been able to confirm whether dioxin is being discharged at concentrations above 1613B Minimum Levels or conclusively identify the primary source of the discharge (e.g., stormwater or process wastewater from catalytic reforming and catalyst regeneration operations).

- EPA's TRA in 2011 (U.S. EPA, 2012) and review of TNSSS data in the 2012 Annual Review (see Section 6.1) identified the metal finishing point source category (40 CFR Part 433) as potentially discharging high concentrations of metals, particularly chromium, nickel, and zinc to POTWs that could then transfer to sewage sludge and impact its beneficial use.

- EPA's review of CAPs (see Section 6.2) identified the following pollutants that are potentially present (and unregulated) in industrial wastewater discharges:

benzidine dyes, bisphenol A (BPA), hexabromocyclododecane (HBCD), nonylphenol and nonylphenol ethoxylates, perfluorinated chemicals (PFCs), phthalates, short-chain chlorinated paraffins (SCCPs), hydrolysis byproducts of toluene diisocyanate (TDI) and methylene diphenyl diisocyanate (MDI).

- EPA's review of new wastewater discharges from air pollution controls (see Section 6.3) identified three industries that have air regulations that may result in an unregulated wastewater discharge; brick and structural clay product manufacturing, industrial, commercial, and institutional boilers, and industrial, commercial, and institutional steam generating units. In addition, EPA identified 13 industries with existing ELGs, for which new air regulations may result in the discharge of new or additional pollutants.

- EPA's review of the planned TRI sector expansion information (see Section 6.4) in the 2012 Annual Review suggests that selenium discharges from phosphate mines (regulated under 40 CFR Part 136) may be a new pollutant of concern. However, because the TRI sector expansion rulemaking and supporting information have not yet been published (projected publication is December 2014), EPA was not able to fully evaluate the impact of selenium discharges from phosphate mines at this time.

- EPA's review of recent analytical method developments (see Section 6.5), identified that there are reduced detection limits for some metals and additions of new methods for detecting other pollutants of concern from industrial wastewater discharges, including: free cyanide, acid mine drainage, nonylphenol, and bisphenol A.

  In addition, EPA identified several pesticides measured by some of the approved pesticide analytical methods (listed in 40 CFR Part 136) that do not currently have effluent limits under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455).

  EPA also reviewed OGWDW and ORD drinking water analytical methods and identified two relatively new methods developed by ORD to measure concentrations of PFCs and 1,4-dioxane. OGWDW is using these methods in its UCMR to evaluate PFCs and 1,4-dioxane in drinking water. EPA has identified industrial wastewater discharges for both PFCs and 1,4-dioxane.

This report details EPA's methodology for its 2012 Annual Review and supports EPA Office of Water's *Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans* (U.S. EPA, 2014). The Plans, pursuant to Section 304(m) of the Clean Water Act (CWA),[1] discuss the findings of the 2011 and 2012 Annual Reviews and detail EPA's proposed actions and follow-up. The Plans also identify any new or existing industrial categories selected for effluent guidelines rulemaking and provide a schedule for such rulemaking.

[1] Available at: http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/.

## 1.1 References for 2012 Annual Review Executive Summary

1. U.S. EPA. 2012. *The 2011 Annual Effluent Guidelines Review Report*. Washington, D.C. (December). EPA-821-R-12-001. EPA-HQ-OW-2010-0824-0195.

2. U.S. EPA. 2014. *Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans*. Washington, D.C. (September). EPA-820-R-14-001. EPA-HQ-OW-2010-0824. DCN 07756.

# 2. BACKGROUND

This section explains how the Effluent Guidelines Program fits into EPA's National Water Program, describes the general and legal background of the Effluent Guidelines Program, and summarizes EPA's process for making effluent guidelines revision and development decisions (i.e., effluent guidelines planning), including details of its annual review process.

## 2.1 The Clean Water Act and the Effluent Guidelines Program

The Clean Water Act (CWA) is based on the principle of cooperative federalism, with distinct roles for both EPA and the states, in which the goal is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. To that end, the Act is generally focused on two types of controls: (1) water-quality-based controls, based on water quality standards and (2) technology-based controls, based on effluent limitations guidelines and standards (ELGs).

The CWA gives states the primary responsibility for establishing, reviewing, and revising water quality standards. Water quality standards consist of the following elements: (1) designating uses for each water body (e.g., fishing, swimming, supporting aquatic life), (2) establishing criteria that protect the designated uses (numeric pollutant concentration limits and narrative criteria, e.g., "no objectionable sediment deposits"), and (3) developing an anti-degradation policy. EPA develops recommended national criteria for many pollutants, pursuant to CWA section 304(a), which the states may adopt or modify as appropriate to reflect local conditions.

EPA is responsible for developing technology-based ELGs, based on currently available technologies for controlling industrial wastewater discharges. Permitting authorities (states authorized to administer the National Pollutant Discharge Elimination System (NPDES) permit program, and EPA in the few states that are not authorized) then must incorporate these guidelines and standards into discharge permits as technology-based effluent limitations, where applicable (U.S. EPA, 2010).

While technology-based effluent limitations in discharge permits are sometimes as stringent as, or more stringent, than necessary to meet water quality standards, the effluent guidelines program is not specifically designed to ensure that the discharges from each facility meet the water quality standards of its receiving water body. For this reason, the CWA also requires authorized states to establish water-quality-based effluent limitations, where necessary to meet water quality standards. Water-quality-based limits may require industrial facilities to meet requirements that are more stringent than those of a national effluent guideline regulation. In the overall context of the CWA, effluent guidelines must be viewed as one tool in the broader set of tools and authorities Congress provided to EPA and the states to restore and maintain the quality of the nation's waters.

The 1972 CWA directed EPA to promulgate effluent guidelines that reflect pollutant reductions that can be achieved by categories or subcategories of industrial point sources through the implementation of available treatment and prevention technologies. The effluent guidelines are based on specific technologies (including process changes) that EPA identifies as meeting the statutorily prescribed level of control (see CWA sections 301(b)(2), 304(b), 306, 307(b), and

307(c)). See Appendix A of this report for more information on the CWA and an explanation of the different levels of control for ELGs.

Unlike other CWA tools, effluent guidelines are national in scope and establish pollution-control obligations for all facilities within an industrial category or subcategory that discharge wastewater. In establishing these controls, under the direction of the statute, EPA assesses, for example, (1) the performance and availability of the best pollution-control technologies or pollution-prevention practices for an industrial category or subcategory as a whole; (2) the economic achievability of those technologies, which can include consideration of the affordability of achieving the reduction in pollutant discharge; (3) the cost of achieving effluent reductions; (4) non-water-quality environmental impacts (including energy requirements); and (5) such other factors as the EPA Administrator deems appropriate.

Creating a single national pollution-control requirement for each industrial category, based on the best technology the industry can afford was seen by Congress as a way to reduce the potential creation of "pollution havens" and to set the nation's sights on eliminating the discharge of pollutants to waters of the U.S. Consequently, EPA's goal in establishing national effluent guidelines is to ensure that industrial facilities with similar characteristics, regardless of their location or the nature of their receiving water, will at a minimum meet similar effluent limitations, representing the performance of the best pollution control technologies or pollution prevention practices.

In addition to establishing technology-based effluent limits, effluent guidelines provide the opportunity to promote pollution prevention and water conservation. This may be particularly important in controlling persistent, bioaccumulative, and toxic pollutants discharged in concentrations below analytic detection levels. ELGs also control pollutant discharges from industrial facilities and cover discharges directly to surface water (direct discharges) and discharges to publicly owned treatment works (POTWs) (indirect discharges).

## 2.2 Effluent Guidelines Review and Planning Process

In addition to establishing new regulations, the CWA requires EPA to review existing effluent guidelines annually. EPA reviews all point source categories subject to existing effluent guidelines and pretreatment standards to identify potential candidates for revision, consistent with CWA sections 304(b), 301(d), and 304(g). EPA also reviews industries consisting of direct-discharging facilities not currently subject to effluent guidelines to identify potential candidates for effluent guidelines rulemakings, pursuant to CWA section 304(m)(1)(B). Finally, EPA reviews industries consisting entirely or almost entirely of indirect-discharging facilities that are not currently subject to pretreatment standards, to identify potential candidates for pretreatment standards development under CWA section 307(b).

### *2.2.1 Effluent Guidelines Review and Prioritization Factors*

In its annual reviews, EPA considers four major factors for prioritizing existing effluent guidelines or pretreatment standards for possible revision, or identifying new industries of concern through alternate analyses. These factors were developed in EPA's draft National Strategy, described at http://water.epa.gov/scitech/wastetech/guide/strategy/fs.cfm.

The first factor EPA considers is the amount and type of pollutants in an industrial category's discharge and the relative hazard posed by that discharge. This enables the Agency to set priorities for its rulemaking that will achieve significant environmental and health benefits.

The second factor EPA considers is the performance and cost of applicable and demonstrated wastewater treatment technologies, process changes, or pollution prevention alternatives that could effectively reduce the concentrations of pollutants in the industrial category's wastewater and, consequently, reduce the hazard to human health or the environment associated with these pollutant discharges.

The third factor EPA considers is the affordability or economic achievability of the wastewater treatment technology, process change, or pollution prevention measures identified using the second factor. If the financial condition of the industry indicates that it would not be affordable to implement expensive and stringent new requirements, EPA might conclude a less stringent, less expensive approach to reduce pollutant loadings would better satisfy applicable statutory requirements.

The fourth factor EPA considers is the opportunity to eliminate inefficiencies or impediments to pollution prevention or technological innovation, or opportunities to promote innovative approaches such as water-quality trading, including within-plant trading. This factor might also prompt EPA, during annual reviews, to decide against revising an existing set of effluent guidelines or pretreatment standards where the pollutant source is already efficiently and effectively controlled by other regulatory or non-regulatory programs.

### *2.2.2 Annual Review Process*

EPA has instituted a two-step annual review process. In the odd-year reviews, EPA screens industrial dischargers through a toxicity ranking analysis (TRA) that identifies and ranks those categories whose pollutant discharges pose a substantial hazard to human health and the environment (the first draft National Strategy factor). For the TRA, EPA relies on discharge monitoring report (DMR) and Toxics Release Inventory (TRI) data to rank and prioritize for review industrial discharge categories based on toxic-weighted pound equivalents (TWPE) released. EPA relies on facility and state contacts, permits, and publicly available data sources to review top ranking industrial categories (see Section 2.2.2.1 for more detail on the TRA).

In the even years, EPA reviews additional hazard data sources and conducts alternate analyses to enhance the identification of industrial categories for which new or revised ELGs may be appropriate, beyond those that traditionally rank high in the TRA. This is consistent with the Government Accountability Office's (GAO) recommendation that EPA's annual review approach include additional industrial hazard data sources to augment its screening-level review of discharges from industrial categories.[2] Furthermore, EPA recognizes the need to consider in the screening phase the availability of treatment technologies, process changes, or pollution-prevention practices that can reduce the identified hazards (the second and fourth draft National Strategy factors). Specifically, in the even-year reviews, EPA plans to target new data sources

[2] GAO published its recommendations for the review of additional hazard data sources in its September 2012 report *Water Pollution: EPA Has Improved Its Review of Effluent Guidelines But Could Benefit from More Information on Treatment Technologies*, available online at: http://www.gao.gov/assets/650/647992.pdf.

that will provide information on other considerations not currently captured as part of the TRA, including, but not limited to:

- Industrial process changes.
- Emerging contaminants of concern.
- Advances in treatment technologies and pollution prevention practices.
- Availability of new, more sensitive analytical methods.
- Other hazard data and information not captured in the TRI or DMR databases and/or suggested by stakeholders or from public comments.

Using the TRA in the odd-year review in conjunction with additional analyses and hazard data in the even-year review, EPA is considering more cohesively and comprehensively the factors laid out in EPA's draft National Strategy. This approach allows the Agency to prioritize existing effluent guidelines or pretreatment standards for possible revision or identifying new industries of concern through alternate analyses. See Section 2.2.2.2 for an overview of EPA's even-year analyses.

EPA also conducts a more detailed preliminary category review of those industrial discharge categories that rank highest in terms of TWPE (i.e., pose the greatest hazard to human health and the environment) in the TRA or are identified as warranting further review during the even-year analyses. If EPA determines that further review is warranted for an industrial category, EPA may complete a preliminary or detailed study of the point source category (see Section 2.2.2.4), which may eventually lead to a new or revised guideline.

#### 2.2.2.1 Overview of the Toxicity Ranking Analysis and Odd-Year Annual Reviews

In the odd-year annual reviews, EPA conducts a TRA using data from the TRI and data from DMRs contained in the Permit Compliance System (PCS) and the Integrated Compliance Information System for the National Pollutant Discharge Elimination System (ICIS-NPDES). Figure 2-1 details how EPA uses the TRA to identify existing ELGs that may warrant revision; Figure 2-2 addresses how EPA identifies new categories that may warrant regulation.

TRI and DMR data do not identify the effluent guideline(s) applicable to a particular facility. However, TRI includes information on a facility's North American Industry Classification System (NAICS) code, while DMR data include information on a facility's Standard Industrial Classification (SIC) code. Thus, the *first step* in EPA's TRA is to relate each SIC and NAICS code to an industrial category.[3] The *second step* is to use the information reported in TRI and DMR for a specific year to calculate the pounds of pollutant discharge to U.S. waters. These calculations are performed for toxic, nonconventional, and conventional pollutants. For indirect dischargers, EPA adjusts the facility discharges to account for removals at the POTW. The *third step* is to apply toxic weighting factors (TWFs)[4] to the annual pollutant discharges to calculate the total discharge of toxic pollutants as TWPE for each facility. *EPA*

[3] For more information on how EPA related each SIC and NAICS code to an industrial category, see Section 5.0 of the *2009 Technical Support Document for the Annual Review of Existing Effluent Guidelines and Identification of Potential New Point Source Categories* (U.S. EPA, 2009).
[4] For more information on TWFs, see *Toxic Weighting Factor Development in Support of CWA 304(m) Planning Process* (U.S. EPA, 2006).

*then* sums the TWPE for each facility in a category to calculate a total TWPE per category for that year. EPA calculates two TWPE estimates for each category: one estimate based on data in TRI and one estimate based on DMR data. EPA combines these two estimates to generate a single TWPE value for each industrial category. EPA takes this approach because it found that combining the TWPE estimates from TRI and DMR data into a single TWPE number offered a clearer perspective of the industries with the most toxic pollution.[5]

EPA then ranks point source categories according to their total TWPE discharges. To identify categories for further review, EPA prioritizes categories accounting for 95 percent of the cumulative TWPE from the combined DMR and TRI data. For more information on EPA's odd-year review process and methodology, see Section 3 of EPA's Preliminary 2012 Plan (U.S. EPA, 2013). As illustrated in Figure 2-1, EPA typically excludes from further review categories for which an effluent guidelines rulemaking is currently underway or for which effluent guidelines have been promulgated or revised within the past seven years.[6] EPA also excludes categories in which only a few facilities account for a large majority of toxic-weighted pollutant discharges. EPA generally does not prioritize such a category for additional review, but suggests that individual permits may be more effective in addressing the toxic-weighted pollutant discharges than a national effluent guidelines rulemaking. For more information on the results of the 2011 Annual Review, see Section 4 of EPA's Preliminary 2012 Plan (U.S. EPA, 2013).

As illustrated in Figure 2-2, EPA may also evaluate discharges in the odd-year TRA that are associated with SIC or NAICS codes that are not currently regulated or that may be a potential new subcategory of an existing ELG. EPA evaluates these discharges to determine if new ELGs are warranted for the new industrial category (or subcategory). Similarly, EPA can supplement this information with findings from new analyses conducted in the even-year annual review and review of treatment technology performance data to identify new industrial categories that may warrant ELGs (see Section 2.2.2.2).

#### 2.2.2.2 Overview of Even-Year Annual Reviews

In the even-year annual reviews, EPA identifies additional hazard data and reviews treatment technologies to augment the TRA completed in each odd-year review. EPA prioritizes the review of these additional hazard data sources based on (1) the likelihood of identifying unregulated industrial discharges, (2) the utility of identifying new wastewater treatment technologies or pollution prevention alternatives, and (3) representativeness of the data for an industrial category. These new analyses take into account a broader set of hazard data and advancements in treatment technologies. In addition to the new hazard data sources, the even-year reviews will include information from the public comments received on the Preliminary Plan and any continuing preliminary category reviews identified during the odd-year review, as illustrated in Figure 2-3. The specific methodologies and analyses of EPA's 2012 Annual Review are described in more detail in Part II of this report.

[5] Different pollutants may dominate the TRI and DMR TWPE estimates for an industrial category due to the differences in pollutant reporting requirements between the TRI and DMR databases. The single TWPE number for each category highlights those industries with the most toxic discharge data in both TRI and DMR. Although this approach could have theoretically led to double-counting, EPA's review of the data indicates that, because the two databases focus on different pollutants, double-counting is minimal and does not affect the order of the top-ranked industrial categories.

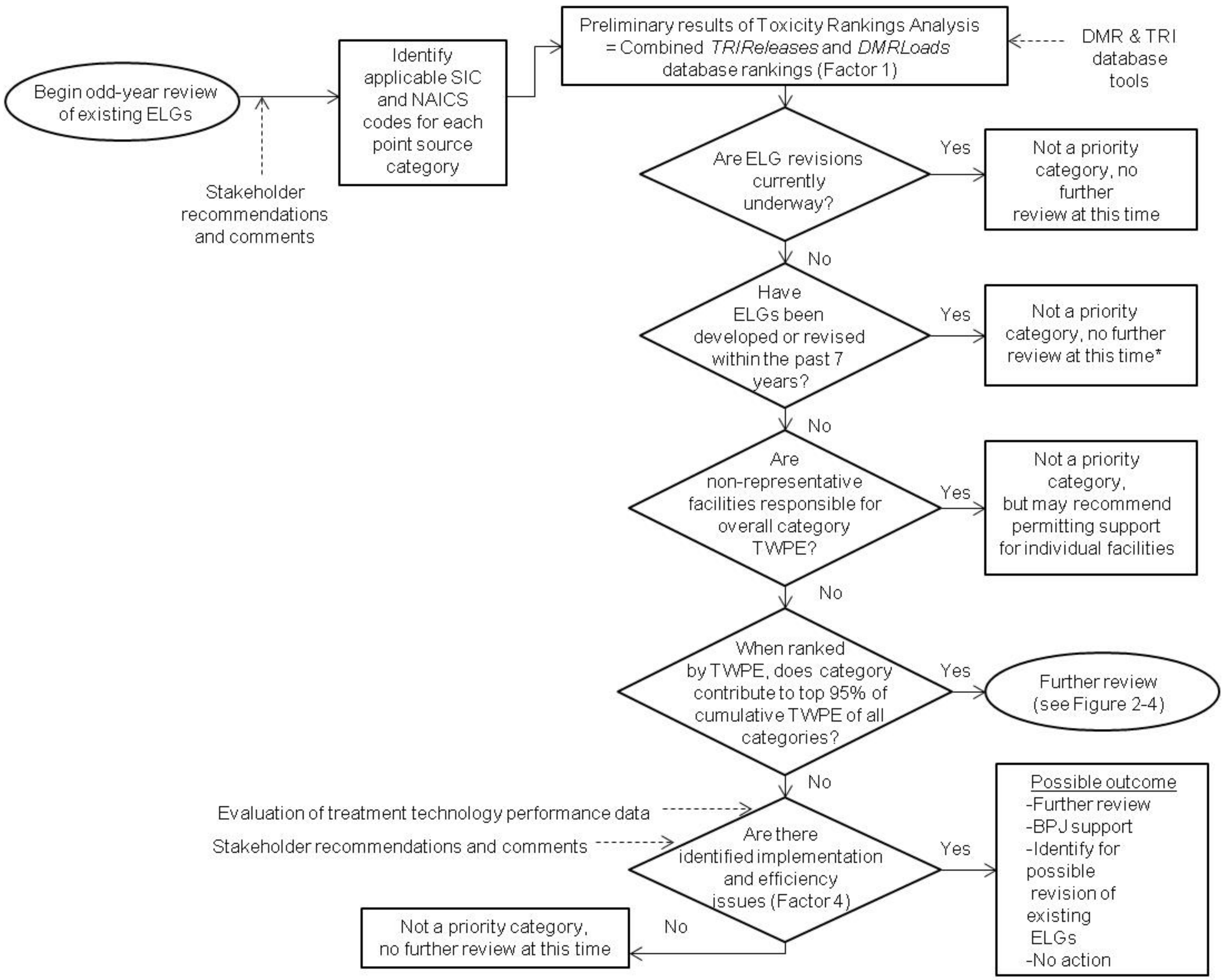
[6] EPA chose seven years because this is the typical length of time for the effects of effluent guidelines or pretreatment standards to be fully reflected in pollutant loading data and TRI reports.

#### 2.2.2.3 Preliminary Category Reviews

For the industrial categories with the highest hazard potential identified in the TRA, or identified as a priority from any of the even-year review analyses, EPA may conduct a preliminary category review, particularly if it lacks sufficient data to determine whether regulatory action would be appropriate, as illustrated in Figure 2-4. EPA will complete preliminary category reviews as part of the odd- or even-year review cycle depending on the industrial categories warranting review at that time. In its preliminary category reviews EPA typically examines the following: (1) wastewater characteristics and pollutant sources, (2) the pollutants driving the toxic-weighted pollutant discharges, (3) availability of pollution prevention and treatment, (4) the geographic distribution of facilities in the industry, (5) any pollutant discharge trends within the industry, and (6) any relevant economic factors. In executing preliminary category reviews, EPA first attempts to verify the toxicity ranking results and fill in data gaps. These assessments provide an additional level of quality assurance on the reported pollutant discharges and number of facilities that represent the majority of toxic-weighted pollutant discharge. After the ranking results are verified, EPA next considers costs and performance of applicable and demonstrated technologies, process changes, or pollution-prevention alternatives that can effectively reduce the pollutants in the point source category's wastewater. Finally, and if appropriate based on the other findings, EPA considers the affordability or economic achievability of the technology, process change, or pollution prevention measure identified using the second factor. During a preliminary category review, EPA may consult data sources including, but not limited to: (1) the U.S. Economic Census, (2) TRI and DMR data, (3) trade associations and reporting facilities that can verify reported releases and facility categorization, (4) regulatory authorities (states and EPA regions) that can clarify how category facilities are permitted, (5) NPDES permits and their supporting fact sheets, (6) EPA effluent guidelines technical development documents, (7) relevant EPA preliminary data summaries or study reports, and (8) technical literature on pollutant sources and control technologies.

#### 2.2.2.4 Preliminary and Detailed Studies

After conducting the preliminary category reviews, as shown in Figure 2-4, EPA may next conduct either a preliminary or detailed study of an industrial category. Typically these studies profile an industry category, gather information about the hazards posed in its wastewater discharges, gather information about availability and cost of treatment and pollution prevention technologies, assess economic achievability, and investigate other factors in order to determine if it would be appropriate to identify the category for possible effluent guidelines revision. During preliminary or detailed studies, EPA typically examines the factors and data sources listed above for preliminary category reviews. However, during a detailed study EPA's examination of a point source category and available pollution prevention and treatment options is generally more rigorous than the analyses conducted during a preliminary category review or a preliminary study and may, if appropriate, include primary data collection activities (such as industry questionnaires and wastewater sampling and analysis) to fill data gaps.




* If EPA is aware of new segment growth within such a category or new concerns are identified, EPA may do further review.

**Figure 2-1. Odd-Year Annual Review of Existing ELGs**

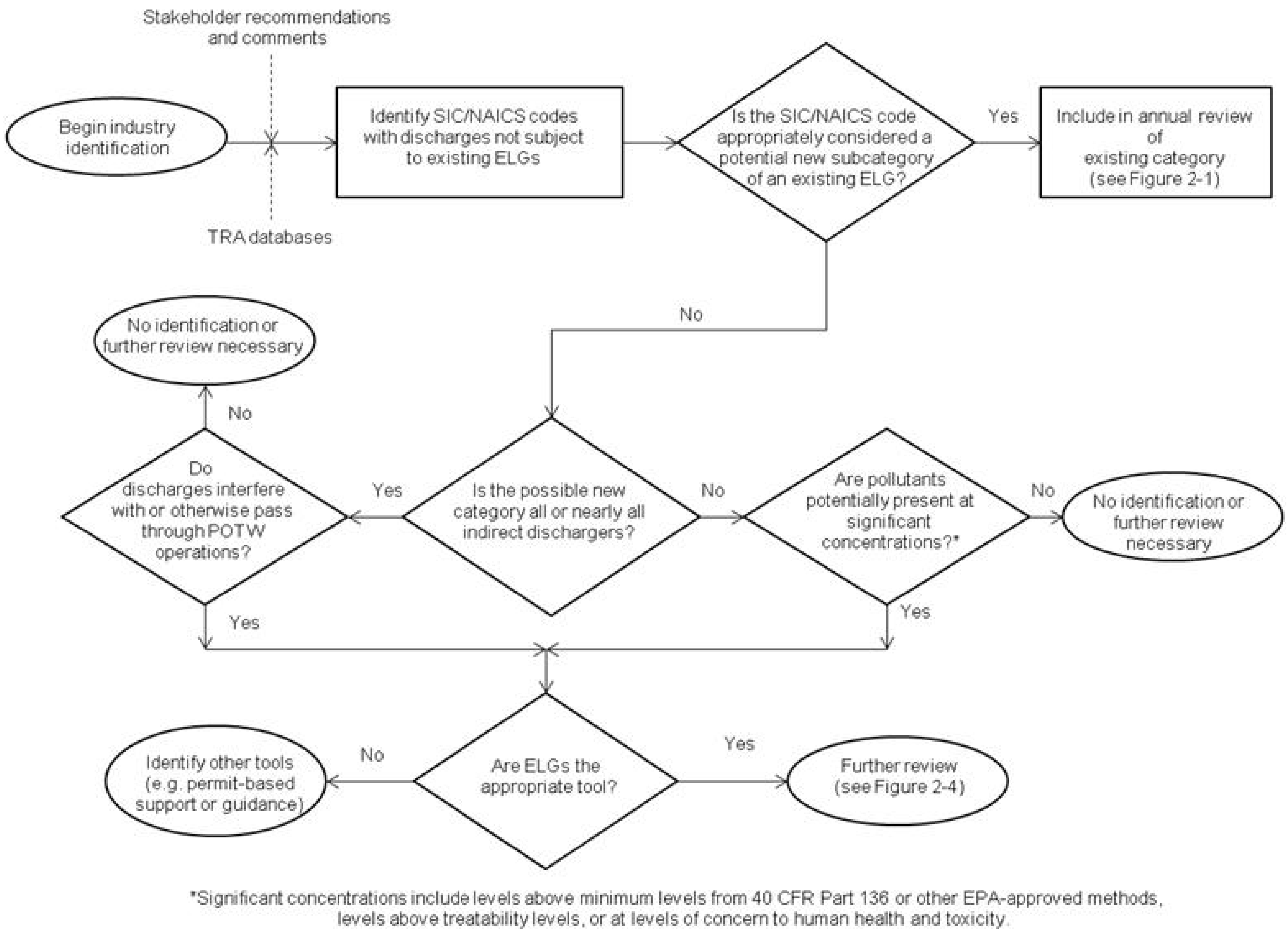
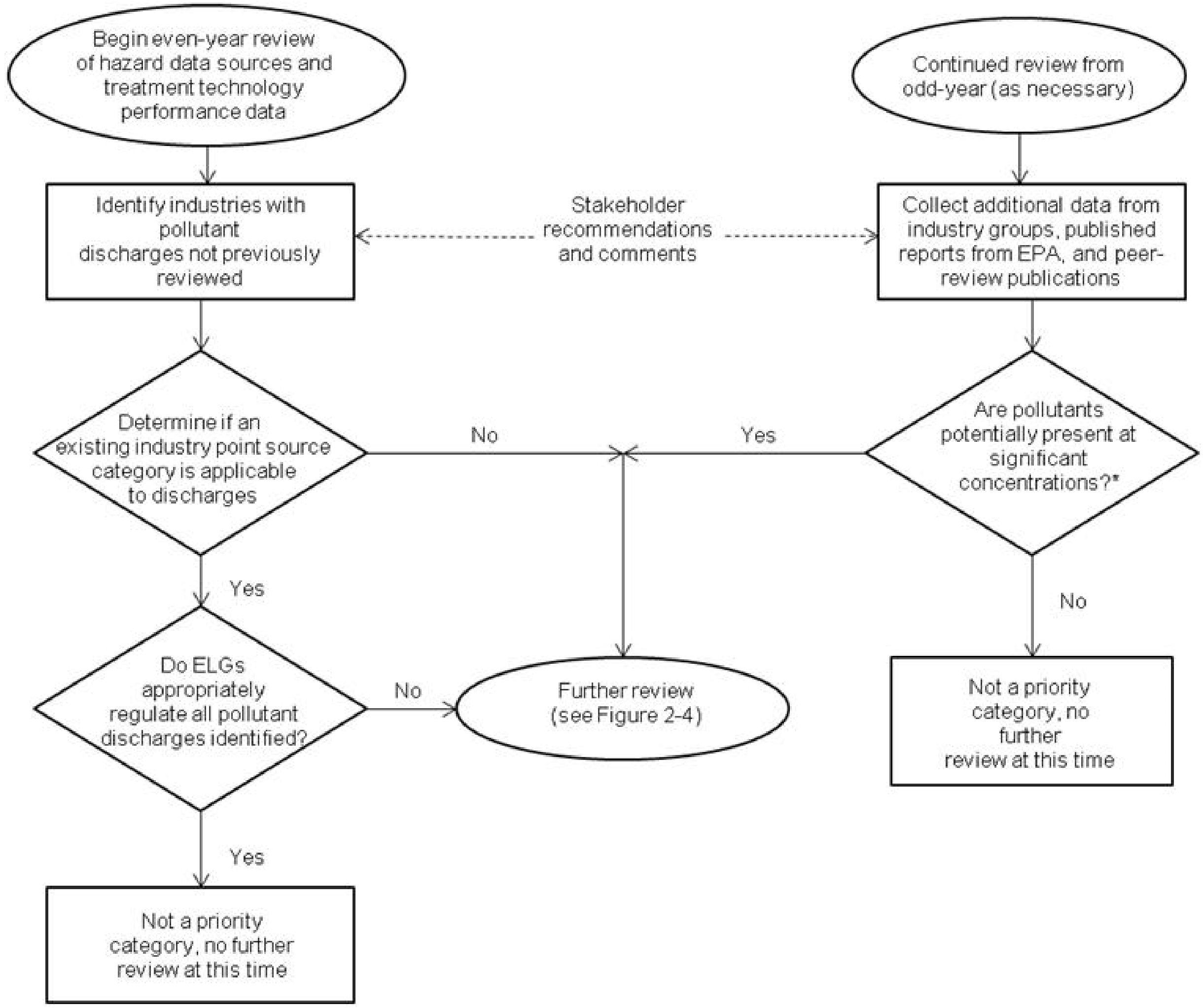



**Figure 2-2. Odd-Year Identification of Possible New ELGs**




*Significant concentrations include levels above minimum levels from 40 CFR Part 136 or other EPA-approved methods, levels above treatability levels, or at levels of concern to human health and toxicity.

**Figure 2-3. Even-Year Annual Review of Existing ELGs and Identification of Possible New ELGs**

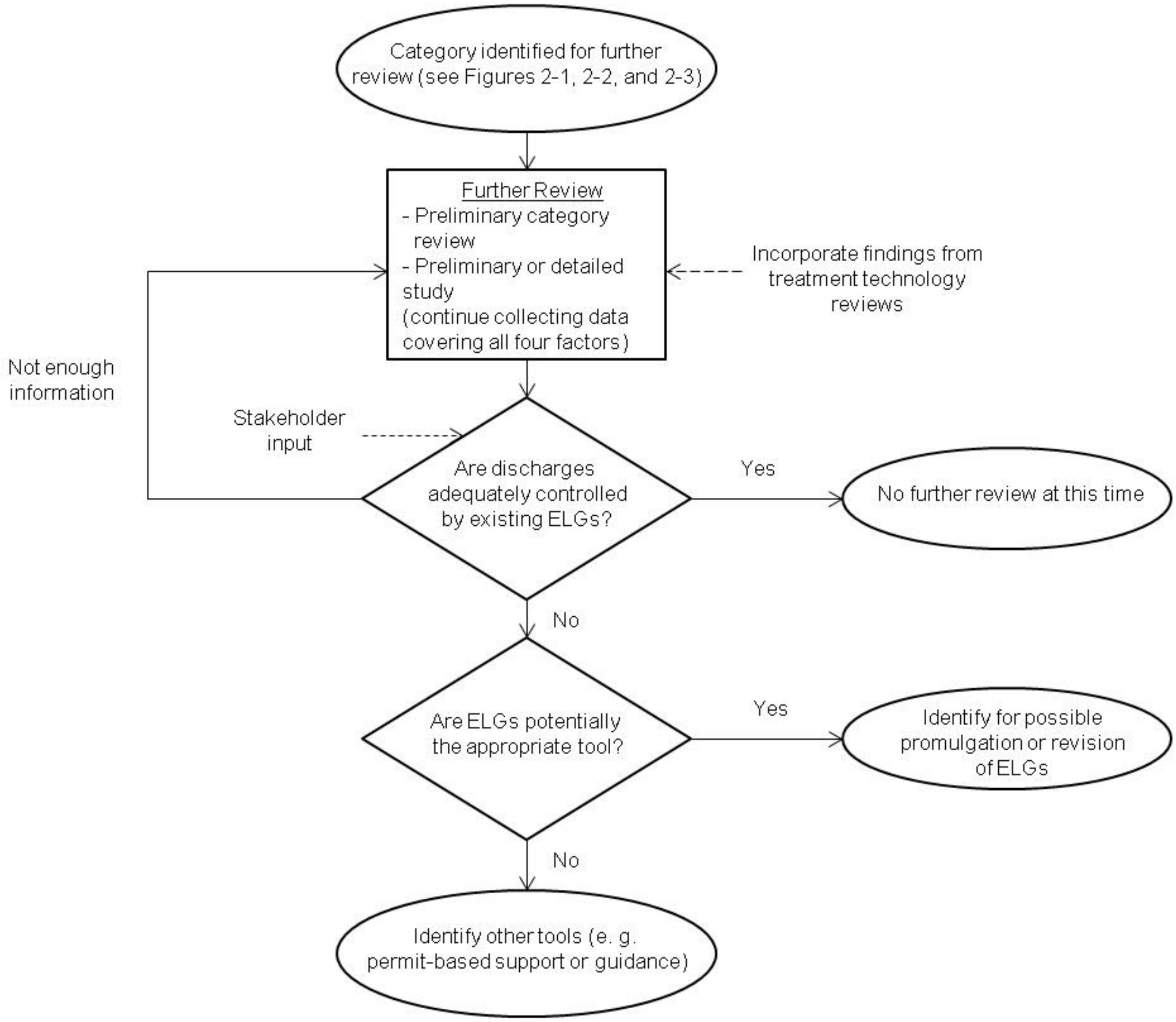



**Figure 2-4. Further Review of Industrial Categories Identified During Odd- and Even-Year Annual Reviews**

### *2.2.3 Effluent Guidelines Program Plans*

CWA section 304(m)(1)(A) requires EPA to publish an Effluent Guidelines Program Plan (Plan) every two years that establishes a schedule for the annual review and revision, in accordance with section 304(b), of the effluent guidelines that EPA has promulgated under that section. EPA publishes the results of the TRA and preliminary category review conducted during the odd-year review in a Preliminary Plan and takes public comment. In the even year following publication of the Preliminary Plan, EPA identifies and evaluates additional data sources and hazard analyses to supplement the TRA. EPA then publishes a Final Plan in the even year. The Final Plan presents the compilation of the odd- and even-year reviews and public comments received on the Preliminary Plan. EPA may initiate, continue, or complete preliminary category reviews, or in-depth studies during the odd- or even-year reviews, depending upon when it identifies a category warranting further review. Additionally, EPA may publish the findings from these studies as part of the Preliminary or Final Plan, based on when during the planning cycle the study or review is completed.

EPA is coordinating its annual reviews under section 304(b) with publication of Plans under section 304(m) for several reasons. First, the annual reviews are inextricably linked to the planning effort because the results of each year of review can inform the content of the Preliminary and Final Plans (e.g., by identifying candidates for effluent guidelines revision for which EPA can schedule rulemaking in the plans, or by identifying point source categories for which EPA has not promulgated effluent guidelines). Second, even though it is not required to do so under either section 304(b) or section 304(m), EPA believes it can serve the public interest by periodically describing to the public the annual reviews (including the review process used) and the results of the reviews. Doing so at the same time as publishing the Preliminary and Final Plans makes both processes more transparent. Third, by requiring EPA to review all existing effluent guidelines each year, Congress appears to have intended for each successive review to build on the results of earlier reviews.

## 2.3 References for Background

1. U.S. EPA. 2006. Toxic Weighting Factor Development in Support of CWA 304(m) Planning Process. Washington, D.C. (June). EPA-HQ-OW-2004-0032-1634.

2. U.S. EPA. 2009. Technical Support Document for the Annual Review of Existing Effluent Guidelines and Identification of Potential New Point Source Categories. EPA-821-R-09-007. Washington, D.C. (October). EPA-HQ-OW-2008-0517-0515.

3. U.S. EPA. 2010. U.S. EPA NPDES Permit Writers' Manual. Washington, D.C. (September). EPA-833-K-10-001. Available online at: http://cfpub.epa.gov/npdes/writermanual.cfm?program_id=45.

4. U.S. EPA. 2013. *Preliminary 2012 Effluent Guidelines Program Plan*. Washington, D.C. (May). EPA-821-R-12-002. EPA-HQ-OW-2010-0824-0194.

# PART II: EPA'S 2012 ANNUAL REVIEW METHODOLOGY AND ANALYSES

# 3. INTRODUCTION TO EPA'S 2012 ANNUAL REVIEW

The even-year review provides EPA with an opportunity to identify additional available hazard data sources and conduct further analyses at the pollutant, industry, or wastewater treatment technology levels. As described above in Section 2.2.2.2, EPA identified and prioritized additional hazard data sources for the 2012 Annual Review based on (1) the likelihood that they would assist in identifying unregulated industrial discharges, (2) their utility in identifying new wastewater treatment technologies or pollution prevention alternatives, and (3) how well the data represent the activity of an industrial category.

EPA is using the data sources and hazard analyses identified in this 2012 Annual Review to screen additional industrial discharge categories and pollutants of concern and to identify for further review those that potentially pose a hazard to human health or the environment. The 2012 Annual Review consisted of three components:

- Considering public comments and other stakeholder input received on the Preliminary 2012 Plan (see Section 4).

- Continuing the preliminary category reviews (e.g., collecting more data, contacting permit writers, evaluating available treatment technology information) of specific point source categories that EPA identified as warranting additional review in the Preliminary 2012 Plan (i.e., odd-numbered years) (see Sections 5.1, 5.2, and 5.3).

- Identifying and evaluating new industrial hazard data sources and analyzing these data to (see Section 6.1 through Section 6.6):

  — Identify new wastewater discharges or pollutants not previously regulated; and
  — Identify wastewater discharges that can be more effectively treated or eliminated.

The specific data sources, analyses, and findings for each of the 2012 Annual Review components listed above are described in detail in Section 4 through Section 6.6. A summary of the 2012 Annual Review findings is presented in Part III of this report.

# 4. PUBLIC COMMENTS AND OTHER STAKEHOLDER INPUT ON THE PRELIMINARY 2012 EFFLUENT GUIDELINES PROGRAM PLAN

EPA's annual review process considers information provided by the public and other stakeholders regarding the need for new or revised effluent limitations guidelines and pretreatment standards. Public comments received on EPA's prior reviews and Plans helped the Agency prioritize its analysis of existing effluent guidelines and pretreatment standards. This section presents a summary of the public comments and stakeholder input received on the Preliminary 2012 Plan.

## 4.1 Public Comments and Stakeholder Input

EPA published its Preliminary 2012 Effluent Guidelines Program Plan (Preliminary 2012 Plan) and provided a 60-day public comment period starting on August 7, 2013 (see 78 FRN 48159). The Docket supporting this Final Plan includes a complete set of the comments submitted, as well as the Agency's responses (see DCN 07979).

Commenting organizations representing industry included:

- Westlake Vinyls Company
- CONSOL Energy, Inc.
- American Petroleum Institute
- WPX Energy, Inc.
- Enervest Operating, LLC
- At Sea Processors Association
- Western Energy Alliance
- American Chemistry Council
- Freezer Longline Coalition
- Vinyl Institute
- Petroleum Association of Wyoming
- Ohio Oil and Gas Association
- Pioneer Natural Resources USA, Inc.
- Coalbed Methane Association of Alabama
- American Forest & Paper Association
- Independent Petroleum Association of America
- Pacific Seafood Processors Association
- Montana Petroleum Association, Inc.
- Independent Oil and Gas Association of West Virginia

Six environmental groups commented, including:

- Cook Inletkeeper
- Clean Water Action
- Wyoming Outdoor Council
- Northern Plains Resource Council
- Powder River Basin Resource Council
- Natural Resources Defense Council

Four additional organizations also provided comments including the Association of Clean Water Administrators (a state representing organization), the National Association of Clean Water Agencies (a publicly owned treatment works (POTWs) group), the Native Village of Eklutna (a tribal government), and the Tuscaloosa County Commission (county government).

Comments addressed the following subject areas:

- Coalbed methane and shale gas extraction (17 comments)
- Chlorine and chlorinated hydrocarbon (3 comments)
- Oil and gas coastal subcategory (2 comments)

- Alaska offshore seafood processors (2 comments)
- Dental amalgam (1 comment)
- Effluent limitations guidelines and standards (ELGs) and Plan process in general (1 comment)
- Other (1 comment)

For coalbed methane extraction (CBM extraction), EPA received 13 comments from industry representatives and county government supporting the delisting of CBM extraction for three main reasons:

- Additional costs would further reduce the feasibility of production, due to the declining economics of the industry.
- CBM extraction production and discharges are declining.
- Discharges are already effectively permitted.

Environmental groups commented that EPA should move forward with developing regulations for CBM extraction because EPA should not rely solely on economic considerations. The environmental groups suggest that changes in gas production processes, gas demand, and wastewater treatment costs could change EPA's findings. The environmental groups also noted there are environmental impacts from CBM extraction discharges that need to be addressed and provided data on new produced water treatment technologies that EPA should consider.

For chlorine and chlorinated hydrocarbon (CCH), two industry trade groups supported the delisting for the reasons EPA presented in the Preliminary 2012 Effluent Guidelines Program Plan. One company provided a comment correcting EPA's classification of their facility in EPA's *Chlorine and Chlorinated Hydrocarbon Data Collection and Analysis Summary* report.

Two commenters, one environmental organization and one tribal government, asked EPA to remove the exemption for Cook Inlet, Alaska from the nationwide zero discharge requirements in the oil and gas coastal ELGs. One industry trade group requested that EPA revise the requirements under the Alaska Offshore Seafood Processors General Permit AK-G2-4000. Additionally, two industry trade groups petitioned EPA to initiate a rulemaking to add a subpart to the Canned and Preserved Seafood Processing point source category, adding ELGs for discharges resulting from the processing of seafood on mobile seafood processing vessels.

For Dental Amalgam, one POTW group requested that EPA take clear action on the draft dental amalgam separator rule and expressed support for dropping it from consideration if EPA did take such action.

One organization representing a number of states suggested improvements to the ELGs and 304m process in general, including using additional data sources to consider improved hazard data and advances in treatment technology. The commenter suggested that EPA incorporate information from other EPA offices and states into the ELG program. The commenter also stated that the metal finishing category should be re-examined because there have been significant changes in the industry over the last few years.

One industry trade group expressed support for EPA's finding that pulp and paper mills present a low risk and that the ELGs should be a lower priority for revision.

**Table 4-1. Comments on the Preliminary 2012 Effluent Guidelines Program Plan**
**EPA Docket Number: EPA-HQ-OW-2010-0824**

| No. | Commenter Name | Commenter Organization | EPA Docket No. | Comment Summary |
|---|---|---|---|---|
| 1 | Eric VanderBeek | Northern Plains Resource Council | 0198 | Supports the development of CBM extraction ELGs. Also recommends that EPA expand their study to include other oil and gas impacts from processes such as hydraulic fracturing. |
| 2 | Wayne Stock | Westlake Vinyls Company | 0200 | Provided data to correct facility information in the *Chlorine and Chlorinated Hydrocarbon (CCH) Data Collection and Analysis Summary*. |
| 3 | Lee O. Fuller | Independent Petroleum Association of America (IPAA) | 0201 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan because many CBM extraction projects are no longer economically feasible and because additional technology costs would further reduce the feasibility of existing and future projects. |
| 4 | Kathleen M. Sgamma | Western Energy Alliance | 0202 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production and sufficient state regulation of CBM extraction effluent. |
| 5 | Carrie B. Crumpton | CONSOL Energy, Inc. | 0203 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production. |
| 6 | Judith Nordgren | American Chemistry Council (ACC) | 0204 | Supports EPA's decision to delist the CCH manufacturing industry from the Effluent Guidelines Program Plan. |
| 7 | David Galt | Montana Petroleum Association, Inc. | 0205 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production and sufficient state regulation of CBM extraction effluent. |
| 8 | Richard P. Krock | The Vinyl Institute | 0206 | Supports EPA's decision to delist the CCH manufacturing industry from the Effluent Guidelines Program Plan for the reasons provided in the 2012 Program Plan and because it is consistent with the results of the Voluntary Sampling Program, which shows that current discharge levels are superior to international benchmark standards. |
| 9 | W. Hardy McCollum | Tuscaloosa County Commission | 0207 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production. |
| 10 | Charlie Burd | Independent Oil and Gas Association of West Virginia, Inc. | 0208 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production and the fact that ELGs are ill-suited to apply to CBM extraction operations. |
| 11 | Gretchen Kern | Pioneer Natural Resources USA, Inc. | 0209 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production. |

**Table 4-1. Comments on the Preliminary 2012 Effluent Guidelines Program Plan**
**EPA Docket Number: EPA-HQ-OW-2010-0824**

| No. | Commenter Name | Commenter Organization | EPA Docket No. | Comment Summary |
|---|---|---|---|---|
| 12 | Ryan D. Elliott | Vorys on behalf of Ohio Oil and Gas Association | 0210 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan because the state has adequate regulations for CBM extraction effluent, the declining economic viability of the CBM extraction industry, and the unreasonable burden such an ELG would impose on producers. |
| 13 | Suzanne Bostrom, Sarah Mackie | Trustees for Alaska on behalf of Cook Inletkeeper | 0211 | Recommends and provides information supporting that EPA remove the exemption for Cook Inlet from the nationwide zero discharge requirement in the Oil and Gas Coastal ELGs. |
| 14 | Joe Olson, Gretchen Kohler | WPX Energy, Inc. | 0212 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production. |
| 15 | Chad I. See | Freezer Longline Coalition | 0213 | Recommends EPA consider revising requirements under the Alaska Offshore Seafood Processors General Permit AK-G2-4000, specifically the requirement to grind fish waste to 0.5 inches and the quarterly water quality testing requirement. |
| 16 | Amy Emmert | American Petroleum Institute (API) | 0214 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production and sufficient federal, state, and local level regulation of CBM extraction effluent. |
| 17 | Dennis Lathem | Coalbed Methane Association of Alabama | 0215 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan because of the adverse economic impact and the fact that state regulation has proven effective to accomplish the same goals as the ELG. |
| 18 | Cynthia A. Finley | National Association of Clean Water Agencies (NACWA) | 0217 | Requests that EPA take action on the draft dental amalgam separator rule, but expresses support for dropping it from consideration. Recommends that EPA allow POTWs, states, and regions to develop their own dental amalgam separator programs, as necessary, thereby addressing local needs better. |

**Table 4-1. Comments on the Preliminary 2012 Effluent Guidelines Program Plan**
**EPA Docket Number: EPA-HQ-OW-2010-0824**

| No. | Commenter Name | Commenter Organization | EPA Docket No. | Comment Summary |
|---|---|---|---|---|
| 19 | Susan Kirsch | Association of Clean Water Administrators (ACWA) | 0218 | Recommends EPA improve the ELG planning process and move the program forward with the 2014 Preliminary Plan, increase the staff allocated to working on ELGs, issue future ELG Plans and Annual Review Reports in a more timely manner, incorporate information from other parts of EPA into the ELG program, engage states early and in ongoing dialogue during the planning process, prioritize facilities for review based on the time elapsed since ELG revision and on the number of facilities regulated, and expand its use of industry surveys to gather information. Recommends EPA reexamine the metal finishing category due to significant changes in the industry over the last few years. Recommends EPA acknowledge the status of ELGs under development in future plans, particularly the rulemaking for dental amalgam. Recommends EPA use information aside from TWFs to prioritize industries for review, based on the toxicity of the discharge. Encourages EPA to expand its screening process beyond DMR and TRI data to consider improved hazard data and treatment technology advances. |
| 20 | Jerry Schwartz | American Forest & Paper Association (AF&PA) | 0219 | Supports EPA's conclusion that pulp and paper mills present a low risk and the ELGs should be a lower priority for revision. |
| 21 | Lynn Thorp | Clean Water Action et al. | 0220 | Opposes EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan because CBM extraction produces large volumes of wastewater characterized by the presence of numerous contaminants at potentially high concentrations. Shifts in gas prices, demand, and costs of wastewater treatment should also be considered. CBM extraction ELGs are necessary to prevent "pollution havens." Commenter supports the ongoing revisions to the Onshore Oil and Gas ELGs to address pollution from the unconventional oil and gas extraction industry. |
| 22 | Marc Lamoreaux, Lee Stephen | Native Village of Eklutna (NVE) | 0221 | Recommends and provides information supporting that EPA remove the exemption for Cook Inlet from the nationwide zero discharge requirement in the Oil and Gas Coastal ELGs. |
| 23 | Jim Pritt, Barry Lay | Enervest Operating, LLC | 0222 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production, economic impacts, and effectiveness of current permits. |

**Table 4-1. Comments on the Preliminary 2012 Effluent Guidelines Program Plan EPA Docket Number: EPA-HQ-OW-2010-0824**

| No. | Commenter Name | Commenter Organization | EPA Docket No. | Comment Summary |
|---|---|---|---|---|
| 24 | L. John Iani, Charles R Brumfield | Perkins Cole on behalf of the At Sea Processors Association and the Pacific Seafood Processors Association | 0223 | Provided a petition for EPA to initiate a rulemaking to add a subpart to the Canned and Preserved Seafood Processing point source category which would establish ELGs for discharges resulting from the processing of seafood on mobile seafood processing vessels. |
| 25 | John Robitaille | Petroleum Association of Wyoming | 0224 | Supports EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan due to the decline in CBM extraction production. |
| 26 | Amy Mall | Natural Resources Defense Council | 0225 | Provides data on new technologies EPA should consider for CBM Extraction. |
| 27 | Amber Wilson, Jill Morrison | Wyoming Outdoor Council/Powder River Basin Resource Council | 0226 | Opposes EPA's decision to delist the CBM Extraction subcategory from the Effluent Guidelines Program Plan because EPA considered only the financial cost to industry and overlooked the cost and impacts of untreated discharges. |

# 5. CONTINUED REVIEW OF SELECT POINT SOURCE CATEGORIES

For the 2012 Annual Review, EPA continued to evaluate three point source categories requiring further review as identified in the Preliminary 2012 Plan: meat and poultry products (40 CFR Part 432); petroleum refining (40 CFR Part 419); and pulp, paper, and paperboard (40 CFR Part 430) (U.S. EPA, 2013). EPA's continued review consisted of collecting additional discharge data from permit writers, publicly available data sources (e.g., EPA's DMR Pollutant Loading Tool), trade associations, and specific facility contacts to confirm the discharges reported in the toxicity rankings analysis (TRA) databases. Additionally, EPA collected information on available treatment technologies for specific industrial categories to compare current discharges to discharge levels that are treatable with available technologies. Section 5.1 through Section 5.3 of this report details EPA's continued review of these three point source categories.

## 5.1 Meat and Poultry Products (40 CFR Part 432)

During the 2011 Annual Review, EPA identified the Meat and Poultry Products Category (40 CFR Part 432) for preliminary review because it ranked high, in terms of toxic-weighted pound equivalents (TWPE), in the 2011 toxicity rankings analysis. See Table 4-3 in Section 4.1.6 of the *Preliminary 2012 Effluent Guidelines Program Plan* (U.S. EPA, 2013). EPA required additional data to complete the preliminary category review and continued its review of the Meat and Poultry Category during the 2012 review (U.S. EPA, 2012). Based on findings from the 2011 Annual Review, EPA continued to review discharges of nitrate compounds reported in the Toxics Release Inventory (TRI), because of their high TWPE relative to other pollutants in the Meat and Poultry Category. This section summarizes the findings from the 2011 and 2012 Annual Reviews associated with the Meat and Poultry Products Category.

### *5.1.1 Meat and Poultry Products Category Background*

The meat and poultry industry includes facilities engaged in the slaughtering, dressing, and packing of meat and poultry products for human consumption and/or animal food and feeds. Meat and poultry products for human consumption include:

- Meat and poultry from cattle, hogs, sheep, chickens, turkeys, ducks, and other fowl; and
- Sausages, luncheon meats, and cured, smoked, canned, or otherwise prepared meat and poultry products from purchased carcasses and other materials.

Meat and poultry products for animal food and feeds include animal oils, meat meal, and rendered grease and tallow from animal fat, bones, and meat scraps (40 CFR Part 32.1).

Part 432 regulates wastewater discharges from meat and poultry processing plants in 12 subcategories of products and product groups. EPA last updated effluent limitations guidelines and standards (ELGs) for the Meat and Poultry Category (40 CFR Part 432) on September 8, 2004 (69 FR 54476). In addition to best practicable control technology (BPT) limitations, Part 432 includes limitations based on the best available technology economically achievable (BAT) and new source performance standards (NSPS). Part 432 regulates conventional pollutants (biological oxygen demand (BOD), fecal coliform, oil and grease, and TSS) for all subparts. Excluding Subpart E (Small Processors), all subparts also regulate ammonia as nitrogen (N) and total nitrogen, at plants exceeding a threshold pounds of annual live weight kill (LWK) (40 CFR §432).

Table 5-1 presents the subpart applicability and ammonia as N and total nitrogen limitations for each subpart. EPA focuses on the ammonia as N and total nitrogen regulations in this section because nitrates are a top pollutant, in terms of TWPE, in the toxicity rankings analysis databases. No pretreatment standards currently exist for meat and poultry products facility discharges to publicly owned treatment works (POTWs).

**Table 5-1. BAT ELG Limitations for the Meat and Poultry Products Category[a]**

| Subpart | Subpart Title | Subcategory Applicability | Ammonia as N[a] | | Total Nitrogen[b] | |
|---|---|---|---|---|---|---|
| | | | Max Daily (mg/L) | Max Monthly Average (mg/L) | Max Daily (mg/L) | Max Monthly Average (mg/L) |
| A[c] | Simple Slaughterhouses | Process wastewater discharges resulting from production of meat carcasses by simple slaughterhouses | 8.0 | 4.0 | 194 | 134 |
| B[c] | Complex Slaughterhouses | Process wastewater discharges resulting from production of meat carcasses by complex slaughterhouses | 8.0 | 4.0 | 194 | 134 |
| C[c] | Low-processing Packinghouses | Process wastewater discharges resulting from production of meat carcasses by low-processing packinghouses | 8.0 | 4.0 | 194 | 134 |
| D[c] | High-processing Packinghouses | Process wastewater discharges resulting from production of meat carcasses by high-processing packinghouses | 8.0 | 4.0 | 194 | 134 |
| E[d] | Small Processors | Process wastewater discharges resulting from production of finished meat products (i.e., fresh meat cuts, smoked products, canned products, hams, sausages, and luncheon meats) by a small processor | NA | NA | NA | NA |
| F[e] | Meat Cutters | Process wastewater discharges resulting from production of fresh meat cuts (i.e., steaks, roasts, and chops) by a meat cutter | 8.0 | 4.0 | 194 | 134 |

**Table 5-1. BAT ELG Limitations for the Meat and Poultry Products Category[a]**

| Subpart | Subpart Title | Subcategory Applicability | Ammonia as N[a] | | Total Nitrogen[b] | |
|---|---|---|---|---|---|---|
| | | | Max Daily (mg/L) | Max Monthly Average (mg/L) | Max Daily (mg/L) | Max Monthly Average (mg/L) |
| G[e] | Sausage and Luncheon Meats Processors | Process wastewater discharges resulting from production of fresh meat cuts, sausage, bologna, and other luncheon meats by a sausage and luncheon meat processor | 8.0 | 4.0 | 194 | 134 |
| H[e] | Ham Processors | Process wastewater discharges resulting from production of hams by a ham processor | 8.0 | 4.0 | 194 | 134 |
| I [e] | Canned Meats Processors | Process wastewater discharges resulting from production of canned meats by a canned meats processor | 8.0 | 4.0 | 194 | 134 |
| J | Renderers | Process wastewater discharges resulting from production of meat meal, dried animal byproduct residues (tankage), animal oils, grease and tallow, and hide curing, by a renderer | 0.14 (pounds per 1,000 pounds (g/kg) of raw material) | 0.07 (pounds per 1,000 pounds (g/kg) of raw material) | 194 | 134 |
| K[r] | Poultry First Processing | Process wastewater discharges resulting from slaughtering of poultry, further processing of poultry and rendering of material derived from slaughtered poultry | 8.0 | 4.0 | 147 | 103 |
| L[g] | Poultry Further Processing | Process wastewater discharges resulting from further processing of poultry | 8.0 | 4.0 | 147 | 103 |

Source: 40 CFR §432.
NA: Not applicable.
[a] BPT limits include $BOD_5$, fecal coliform, oil and grease, and TSS.
[b] Units are mg/L unless otherwise noted.
[c] Any existing point source subject to this subpart that slaughters more than 50 million pounds per year (in units LWK) must achieve the applicable BAT-based limits for total nitrogen and ammonia as N.
[d]The Small Processors Subcategory has no BAT-based limits and therefore no limits for ammonia or total nitrogen; however, it does have BPT- and NSPS-based limits for BOD5, fecal coliform, oil and grease, and TSS.
[e] Any existing point source subject to this subpart that produces more than 50 million pounds per year of final product must achieve the applicable BAT-based limit for total nitrogen. The ammonia as N BAT-based limit applies to all facilities.
[f] Any existing point source subject to this subpart that slaughters more than 100 million pounds per year (in units LWK) must achieve the applicable BAT-based limits for total nitrogen and ammonia as N.
[g] Any existing point source subject to this subpart that slaughters more than 7 million pounds per year (in units LWK) must achieve the applicable BAT-based limits for total nitrogen and ammonia as N.

#### 5.1.1.1 Historic DMR and TRI Data for Meat and Poultry Products

Table 5-2 compares the toxicity rankings analysis results for the Meat and Poultry Products Category from the 2009 through 2011 Annual Reviews.

**Table 5-2. Meat and Poultry Category TRI and DMR Discharges for the 2009 Through 2011 Toxicity Rankings Analyses**

| Year of Discharge | Year of Review | Meat and Poultry Category | | |
|---|---|---|---|---|
| | | TRI TWPE[a] | DMR TWPE[b] | Total TWPE |
| 2007[c] | 2009 | 35,900 | 536,000[d] | 572,000 |
| 2008[c] | 2010 | 61,600 | 15,700 | 77,300 |
| 2009 | 2011 | 53,800 | 17,200 | 71,000 |

Sources: *TRI Releases 2007 v2, DMRLoads2007_v4, TRIReleases2008_v3, DMRLoads2008_v3; TRIReleases2009_v2;* and *DMRLoads2009_v2*.
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Discharges include transfers to POTWs and account for POTW removals.
[b] DMR data from 2007 include only major dischargers. DMR 2008 data include both minor and major dischargers.
[c] EPA did not include the Meat and Poultry Products Category discharges in its 2009 and 2010 Annual Reviews because the category ELGs were promulgated in 2004. In general, EPA does not review discharge data for an industrial point source category if EPA established, revised, or reviewed the category's ELGs within seven years of the annual review.
[d] In 2007, one facility's erroneous data caused the larger TWPE. This facility's reported fluoride discharges of 12,600,000 pounds and 439,500 TWPE are likely an error. The facility did not have any fluoride discharge in 2008, 2009, or 2010, therefore EPA believes this data to be erroneous.

Overall, the TWPE has decreased from 2007 to 2009, possibly resulting from implementation of the 2004 ELGs. However, because the category ranked high, in terms of TWPE, compared to other industry categories, EPA reviewed TRI and DMR data in detail for the 2011 and 2012 reviews.

#### 5.1.1.2 Nitrogen Compounds

The primary pollutants of concern in meat and poultry products wastewater are nitrogen and specific nitrogen components including total Kjeldahl nitrogen (TKN),[7] ammonia nitrogen, and nitrite plus nitrate nitrogen. Because protein, which is the principal component of meat and poultry, contains nitrogen, wastewaters from meat and poultry processing contain relatively high concentrations of nitrogen (U.S. EPA, 2002).

Organic nitrogen, either soluble or particulate, is a mix of amino acids, amino sugars, and proteins. In wastewater, organic nitrogen is readily converted to ammonia nitrogen by bacterial decomposition. Ammonia nitrogen exists in water as the ammonium ion or ammonia gas, depending on the pH of the water. In the presence of oxygen, oxidizing bacteria, different from the bacteria that decompose organic nitrogen to ammonia, can oxidize the ammonia nitrogen to nitrites and nitrates by nitrification. In the absence of oxygen, denitrifying bacteria will reduce

[7] TKN is the portion of the total nitrogen that is organic and ammonia nitrogen only.

nitrate to nitrogen gas. The nitrogen gas will evaporate from the wastewater and enter the atmosphere (Metcalf and Eddy, 2003).

As shown in Table 5-1, the ELGs for the meat and poultry products category include limitations for both total nitrogen and ammonia as N. Figure 5-1 shows the relationship between nitrogen compounds. EPA learned from facility contacts that they often measure nitrate ($NO_3$) or nitrate as nitrogen ($NO_3$-N) (the amount of nitrogen in the nitrate form) regularly. Facilities that estimate nitrate loads using nitrate as nitrogen measurements assume that all nitrogen compounds convert to nitrate, and that nitrate as nitrogen therefore measures total nitrogen.

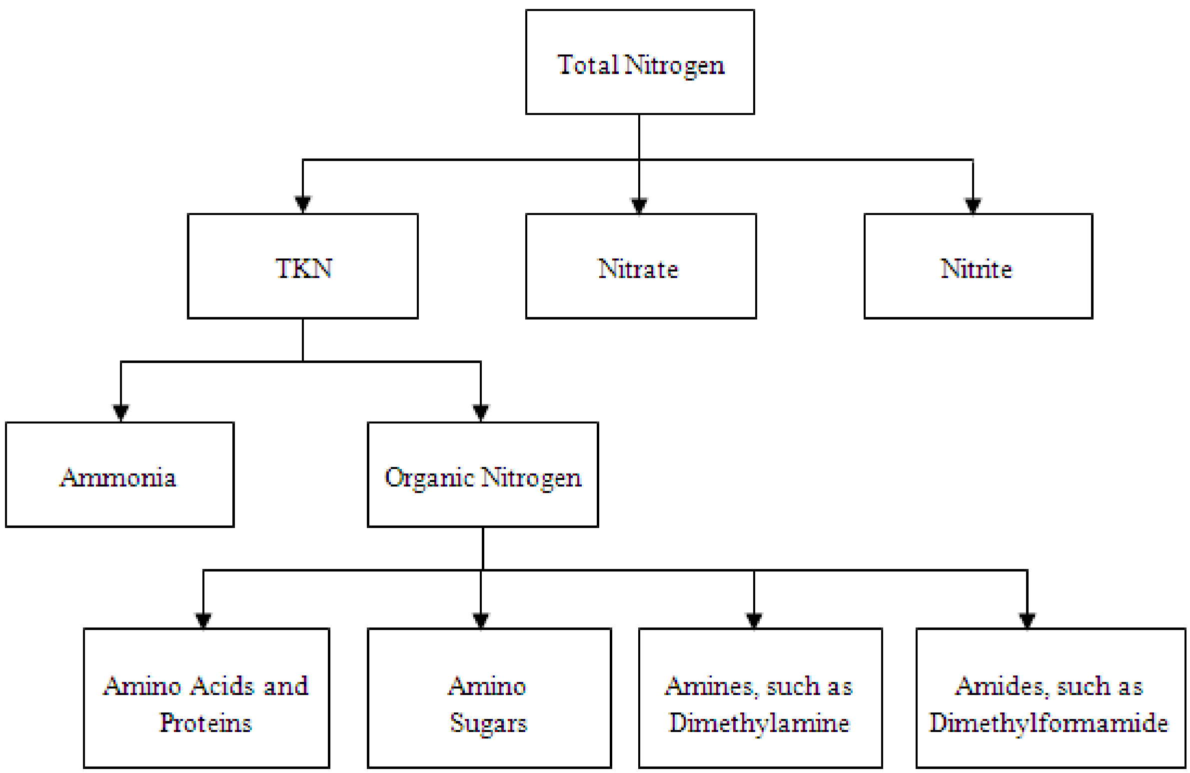



**Figure 5-1. Relationship Between Total Nitrogen Compounds**

### *5.1.2 Results of the 2011 Annual Review*

The following subsections describe the results of EPA's 2011 Annual Review of the Meat and Poultry Products Category.

#### 5.1.2.1 Meat and Poultry Pollutants of Concern

EPA's 2011 review of the Meat and Poultry Category focused on the 2009 TRI discharges because the 2009 TRI data dominated the combined category TWPE. During the 2011 Annual Review, EPA identified nitrate compounds, accounting for 87 percent of the total 2009 Meat and Poultry TRI TWPE, as the top TRI pollutants of concern for the Meat and Poultry

Category. See Table 11-4 of the 2011 Annual Review Report for the remaining top pollutants identified during the 2011 Annual Review (U.S. EPA, 2012).

#### 5.1.2.2 Meat and Poultry Nitrate Compound Discharges in TRI

Table 5-3 presents the facilities that account for the nitrate compound discharges in the 2009 TRI database. As shown in Table 5-3, EPA determined that the top 13 nitrate discharging plants are located in nine states and include operations covered by Subpart B (Complex Slaughterhouses), K (Poultry First Processing), or L (Poultry Further Processing). All three of these subparts include ELGs for ammonia as N and total nitrogen.

During the 2011 Annual Review, EPA reviewed available permit and discharge data for five of the 13 facilities. From the review of available data, EPA determined that all five facilities are complex slaughterhouses, with operations covered by Subpart B of the Meat and Poultry Products ELGs. EPA did not review the remaining eight facilities because the facility subpart could not be determined during the 2011 Annual Review. EPA found that for the five complex slaughterhouses, the facility permits include limitations for ammonia as N, but not total nitrogen. EPA determined that the wastewater treatment operations at these five plants, matching the BAT treatment basis of nitrification followed by partial denitrification, include some combination of screening, anaerobic lagoons, aeration basins, chlorination, and dechlorination. See Section 11.4 in the 2011 Annual Review Report for more detailed information for each facility reviewed (U.S. EPA, 2012).

**Table 5-3. Meat and Poultry Category Nitrate Compounds Dischargers in the 2009 TRI Database**

| Facility Name | Location | Subpart[a] | Nitrate Compound Pounds Released | Nitrate Compound TWPE | Facility Percent of Nitrate Compound Category TWPE |
|---|---|---|---|---|---|
| Tyson Fresh Meats, Inc. | Lexington, NE | B | 4,990,000 | 3,730 | 7.94% |
| Tyson Fresh Meats, Inc., Joslin IL | Hillsdale, IL | B | 4,450,000 | 3,320 | 7.08% |
| Cargill Meat Solutions Corp. | Schuyler, NE | B | 3,850,000 | 2,870 | 6.12% |
| Smithfield Packing, Co., Inc. Tar Heel Div. | Tar Heel, NC | B | 3,750,000 | 2,800 | 5.96% |
| Cargill Meat Solutions Corp. | Beardstown, IL | ND[b] | 3,650,000 | 2,730 | 5.81% |
| Lewiston Processing Plant | Lewiston Woodville, NC | L | 3,260,000 | 2,440 | 5.19% |
| Accomac Processing Plant | Accomac, VA | K | 2,080,000 | 1,550 | 3.30% |
| Farmland Foods, Inc. | Crete, NE | B | 1,780,000 | 1,330 | 2.84% |
| JBS Plainwell | Plainwell, MI | B | 1,750,000 | 1,300 | 2.78% |
| Cargill Meat Solutions Corp. | Wyalusing, PA | B | 1,670,000 | 1,250 | 2.66% |
| Tyson Fresh Meats, Inc. | Columbus Junction, IA | B | 1,620,000 | 1,210 | 2.58% |
| Tyson Foods, Inc., Blountsville Processing Plant | Blountsville, AL | L | 1,490,000 | 1,110 | 2.37% |
| Pilgrim's Pride Corp., Mt. Pleasant Complex | Mount Pleasant, TX | K | 1,390,000 | 1,040 | 2.22% |
| Remaining facilities reporting nitrate compound discharges[c] | | | 27,100,000 | 20,300 | 43.20% |
| **Total** | | | **62,900,000** | **46,900** | **100%** |

Source: *TRIReleases2009_v2.*
ND: Not determined.
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] See Table 5-1 for the description and applicability of the Subparts B, L, and K. During the 2011 Annual Review, EPA only determined the applicable subparts for five of the 13 plants (U.S. EPA, 2012, see Section 11.4). EPA determined the subparts of the remaining eight plants as part of the 2012 Annual Review.
[b] EPA contacted Cargill Meat Solutions Corp in Beardstown, IL to determine the applicable subpart. Based on conversations with the facility contact, Cargill Meat Solutions Corp is a slaughterhouse that processes pork. The processes at the facility include live rendering, boxing, and filling finished product. In 2012, Cargill Meat Solutions processed 1.4 billion pounds (in units LWK) of pork. Cargill Meat Solutions Corp explained that the facility NPDES permit (last expired in 2009) is still under review for revision by Illinois EPA (IEPA) (Barnes, 2013). Based on the facility information, EPA expects that with the revised facility permit, Cargill Meat Solutions Corp will be regulated under 40 CFR Part 432, Subpart B (Complex Slaughterhouses), with total nitrogen limits.
[c] 103 additional facilities reported nitrate compounds discharges in the 2009 TRI, accounting for approximately 43 percent of the category's nitrate compounds 2009 TRI TWPE.

### *5.1.3 Results of the 2012 Annual Review*

EPA continued its review of the Meat and Poultry Products Category in 2012 by focusing on the facilities with the highest nitrate compound discharges reported to TRI. EPA reviewed the TRI nitrate compound reporting requirements and guidance. Additionally, EPA contacted the nine state permitting authorities corresponding to the top 13 nitrate compounds discharging facilities in Table 5-3 to evaluate nitrate discharges. To determine how the facilities estimated TRI-reported nitrate discharges, EPA also contacted the two facilities with the highest reported nitrate discharges. Finally, EPA reviewed 2010 and 2011 DMR discharge data from the DMR Loading Tool to review the total nitrogen concentration ranges discharged from the top 13 facilities. The following subsections present EPA's findings from the 2012 Annual Review.

#### 5.1.3.1 Reporting Nitrate Compounds to TRI

In the 2009 TRI, facilities report nitrate discharges under the chemical name "nitrate compounds," if they estimate releases of nitrate compounds greater than 10,000 pounds per year. According to the TRI Program's guidance document, the *List of Toxic Chemicals Within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting*, all dissociable nitrate compounds, in aqueous solution, are included in nitrate compounds (U.S. EPA, 2000).

However, based on recent contacts, meat and poultry facilities typically measure either nitrate or nitrate as nitrogen ($NO_3$- N) and not total nitrogen. To estimate their nitrate loads, they simply convert the pounds of nitrate as nitrogen to pounds of nitrate as shown in Equation 5-3 below.

1. **Measurement of nitrate as nitrogen nitrate as nitrogen.** From sampling data, a facility might estimate that it releases 800 pounds of nitrate as nitrogen (or the amount of nitrogen in the nitrate form) based on wastewater measurements.
2. **Conversion of pounds of nitrate as nitrogen generated to pounds of nitrate.** Using molecular weights (MWs), the facility would convert the 800 pounds of nitrate as nitrogen to the equivalent pounds of nitrate using the following equations.

$$\text{Nitrate MW } (NO_3^-) = 14 + (3 \times 16) = 62 \qquad \text{(Eq. 5-1)}$$

$$\text{Nitrogen MW (N)} = 14 \qquad \text{(Eq. 5-2)}$$

$$\text{Estimated pounds of } NO_3^- \text{ from nitrate as nitrogen} = \text{Estimated pounds of N} \times \frac{NO_3^- \text{ MW}}{\text{N MW}}$$

or

$$\text{Estimated pounds of } NO_3^- \text{ from nitrate as nitrogen} = 800 \times \frac{62}{14} = 800 \text{ x } 4.43 = 3{,}543 \text{ Pounds of } NO_3^- \qquad \text{(Eq. 5-3)}$$

#### 5.1.3.2 State Contacts

EPA contacted state permitting authorities for the 13 facilities with the highest TRI-reported nitrate discharges. EPA contacted the state permitting authorities to determine the status of the facilities' most recent permits, the nitrogen pollutants regulated by the facility permits, the wastewater treatment operations at the plants, and any changes resulting from the revised Part 432 ELGs. Additionally, EPA requested the most recent facility permits and fact sheets. The following subsections summarize EPA's contact with the state permitting authorities and review of facility permits and fact sheets. Table 5-4 also summarizes EPA's findings from the permitting authorities.

***Nebraska Department of Environmental Quality (NE DEQ)***

EPA contacted the NE DEQ to obtain facility permit information for **Tyson Fresh Meats, Inc.,** in Lexington; **Cargill Meat Solutions Corp.** in Schuyler; and **Farmland Foods, Inc.,** in Crete.

The permit writer for Tyson Fresh Meats, Inc. stated that the facility is a complex beef slaughterhouse, with a production of approximately 6,000,000 pounds per day in LWK. Treated process wastewater is discharged via outfall 001 to the Tri-County Canal. Wastewater is treated in an onsite activated sludge treatment plant prior to discharge. Outfall 002 is maintained for emergency purposes only and would discharge treated process wastewater to the Platte River directly. Outfall 002 has never discharged.

The facility permit, issued October 2010, includes limitations for total nitrogen and seasonal limitations for ammonia as N for outfalls 001 and 002. The total nitrogen permit limitations are based on Part 432 and are 134 mg/L monthly average, 194 mg/L daily maximum. The ammonia as N permit limitations are based on water-quality-based effluent limitations (WQBELs) and Part 432. They are (NE DEQ, 2010a):

- Spring/winter: 4.0 mg/L monthly average, 8.0 mg/L daily maximum; and
- Summer: 2.4 mg/L monthly average, 5.4 mg/L daily maximum.

Cargill Meat Solutions Corporation is a complex beef slaughterhouse, with a production of approximately 6,500,000 pounds per day in LWK. Treated process wastewater is discharged via outfalls 001 and 003 to surface water and agricultural land application sites, respectively. Process wastewater discharged to outfall 001 is treated with a dissolved air floatation unit, anaerobic lagoon cells, a four chambered sequential batch reactor (an activated sludge plant), a chlorine contact basin, and dechlorination. Discharges of nutrient-rich water from outfall 003 (treated process wastewater and non-contact cooling water) are used on agricultural land. (The facility does not have an outfall 002) (NE DEQ, 2009).

The facility permit, issued October 2009, includes seasonal limitations for ammonia as N for outfalls 001 and 003. The permit does not include limitations for total nitrogen. The permit writer for Cargill Meat Solutions Corp. stated that the ammonia as N limitations were more stringent than the water quality criteria; however, there are no limitations for total nitrogen (Ewoldt, 2012). The ammonia as N permit limitations are (NE DEQ, 2009):

- Winter: 4.0 mg/L monthly average, 8.0 mg/L daily maximum;

- Spring: 2.58 mg/L monthly average, 5.17 mg/L daily maximum; and
- Summer: 1.89 mg/L monthly average, 3.79 mg/L daily maximum/

Farmland Foods, Inc., is a complex swine slaughterhouse, with a production of approximately 2,800,000 pounds per day in LWK. Treated process wastewater is discharged via outfall 001 to surface water. The process wastewater is treated by a dissolved air flotation unit, two anaerobic lagoon cells, an anoxic tank, three aeration basins, two final clarifiers (activated sludge plant), a chlorine contact basin and a dechlorination step, a v-notch weir, and a sludge holding lagoon.

The facility permit, issued April 2010, includes limitations for total nitrogen and ammonia as N for outfall 001. The total nitrogen permit limitations are based on Part 432 and are 134 mg/L monthly average, 194 mg/L daily maximum. Similarly, ammonia as N permit limitations are based on Part 432 and are 4.0 mg/L monthly average, 8.0 mg/L daily maximum (NE DEQ, 2010b).

***Illinois Environmental Protection Agency (IEPA)***

EPA contacted the IEPA to obtain the updated permits and facility information for **Tyson Fresh Meats, Inc.,** in Hillsdale and **Cargill Meat Solutions, Corp.,** in Beardstown.

The Tyson Fresh Meats, Inc., facility is a beef slaughter and processing plant with rendering activities. The maximum onsite slaughter LWK is 3,950,000 pounds per day. Treated process wastewater, boiler blowdown, sanitary wastewater, miscellaneous wastewater, stormwater, and cooling water are discharged via outfall 001 to surface water.

The facility permit public notice, issued June 2011, includes limitations for total nitrogen and seasonal limitations for ammonia as N for outfall 001. The total nitrogen permit limitations are based on Part 432 and are 134 mg/L monthly average, 194 mg/L daily maximum. The ammonia as N permit limitations are based on WQBELs and are (IEPA, 2011):

- Winter: 3.2 mg/L daily maximum;
- Spring/fall: 3.3 mg/L daily maximum; and
- Summer: 3.1 mg/L daily maximum.

Cargill Meat Solutions, Corp., is a minor discharger in the Meat and Poultry Products Category. The facility is a pork processor that produces 5.6 million 8 oz servings per day. The facility processes also include slaughtering, live rendering, and boxing and filling final product. In 2012, the plant processed 1.4 billion pounds of pork (in units LWK) (Barnes, 2013). The facility’s old permit (expired in October 2009) includes seasonal limitations for ammonia as N for outfalls 001 and 002. Non-contact cooling water is discharged via outfall 001 and treated process wastewater and stormwater are discharged via outfall 002 to the Illinois River and an unnamed tributary. The ammonia as N permit limitations for outfalls 001 and 002 are (IEPA, 2004):

- Winter: 4.0 mg/L monthly average, 8.0 mg/L daily maximum; and
- Summer: 2.5 mg/L monthly average, 5.0 mg/L daily maximum.

In order to determine the status of the revised facility permit, EPA contacted Cargill Meat Solutions, Corp. and determined that the new facility permit is still under review. Currently, the facility has permission from IEPA to discharge in compliance with the expired permit. Because the expired permit was issued prior to the revised 2004 ELGs, it does not include limitations for total nitrogen. EPA expects that with the revised facility permit, Cargill Meat Solutions Corp will be regulated under 40 CFR Part 432, Subpart B (Complex Slaughterhouses), with total nitrogen limits.

***North Carolina Department of Environmental and Natural Resources (NC DENR)***

EPA contacted NC DENR to obtain the most recent permit information for **Smithfield Packing Co.** in Tar Heel and **Lewiston Processing Plant** in Lewistown Woodville.

The Smithfield Packing Company, Tar Heel Division, is a hog slaughtering and pork packing plant constructed in 1992 that currently harvests an average of 32,000 hogs per day weighing approximately 267 pound per hog. The complex slaughterhouse processes more than 50 million pounds per year. The primary products are fresh cuts. Byproduct operations include blood and hair collection, viscera handling, and inedible rendering (NC DENR, 2011). Treated process wastewater is discharged through outfall 001. The facility treatment system includes dissolved air flotation, anaerobic treatment, aeration, clarification, filtration, re-aeration, UV disinfection, and chlorination/dechlorination.

The facility permit, issued February 2012, includes limitations for total nitrogen and seasonal limitations for ammonia as N at outfall 001. The total nitrogen permit limitations are based on Part 432 and are 134 mg/L monthly average, 194 mg/L daily maximum. The ammonia as N permit limitations are more stringent than Part 432 and are (NC DENR, 2012):

- Winter: 4.0 mg/L monthly average, 8.0 mg/L daily maximum; and
- Summer: 2.0 mg/L monthly average, 7.5 mg/L daily maximum.

During the previous permit renewal period, Smithfield did not comply with new effluent guideline requirements for total nitrogen. DENR pursued legal enforcement against Smithfield on July 13, 2007. The company entered into a consent decree requiring the company to adhere to a schedule of compliance. In response, Smithfield constructed new treatment systems, including two 10,000- gallon carbon source storage tanks. Smithfield has made additional improvements to its treatment systems since July 2007 including installation of three new floating surface aerators, a two million gallon aeration basin, a centrifuge sludge dewatering system, a backup liquid chlorination/dechlorination system, replacement of existing diffusers in three aeration basins, and sludge facility improvements (NC DENR, 2011).

The Lewiston Processing Plant is a poultry further processing plant that slaughters broiler chickens. Other plant operations include cutting, de-boning, marinating, packing, and rendering of byproducts. The facility processes 400,000 birds per day (NC DENR, 2007). Outfall 001 discharges process wastewater. Wastewater treatment includes sedimentation, screening, two anaerobic lagoons, an equalization basin, oxidation ditch for nitrification/denitrification, secondary clarifier, chlorination and dechlorination, sludge gravity thickener, and digestion.

The facility permit, issued February 2008, includes total nitrogen and ammonia as N limitations for outfall 001. The total nitrogen permit limitations are based on Part 432 and are 103 mg/L monthly average, 147 mg/L daily maximum. The ammonia as N permit limitations are also based on Part 432 and are 4.0 mg/L monthly average, 8.0 mg/L daily maximum (NC DENR, 2008).

***Virginia Department of Environmental Quality (VA DEQ)***

EPA contacted VA DEQ to obtain the most recent permitting information for the **Accomac Processing Plant** in Accomac. The Accomac Processing Plant is a poultry first processing plant with a production of approximately 450,000,000 pounds per year in LWK (VA DEQ, 2010). The facility permit, issued September 2011, includes limitations for total nitrogen and seasonal limitations for ammonia as N for outfall 001, which discharges to the Atlantic Ocean. The total nitrogen permit limitations are based on Part 432 and are 103 mg/L monthly average, 147 mg/L daily maximum. The ammonia as N limitations are based on WQBELs and are (VA DEQ, 2011):

- Winter: 4.0 mg/L monthly average, 8.0 mg/L daily maximum; and
- Summer: 2.0 mg/L monthly average, 7.5 mg/L daily maximum.

***Michigan Department of Environmental Quality (MI DEQ)***

EPA contacted MI DEQ to obtain the recent permitting information for **JBS Plainwell** in Plainwell. The facility is a complex slaughterhouse with a production of approximately 520,000,000 pounds per year in LWK (MI DEQ, 2011). The facility permit, issued November 2011, does not include limitations for total nitrogen. The only nitrogen compound permit limitation included is ammonia nitrogen (as N) for outfall 001, which discharges to the Kalamazoo River (MI DEQ, 2011). Based on Part 432, the facility permit should also include limitations for total nitrogen.

***Pennsylvania Department of Environmental Protection (PA DEP)***

EPA contacted PA DEP to obtain the most recent permit information for **Cargill Meat Solutions** in Wyalusing. PA DEP stated that the facility is a large complex slaughterhouse that discharges to the Chesapeake Bay. PA DEP further explained that it recently revised the facility's permit, which last expired in March 2009, developing total nitrogen limitations based on Chesapeake Bay water quality criteria requirements, which are more stringent than the ELGs. EPA has not yet approved the state's permit for this facility (i.e., the permit limits may change) (Randis, 2012).

PA DEP and Cargill are negotiating a compliance schedule to be in effect in 2012. To meet the new permit limits, the plant will add an aerobic and anaerobic treatment system. The compliance schedule currently requires the Cargill Meat Solutions facility to meet new permit limitations for total nitrogen by August 2013 (Randis, 2012).

***Iowa Department of Natural Resources (IA DNR)***

EPA contacted IA DNR to obtain facility permit information for **Tyson Fresh Meats, Inc.**, in Columbus Junction. The facility permit writer stated that the permit is very old and is currently under revision. The permit currently only requires monitoring of total nitrogen (no numerical limitations); however, numerical limitations will be included in the revised permit as required by the 2004 revised ELGs. The permit revision is on hold until the state classifies the receiving water stream to determine if total nitrogen limitations will be developed based on Part 432 or WQBELs (Heeb, 2012).

***Alabama Department of Environmental Management (ADEM)***

EPA contacted ADEM to obtain facility permit information for **Tyson Foods, Inc.**, in Blountsville. Tyson Foods is a poultry processing plant with a production of over 50,000,000 pounds per year. The facility discharges treated process wastewater via outfall 001.

The facility permit, issued October 2005, requires the facility to monitor for nitrate and nitrite and limits total nitrogen, ammonia as N, and TKN. The total nitrogen permit limitations are based on Part 432 and are 103 mg/L monthly average, 147 mg/L daily maximum. The ammonia as N permit limitations are more stringent than Part 432, requiring1.6 mg/L monthly average, 2.4 mg/L daily maximum (ADEM, 2005).

***Texas Commission of Environmental Quality (TCEQ)***

EPA contacted TCEQ to obtain the most recent facility permit information for **Pilgrim's Pride Corp.** in Mount Pleasant. The facility is a poultry first processing plant, recently under new ownership. Its permit, which is currently under revision, includes limitations for total nitrogen and seasonal limitations for ammonia as N. According to the draft facility permit, the facility discharges treated process wastewater via outfall 001. The process wastewater is treated by primary and secondary screening for solids removal, flow equalization, dissolved air flotation with chemical addition, biotower treatment, two activated sludge aeration basins, two final clarifiers, sand filtration, chlorination, and dechlorination.

The draft total nitrogen permit limitations are based on Part 432 and are 103 mg/L monthly average, 147 mg/L daily maximum. The ammonia as N draft permit limitations are based on water quality criteria. They are (TCEQ, 2011):

- Winter: 8.0 mg/L monthly average, 16.0 mg/L daily maximum; and
- Summer: 1.0 mg/L monthly average, 2.0 mg/L daily maximum.

#### 5.1.3.3 Facility-Specific Contacts

In addition to the state contacts described above, EPA also contacted the top two 2009 TRI nitrate dischargers, **Tyson Fresh Meats, Inc. (Lexington)** and **Tyson Fresh Meats, Inc. (Hillsdale)**, to determine how they were estimating the nitrate loads reported in the 2009 TRI database. To report discharges to the TRI database, facilities can use available monitoring data, emission factors, engineering calculations or other estimations including mass balance equations. Therefore, EPA contacted these facilities to determine if the nitrate loads reported were based on monitoring data, engineering calculations, or other estimation methods.

***Tyson Fresh Meats, Inc., in Lexington, Nebraska***

Tyson Fresh Meats, a complex slaughterhouse, reported 4.99 million pounds of nitrate compound discharges in the 2009 TRI database. This facility accounted for approximately 8 percent of the total 2009 TRI nitrate compound TWPE. The facility contact confirmed the 2009 TRI nitrate load and explained that they estimate the load using nitrogen monitoring data. The plant collects samples three times weekly and analyzes them onsite for nitrate as nitrogen. To estimate the nitrate compound load for TRI, the facility multiplies its nitrate as nitrogen concentration and flow to calculate a nitrate as nitrogen load. They then convert to pounds of nitrate by multiplying by the factor of 4.43. See Equations 5-1 through 5-3 for the more detailed calculations. The facility assumes that all of the nitrogen is completely oxidized to nitrate by nitrification and that their reported TRI amount reflects their total nitrogen release (Loeg, 2012).

Additionally, the facility contact stated that due to the 2010 permit revision to include total nitrogen limitations, they estimate that their nitrate loads decreased to 3.4 million pounds in 2010. To meet the new total nitrogen limitations, the facility changed two complete mixing basins (previously part of the extended air basin) to an on/off system, so aeration is occurring half of the time in the wastewater treatment system. This creates an anoxic environment, and achieves both nitrification and denitrification (Loeg, 2012).

***Tyson Fresh Meats, Inc., in Hillsdale, Illinois***

Similar to the Tyson Fresh Meats in Nebraska, the Tyson Fresh Meats in Hillsdale is a complex slaughterhouse. The facility reported 4.45 million pounds of nitrate compound discharges in the 2009 TRI database, accounting for approximately 7 percent of the total 2009 TRI nitrate compound TWPE. The facility contact confirmed the 2009 TRI nitrate load and explained that the facility estimates its load using the same approach as the Tyson Fresh Meats in Nebraska. The facility multiplies its nitrate as nitrogen concentration and flow to calculate a nitrate as nitrogen load. They then convert to pounds of nitrate by multiplying by the factor of 4.43. See Equations 5-1 through 5-3 for the more detailed calculations (Rastessin, 2012).

Additionally, the facility recently received its new discharge permit from the state, which implements the total nitrogen permit limitations in Part 432.The facility is currently evaluating its wastewater treatment system to determine if it needs to make any changes to meet the new total nitrogen limitations (Rastessin, 2012).

#### 5.1.3.4 DMR Data for Top Nitrate Dischargers

EPA reviewed 2010 and 2011 DMR data for the top 13 facilities discharging nitrate compounds to determine if total nitrogen loads, including nitrate, are decreasing as a result of the 2004 ELGs. In addition to determining if any plants exceed the total nitrogen limitations, the availability of 2010 and 2011 DMR data also suggest that some plants are still receiving revised permits with total nitrogen limitations through the reporting year 2011.

By comparing the DMR data to the data from permit writers, facility permits, facilities, and TRI, EPA determined that the top 13 facilities from Table 5-3 are:

- Currently meeting permit limitations for total nitrogen, which includes the nitrate discharges;

- Receiving revised permit with total nitrogen limitations by the end of 2012; or
- Currently waiting for a revised permit from the state that are expected to include total nitrogen limitations based on subpart applicability.

Additionally, two facilities are taking action to improve wastewater treatment to address new total nitrogen permit limitations.

However, EPA also determined that two facilities do not have total nitrogen limitations in renewed permits, even though they appear to meet the production threshold to be considered regulated by 40 CFR Part 432. Table 5-4 lists the top nitrate dischargers in the 2009 TRI database, their most recent permit issue date, the range of total nitrogen concentrations reported from 2010 through 2011, and EPA's findings from the 2012 Annual Review. EPA selected the range from 2010 through 2011 to capture those facilities that received revised permits in late 2010 or early 2011.

From the data provided in Table 5-4, EPA determined that:

- Six facilities have permits with total nitrogen limitations and are not reporting concentrations that exceed the ELG-based limitations;
- Four facilities have recently received revised permits or are still waiting for revised permits that will include total nitrogen limitations;
- One facility is still waiting for a revised permit, but EPA was still unable to confirm the applicable subpart with the facility contact. Based on information from the facility contact, EPA expects that the facility will be regulated under 40 CFR Part 432, Subpart B (Complex Slaughterhouses), with total nitrogen limits in the revised facility permit; and
- Two facilities have recently revised permits that do not include total nitrogen limitations.

For the five facilities with recently revised, or pending revised, permit limitations for total nitrogen, EPA expects a decrease in total nitrogen, including nitrate compounds, as facilities comply with their new permit limitations. For the two facilities that do not have total nitrogen limitations, facility-specific permitting action may be warranted to ensure permits appropriately incorporate the 2004 ELGs.

**Table 5-4. Permit Status as of January 2012 and DMR Total Nitrogen Concentrations for Meat and Poultry Treated Process Wastewater Outfalls**

| Facility Name | State | Subpart | Date Most Recent Permit Issued | Part 432 Total Nitrogen Max Daily (mg/L) | Part 432 Total Nitrogen Max Monthly Average (mg/L) | 2010–2011 Monthly Average Total Nitrogen Concentration Range (mg/L) | EPA Findings |
|---|---|---|---|---|---|---|---|
| Tyson Fresh Meats, Inc. | NE | B | October 2010 | 194 | 134 | 38–80.7 | In compliance with Part 432 total nitrogen limitations. |
| Tyson Fresh Meats, Inc., Joslin, IL | IL | B | June 2011[a] | 194 | 134 | NA | Public announcement for facility permit released in 2011, facility still waiting to receive revised permit with total nitrogen limitations. |
| Cargill Meat Solutions Corp. | NE | B | October 2009 | 194 | 134 | NA | Facility appears to meet requirements for Part 432; however, permit does not limit total nitrogen. |
| Smithfield Packing, Co., Inc., Tar Heel Div. | NC | B | February 2012 | 194 | 134 | 80.8 – 119 | In compliance with Part 432 total nitrogen limitations. |
| Cargill Meat Solutions Corp. | IL | ND[b] | Under Revision | NA | NA | NA | IEPA is still reviewing this facility before issuing a new permit, currently the facility discharges in compliance with the old permit (expired 10/2009) |
| Lewiston Processing Plant | NC | L | February 2008 | 147 | 103 | 94.8[c] | In compliance with Part 432 total nitrogen limitations. |
| Accomac Processing Plant | VA | K | September 2011 | 147 | 103 | 69 – 85 | In compliance with Part 432 total nitrogen limitations. |
| Farmland Foods, Inc. | NE | B | April 2010 | 194 | 134 | 30 – 97.8 | In compliance with Part 432 total nitrogen limitations. |
| JBS Plainwell | MI | B | November 2011 | 194 | 134 | NA | Facility appears to meet requirements for Part 432; however, permit does not limit total nitrogen. |
| Cargill Meat Solutions Corp. | PA | B | Under Revision | 194 | 134 | NA | Permit is currently under revision, plant has not yet received revised permit. |

**Table 5-4. Permit Status as of January 2012 and DMR Total Nitrogen Concentrations for Meat and Poultry Treated Process Wastewater Outfalls**

| Facility Name | State | Subpart | Date Most Recent Permit Issued | Part 432 Total Nitrogen Max Daily (mg/L) | Part 432 Total Nitrogen Max Monthly Average (mg/L) | 2010–2011 Monthly Average Total Nitrogen Concentration Range (mg/L) | EPA Findings |
|---|---|---|---|---|---|---|---|
| Tyson Fresh Meats, Inc. | IA | B | Under Revision | 194 | 134 | NA | Permit is currently under revision, plant has not yet received revised permit. |
| Tyson Foods, Inc., Blountsville Processing Plant | AL | L | October 2005 | 147 | 103 | 70.6 – 94.8 | In compliance with Part 432 total nitrogen limitations. |
| Pilgrim's Pride Corp., Mt. Pleasant Complex | TX | K | Under Revision | 147 | 103 | NA | Permit is currently under revision, plant has not yet received revised permit. |

Source: EPA Envirofacts.
NA: Not applicable.
ND: Not determined.
Under revision: The facility permit is under revision to include total nitrogen limitations. Therefore, total nitrogen concentrations are not included in the 2010 through 2011 DMR data.
[a] IEPA issued the permit notice for the Tyson Fresh Meats, Inc., Joslin facility in June 2011; not the actual final permit.
[b] EPA contacted Cargill Meat Solutions Corp in Beardstown, IL to determine the applicable subpart. Based on conversations with the facility contact, Cargill Meat Solutions Corp is a slaughterhouse that processes pork. The processes at the facility include live rendering, boxing, and filling finished product. In 2012, Cargill Meat Solutions processed 1.4 billion pounds (in units LWK) of pork. Cargill Meat Solutions Corp explained that the facility NPDES permit (last expired in 2009) is still under review for revision by Illinois EPA (IEPA) (Barnes, 2013). Based on the facility information, EPA expects that with the revised facility permit, Cargill Meat Solutions Corp will be regulated under 40 CFR Part 432, Subpart B (Complex Slaughterhouses), with total nitrogen limits.
[c] Facility reported total nitrogen concentration for only one month in 2011.

### *5.1.4 Summary of Findings from EPA's Review of Meat and Poultry Products Category*

Using data collected for the 2012 Annual Review, EPA identified the following for the Meat and Poultry Category:

- Some facilities are estimating nitrate compounds loads in the TRI database using nitrate as nitrogen concentrations from effluent discharges, and converting the load based on molecular weight to nitrate.
- EPA reviewed the 2009 DMR total nitrogen discharges for the top nitrate compound discharging TRI facilities. EPA determined that the majority of these facilities are in compliance with the ELGs for total nitrogen or are currently awaiting revised permits that will include total nitrogen permit limitations. One facility documented a reduction in nitrate load as a result of more stringent total nitrogen limits. EPA expects a decrease in total nitrogen, including the nitrate compounds, as new permits include the 2004 ELG revisions.
- Two facilities do not currently have total nitrogen permit limitations; however, Part 432 appears to apply to them. These facility's total nitrogen/nitrate discharges may best be handled by facility-specific permitting action.
- Eight of thirteen facilities have, or are projected to have, WQBELs for ammonia as N rather than ELG-based limitations. The WQBELs are more stringent in most cases than limits based on Part 432.

EPA prioritizes point source categories with existing regulations for potential revision based on the greatest estimated toxicity to human health and the environment, measured as TWPE. Based on the above findings, EPA is assigning this category a lower priority for revision — i.e., this category is marked "(3)" in the "Findings" column in Table 7-1 in the Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans (U.S. EPA, 2014).

### *5.1.5 References for Meat and Poultry Products Category*

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15. NE DEQ. 2010a. Nebraska Department of Environmental Quality. Facility Permit and Fact Sheet for NPDES NE0123501—Tyson Fresh Meats, Inc., Lexington, NE. (October 1). EPA-HQ-OW-2010-0824. DCN 07812.

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## 5.2 Petroleum Refining (40 CFR Part 419)

During the 2011 Annual Review, EPA identified the Petroleum Refining Category (40 CFR Part 419) for preliminary review because it ranked high, in terms of toxic-weighted pound equivalents (TWPE), in the 2011 toxicity rankings analysis. See Table 4-3 in Section 4.1.6 of the *Preliminary 2012 Effluent Guidelines Program Plan* (U.S. EPA, 2013a). EPA needed additional data to complete the preliminary category review, so this review continued in the 2012 Annual Review (U.S. EPA, 2012).

This section summarizes the findings from the 2011 and 2012 Annual Reviews associated with the Petroleum Refining Category. Based on findings from the 2011 Annual Review, EPA continued to review discharges of dioxin and dioxin-like compounds from the Toxics Release Inventory (TRI) because of their high TWPE. EPA reviewed metals discharges because of high TWPE and industry trends that might affect metals discharges. These industry trends include the use of new feedstock such as Canadian crude oil and tar sands (Purdue-Argonne Task Force, 2011), and additional air pollution control (see Section 6.3). EPA compared the concentrations of metals that refineries report in their wastewater discharges to recent academia and effluent guidelines industry studies (see Section 5.2.3.2) on the performance of chemical precipitation, biological, and ultrafiltration treatment and found that the highest 2010 daily maximum discharge concentrations reported by many refineries exceed the concentrations achievable by these treatments.

### *5.2.1 Petroleum Refining Category Background*

The Petroleum Refining ELGs (40 CFR Part 419) were promulgated in 1982. EPA has not revised the ELGs, but has subsequently reviewed discharges from petroleum refineries as part of the Preliminary and Final Effluent Guidelines Program Plans in 2004–2010 (U.S. EPA, 2004, 2005, 2006, 2007, 2008, 2009a, 2011). During its 2004 Final Effluent Guidelines Program Plan reviews, EPA also conducted a detailed study of this industry (U.S. EPA, 2004). Table 5-5 compares the toxicity rankings analysis results for the Petroleum Refining Category from the 2007 through 2011 Annual Reviews. See Section 19.1 of EPA's 2011 Annual Review Report for more background on the petroleum refining category (U.S. EPA, 2012).

**Table 5-5. Petroleum Refining Category TRI and DMR Discharges for 2007 Through 2011 Toxicity Rankings Analysis**

| Year of Discharge | Year of Review | Petroleum Refining Category | | |
|---|---|---|---|---|
| | | TRI TWPE[a] | DMR TWPE[b] | Total TWPE |
| 2004 | 2007 | 669,000 | 819,000 | 1,490,000 |
| 2005 | 2008 | 628,000 | NA | NA |
| 2007 | 2009 | 172,000 | 403,000 | 575,000 |
| 2008 | 2010 | 410,000 | 680,000 | 1,090,000 |
| 2009 | 2011 | 436,000 | 295,000 | 731,000 |

Sources: *TRIReleases2004_v3; PCSLoads2004_v3; TRIReleases2005_v2; TRIReleases2007_v2; DMRLoads2007_v4; TRIReleases2008_v3; DMRLoads2008_v3; TRIReleases2009_v2;* and *DMRLoads2009_v2*.
NA: Not applicable. EPA did not evaluate DMR data for 2005.
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Discharges include transfers to publicly owned treatment works (POTWs) and account for POTW removals.
[b] MR data from 2004 through 2007 include only major dischargers. 2008 and 2009 DMR data include both minor and major dischargers.

### *5.2.2 Results of the 2011 Annual Review*

EPA's 2011 review of the Petroleum Refining Category focused on the 2009 TRI and discharge monitoring report (DMR) discharges because both contribute to the category's combined TWPE. Tables 19-2 and 19-3 in Section 19.2 of the 2011 Annual Review Report present the top 2009 TRI and DMR pollutants for the petroleum refining category (U.S. EPA, 2012). EPA investigated the top TRI pollutants, dioxin and dioxin-like compounds and polycyclic aromatic compounds (PACs), because they account for 80 percent of the total 2009 TRI TWPE. EPA investigated the top DMR pollutants, sulfide and chlorine, because they account for more than 61 percent of the total 2009 DMR TWPE. Additionally, EPA reviewed DMR metals discharges because of high TWPE and changes in industry trends that might affect metals discharges. In reviewing the 2009 TRI and DMR database pollutants of concern, EPA reached the following conclusions as part of the 2011 Annual Review:

- In a 2004 detailed study EPA concluded that the petroleum refining PAC discharges reported to TRI are either (1) based on half the detection limit multiplied by the flow or (2) estimated using emission factors and; therefore, concluded that there is little evidence that PACs are being discharged to surface waters in concentrations above the detection limit (U.S., EPA 2004). The petroleum refining PAC TWPE is consistent from discharge years 2004 to 2009; therefore, EPA determined findings from the 2004 detailed study of the industry still apply, and that PAC discharges do not present a hazard priority at this time.
- During the 2011 Annual Review, EPA found that four facilities account for 54 percent of the 2009 DMR sulfide discharges. The majority of discharges for all four facilities were below or near treatable levels; therefore, EPA does not consider these sulfide discharges a hazard priority at this time;

- During the 2011 Annual Review, EPA identified and corrected an error in DMR chlorine discharges; EPA accordingly concludes that chlorine discharges do not present a hazard at this time (U.S. EPA, 2012);
- EPA previously determined that refineries form dioxin and dioxin-like compounds during catalyst regeneration operations for the catalytic reforming process. One refinery, Hovensa, accounts for 65 percent of the dioxin and dioxin-like compound discharges reported by the category in TRI 2009. The facility reported an increase in dioxin and dioxin-like compound discharges from 2008 to 2009. According to the facility contact, the increase in dioxin and dioxin-like compound discharges was due to an increase in the number of catalyst regenerations in 2009. For other refineries, EPA needed more information to verify the refinery-specific data for 2009. Therefore, EPA continued to review dioxin and dioxin-like compound discharges from petroleum refineries during the 2012 Annual Review (U.S. EPA, 2012); and
- EPA identified the need for more information about discharges of metal pollutants during the 2011 Annual Review. Therefore, EPA continued to review metals discharges from petroleum refineries during the 2012 Annual Review (U.S. EPA, 2012).

### *5.2.3 Results of the 2012 Annual Review*

EPA's continued review of the Petroleum Refining Category as part of the 2012 Annual Review focused on dioxin and dioxin-like compound discharges reported to TRI and metals discharges reported in DMR. The following subsections present the findings from EPA's review.

#### 5.2.3.1 Petroleum Refining Dioxin and Dioxin-Like Compound Discharges

EPA continued to review dioxin and dioxin-like compound discharges from petroleum refineries during the 2012 Annual Review by collecting additional data to verify facility discharges. EPA determined in its 2011 Annual Review Report that dioxin and dioxin-like compounds contribute 72 percent of the total petroleum refining category 2009 TRI TWPE and increased by approximately 15,000 TWPE from reporting years 2008 to 2009. Table 5-10 lists the petroleum refineries that reported dioxin and dioxin-like compound discharges to TRI in 2009.

EPA's 2004 detailed study of petroleum refineries indicated that refineries produce dioxin and dioxin-like compounds during catalytic reforming and catalyst regeneration operations (U.S. EPA, 2004). The study also showed that the estimated releases of dioxin and dioxin-like compounds reported to TRI are based on pollutant concentrations below the Method 1613B Minimum Levels (ML). Measurements of concentrations below the Method 1613B ML may not be accurate and may not accurately reflect industry discharges.

During the 2011 Annual Review, EPA investigated the basis of estimates for the petroleum dioxin discharges in the 2009 TRI data, which could include actual sampling data, mass balance calculations, or some other type of estimation (U.S. EPA, 2012). Of the 19 refineries reporting dioxin and dioxin-like compound discharges to TRI in 2009, nine reported discharges based on analytical measurements (designated as "M1" or "M2" in the TRI database) and the other 10 used mass balance, emission factors, or other estimation techniques to determine discharges.

During the 2011 Annual Review, EPA also identified that **Hovensa LLC** in Christiansted, VI, accounts for 65 percent of the category's dioxin and dioxin-like compound discharges in the 2009 TRI database. EPA contacted the facility about its dioxin and dioxin-like compound discharges and determined that the dioxin discharges are estimated using literature values associated with dioxin formation from reformer catalyst regeneration. The facility indicated that the increase in dioxin discharges from 2008 to 2009 was due to the number of times the facility regenerated the reformer catalyst, once in 2008 compared to three times in 2009. The facility contact stated that the number of regenerations required in a given year could vary between zero and three, depending on different operating factors (Vernon, 2011). The facility used the dioxin distributions given in the *Dioxins and Refineries: Analysis in the San Francisco Bay Area* report (CBE, 2000) to estimate the dioxin load and distribution. The source of these dioxin distributions is the 1996 EPA Preliminary Data Summary for the Petroleum Refining Category (U.S. EPA, 1996).

During the 2012 Annual Review, EPA confirmed with Hovensa that its dioxin discharges are based on estimations from literature. Hovensa did not analyze its wastewater for dioxins or furans; therefore, EPA is not certain dioxins and furans are actually present in the wastewater at concentrations above the Method 1613B ML. Although Hovensa's estimate of releases follows TRI program guidance, it may not represent actual wastewater discharges.

Because Hovensa represented a majority of the TRI TWPE, EPA did not review TRI data on dioxins and furans from any other petroleum refineries during the 2012 Annual Review. However, EPA searched 2010 DMR data to see what dioxins and furans might have been measured in effluent from petroleum refineries. Table 5-6. presents final outfall data for six refineries that reported dioxin and dioxin-like compound discharges in the 2010 DMR. As shown, only one refinery, **Tosco Corporation** in Martinez, CA, reported detecting dioxins and furans above the Method 1613B ML in 2010. This refinery reported detecting three congeners: OCDD, OCDF, and an HpCDD congener, but its outfall includes process wastewater and stormwater.

In the 2004 detailed study, EPA reviewed similar 2000 DMR discharges from this facility (U.S. EPA, 2004). As explained in the 2004 detailed study, the Tosco refinery completed an extensive study in 1997 to find the source of dioxin in the final effluent. The study determined that 98 percent of the dioxin loading is from non-process wastewater (discharges from stormwater and the coke pond and clean canal forebay). The refinery reported that wastewater from the treatment plant (treated with granular activated carbon) contributed two percent of the dioxin in the final effluent. The 1997 report suggests that the dioxin in the wastewater discharges from stormwater and the coke pond and clean canal forebay are from aerial deposition in the surrounding area (U.S. EPA, 2004).

## Table 5-6. 2010 DMR Petroleum Refinery Dioxin and Dioxin-Like Compounds Effluent Discharge Data (pg/L)

| Dioxin Congener Number | 1613B ML | Tesoro Alaska Petroleum Co. | | Shell Chemical Company | | Tosco Corp. Amorco Wharf | | Valero Refining Co. — California Benicia Refinery | | Exxon Mobil Oil Corp. – Torrance Refinery | | Conoco Phillips Carson Plant | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Kenai, AK | | Saraland, AL | | Martinez, CA | | Benicia, CA | | Torrance, CA | | Carson, CA | |
| | | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| 2,3,7,8- TCDD | 10 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,2,3,7,8-PeCDD | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,4,7,8-HxCDD | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,6,7,8-HxCDD | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,7,8,9-HxCDD | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,4,6,7,8-HpCDD | 50 | | | | | 153[a] | 293[a] | | | | | | |
| OCDD | 100 | | | | | 1,600[a] | 3,100[a] | | | | | | |
| 2,3,7,8-TCDF | 10 | | | | | ND | ND | | | | | | |
| 1,2,3,7,8-PeCDF | 50 | | | | | ND | ND | | | | | | |
| 2,3,4,7,8-PeCDF | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,4,7,8-HxCDF | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,6,7,8-HxCDF | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,7,8,9-HxCDF | 50 | | | | | ND | ND | | | | | | |
| 2,3,4,6,7,8-HxCDF | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 50 | | | | | ND | ND | | | | | | |
| 1,2,3,4,7,8,9-HpCDF | 50 | | | | | ND | ND | | | | | | |
| OCDF | 100 | | | | | 101[a] | 101[a] | | | | | | |

Source: DMR Loading Tool; Isorena, 2012.
ND: Not detected.
Blank cells indicate the refinery did not monitor for this parameter.
[a] Discharges are above the Method 1613B ML.

#### 5.2.3.2 Petroleum Refining Metals Discharges

Petroleum refinery wastewater contains a number of metals. EPA has observed changes in the petroleum industry in recent years that have led to an increase in discharges of metal compounds. These changes include the use of different feedstock such as Canadian crude oil and tar sands (Purdue-Argonne Task Force, 2011) and changes in air pollution control (see Section 6.3). Crude petroleum is the major source of metals in petroleum refinery wastewater; pipe corrosion, catalyst additives, other refinery raw materials, cooling water biocide, and supply water also contribute metals to the water (U.S. EPA, 2004).

EPA continued to review metals discharges from petroleum refineries during the 2012 Annual Review. EPA reviewed 2010 DMR data in detail and collected readily available treatment performance data for metals discharges. Table 5-7 presents the pounds and TWPE for DMR metals discharges from 2000 to 2010. Part 419 includes limitations for only one metal, chromium. EPA compared 2010 DMR metals concentrations for petroleum refineries to readily available treatability data from three sources:

- The Emerging Technologies and Approaches to Minimize Discharges into Lake Michigan Study (Purdue-Argonne Task Force, 2011);
- The Steam Detailed Study Report (DSR) (U.S. EPA, 2009b); and
- Historical Effluent Limitations Guidelines and Standards (ELGs) (U.S. EPA, 2000; ERG, 2006).

The Argonne National Laboratory and Purdue University studied treatment technologies that could help the BP Whiting (Indiana) Refinery meet wastewater discharge permit limits. The study focused on ultrafiltration treatment for mercury, with a treatability to 0.0000013 mg/L. The Steam DSR represents performance of chemical precipitation and biological treatment at power plants, specifically of flue gas desulfurization wastewater treatment systems. Although the untreated wastestream differs from petroleum refining wastewater, EPA used this readily available data to obtain a sense of the treatability of metals using these more recent technologies, as compared to current metals discharges from petroleum refineries. Table 5-8 presents the Steam DSR performance data used for a preliminary comparison to the 2010 DMR petroleum refinery metals data. EPA also evaluated, as a point of comparison, metals removals achieved by chemical precipitation systems collected during development of the Metal Products and Machinery ELGs (Part 438), Iron and Steel (Part 420), and Centralized Waste Treatment (Part 437) ELGs. Treatability concentrations from the BP Whiting (Argonne National Laboratory and Purdue University) study and Steam DSR are more current and demonstrated better performance (compared to historical ELGs ); therefore, EPA used data from these two sources as the point of comparison for metals removal.

**Table 5-7. DMR Metal Discharges, 2000–2010**

| | 2010 | 2009 | 2008 | 2007 | 2004 | 2000 |
|---|---|---|---|---|---|---|
| Total Metals TWPE | 93,600 | 66,300 | 56,300 | 134,000 | 63,700 | 33,500 |

Sources: *PCSLoads2000; PCSLoads2004_v3; DMRLoads2007_v4; DMRLoads2008_v3; DMRLoads2009_v2;* and DMR Loading Tool (2010).

**Table 5-8. Treatability Data from 2009 Steam Electric Power Generation Detailed Study Report**

| Metal | 2009 Steam DSR: Chemical Precipitation Treatment (mg/L) | 2009 Steam DSR: Chemical Precipitation Followed by Anoxic/Anaerobic Biological Treatment (mg/L) |
|---|---|---|
| Aluminum | <0.05 | <0.05 |
| Arsenic | <0.0103 | <0.002 |
| Chromium | <0.01 – 0.0253 | 0.0242 |
| Copper | <0.0025 – 0.0162 | <0.0025 |
| Lead | <0.0015 – <0.05 | <0.0015 |
| Mercury | 0.000075[a] | 0.000075[a] |
| Nickel | <0.05 – 0.221 | <0.001 |
| Selenium | 0.0825 – 2.91 | 0.0005 [a] |
| Vanadium | 0.0021 – <0.02 | <0.0005 |
| Zinc | <0.01 – 0.0254 | <0.025 |

Source: U.S. EPA, 2009b and U.S. EPA, 2013b.
NA: Not applicable.
[a] Calculated long term average values from Table 13-7 in EPA's *Technical Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category* (U.S. EPA, 2013b).

Table 5-9 lists the metals commonly reported in DMR data in 2010,[8] along with the number of refineries reporting each metal, the range of concentrations, and the method detection limit (MDL) associated with 40 CFR Part 136 methods.[9] The daily maximum concentration range is the highest concentration reported for the metal by each refinery in 2010; it is the worst-case scenario and not reflective of average discharges.

Table 5-9 also compares the 2010 DMR petroleum refinery daily maximum metals discharge concentrations to the lowest metals concentrations identified in the Steam DSR and the Argonne National Laboratory and Purdue University study. This table shows that the metals discharges from petroleum refineries often exceed comparable treatment performance concentrations (though the treatment technologies from the Steam DSR listed were applied to steam electric power generation wastewater, the data does not indicate the performance of these technologies on petroleum refinery wastewater):

- For aluminum, arsenic, copper, lead, mercury, and zinc, the highest 2010 daily maximum metals concentrations exceeded comparable treatment performance concentrations for more than 50 percent of the refineries with data.

[8] During the 2004 detailed study, EPA concluded that 10 metals are most commonly found in discharges from petroleum refineries (U.S. EPA, 2004).
[9] Mercury limits are from EPA Method 1631E.

- One refinery reported vanadium discharge concentrations, and its highest 2010 daily maximum concentration exceeded comparable treatment performance concentrations.
- Forty percent of the refineries' highest 2010 chromium daily maximum concentrations exceeded comparable treatment performance concentrations.
- For nickel and selenium, 25 percent of the refineries' highest 2010 daily maximum concentrations exceeded comparable treatment performance concentrations.

Table 5-11, at the end of this section, lists all of the refineries reporting metals DMR data in 2010 compared to the lowest metals concentrations taken from the Steam DSR and Argonne National Laboratory and Purdue University study (see row Lowest Treatment Performance Level in Table 5-11).

**Table 5-9. 2010 Petroleum Refineries Metals Data from DMR**

| Metal | Range of Daily Maximum Concentration s (mg/L)[a] | Number of Refineries Reporting Metals | MDL[b] (mg/L) | Lowest Comparison Treatment Performance Data (mg/L)[a] | Number of Refineries with Concentrations Exceeding Comparison Treatment Performance Data[c] | Total Percentage of Refineries with Concentrations Exceeding Comparison Treatment Performance Data[c] (%) |
|---|---|---|---|---|---|---|
| Aluminum | 0.085–5.14 | 7 | 0.045 | 0.05 | 7 | 100 |
| Arsenic | 0.0018–0.32 | 12 | 0.053 | 0.0103 | 7 | 58 |
| Chromium | 0.00032–0.31 | 47 | 0.0061 | 0.01 | 19 | 40 |
| Copper | 0.00047–1.705 | 29 | 0.0054 | 0.0025 | 27 | 93 |
| Lead | 0.00076–0.14 | 21 | 0.042 | 0.0015 | 17 | 81 |
| Mercury (pg/L) | 0.00587–18,000,000 | 23 | 200 | 1300 | 18 | 78 |
| Nickel | 0.005–0.093 | 12 | 0.015 | 0.05 | 3 | 25 |
| Selenium | 0–0.42 | 24 | 0.075 | 0.0825 | 6 | 25 |
| Vanadium | 0.012–0.012 | 1 | 0.0075 | 0.0021 | 1 | 100 |
| Zinc | 0–6.42 | 33 | 0.0018 | 0.01 | 30 | 91 |

Sources: DMR Loading Tool; Purdue-Argonne Task Force, 2011; U.S. EPA, 2009b.
[a] Except mercury, which is presented in pg/L.
[b] Method Detection Limit from 40 CFR Part 136, except for mercury, which is from EPA Method 1631E.
[c] As described in the text above, EPA used the Argonne National Laboratory and Purdue University study and the Steam DSR to determine lowest comparison treatment performance concentrations.

### *5.2.4 Summary of Findings from EPA's Review of Petroleum Refining Category*

EPA continued to review TRI and DMR data on dioxin and dioxin-like compound and metals discharges from petroleum refineries. Using data collected for the 2012 Annual Review, EPA identified the following:

- EPA previously determined that refineries form dioxin and dioxin-like compounds during catalyst regeneration operations for the catalytic reforming process. The 2004 detailed study report found all reported petroleum refinery dioxin and dioxin compound discharges to be below the Method 1613B ML. EPA reviewed 2009 dioxin and dioxin-like compound discharges from TRI. One facility, the Hovensa Refinery in Christiansted represented a majority of the TRI TWPE, however, this facility estimates its dioxin discharges based on TRI guidance, and EPA is uncertain whether the data represent actual wastewater discharges.
- EPA also reviewed 2010 DMR data and found that only one refinery reported discharging detectable concentrations of dioxins and furans, with three congeners detected above the Method 1613 ML. This facility performed a study in 1997 that suggests that 98 percent of the dioxin discharges are from stormwater (from aerial deposition), not process wastewater.
- Petroleum refinery wastewater contains a number of metal pollutants. EPA has observed changes in the petroleum industry in recent years that have led to an increase in discharges of metal compounds, including the use of different feedstock such as Canadian crude oil and tar sands, as well as changes in air pollution control. Seventy-six out of 163 petroleum refineries in the U.S. monitor for at least one of 10 metals commonly found in refinery discharges. Of the 10 metals, all are detected, with the maximum detected concentration often exceeding comparison treatability performance data (from the Steam DSR and Argonne National Laboratory and Purdue University study).

EPA prioritizes point source categories with existing regulations for potential revision based on the greatest estimated toxicity to human health and the environment, measured as TWPE. Based on the above findings, EPA is assigning this category a moderate priority for revision—i.e., this category is marked "(5)" in the "Findings" column in Table 7-1 in the Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans (U.S. EPA, 2014).

### *5.2.5 References for Petroleum Refining Category*

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## Table 5-10. Dioxin and Dioxin-Like Discharges from Petroleum Refineries Reported to TRI in 2004–2009

| | | | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Refinery Name** | **Location** | **Comments** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** |
| Hovensa, LLC | Christiansted, VI | No DMR data; TWPE is driving force for 08–09 change in discharge | 1.65 | 205,073 | O | 0.55 | 12,848 | O | NR | NR | NR | 2.2 | 180,442 | E | 1.7 | 148,653 | C |
| Chevron Products Co. Richmond Refinery | Richmond, CA | DMR TWPE is zero; grams is driving force for 08–09 change in discharge | 0.25 | 20,621 | M2 | 0.65 | 84,423 | M2 | 0.32 | 33,397 | M2 | 0.94 | 121,521 | M | 1.35 | 141,106 | O |
| Valero Refining Co, Oklahoma Valero Ardmore Refinery | Ardmore, OK | No DMR data; new to report in 2009 | 0.18053 | 16,463 | C | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Conoco Phillips Co, Billings Refinery | Billings, MT | No DMR data; TWPE is driving force for 08–09 change in discharge | 0.08 | 16,169 | M2 | 0.091 | 3,125 | M2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Chevron Products Co. Div of Chevron USA Inc. | El Segundo, CA | DMR TWPE is zero; grams is driving force for 08–09 change in discharge | 0.599 | 13,283 | M2 | 0.8912 | 81,266 | M2 | 0 | 0 | M2 | 0.158 | 16,221 | M | 0.2 | 20,533 | M |
| Marathon Ashland Petroleum LLC, Illinois Refining Div | Robinson, IL | No DMR data; grams is driving force for 08–09 change in discharge | 0.0404 | 12,622 | M2 | 0.0405 | 28,571 | O | 0.04 | 1,094 | O | 0.0404 | 3,314 | O | 0.04 | 3,604 | O |
| Chevron Products Co. Salt Lake City Refinery | Salt Lake City, UT | No DMR data; new to report in 2009 | 0.097 | 12,611 | E1 | NR | NR | NR | 0.02 | 541 | M2 | NR | NR | NR | NR | NR | NR |
| Shell Oil Co., Deer Park Refining LP | Deer Park, TX | No DMR data; TWPE is driving force for 08–09 change in discharge | 0.1003 | 8,532 | M2 | 0.1303 | 3,044 | M2 | 0.14 | 13,306 | M2 | 0.114 | 10,850 | M | 0.16 | 15,477 | M |

## Table 5-10. Dioxin and Dioxin-Like Discharges from Petroleum Refineries Reported to TRI in 2004–2009

| | | | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Refinery Name** | **Location** | **Comments** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** |
| Chevron Products Co., Pascagoula Refinery | Pascagoula, MS | No DMR data; grams is driving force for 08–09 change in discharge | 0.07265 | 3,595 | O | 0.03709 | 4,592 | O | NR | NR | NR | 0.099 | 4,234 | O | 0.12 | 5,217 | O |
| Tesoro Refining & Marketing Co | Anacortes, WA | No DMR data; grams is driving force for 08–09 change in discharge | 0.41 | 2.905 | M2 | 0.519 | 12,124 | O | NR | NR | NR | 1.94 | 55,248 | M | 1.95 | 54,406 | M |
| Conoco Phillips, San Francisco Refinery | Rodeo, CA | DMR TWPE is zero; grams is driving force for 08–09 change in discharge | 0.0623205 | 2,276 | C | 0.16818 | 15,610 | C | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| BP Products North America Inc, Toledo Refinery | Oregon, OH | DMR TWPE is zero; grams is driving force for 08–09 change in discharge | 0.481 | 785 | M2 | 0.264 | 6,167 | O | 0.29 | 41,963 | O | 0.331 | 47,084 | O | 0.34 | 47,795 | M |
| Citgo Petroleum Corp | Westlake, LA | No DMR data; TWPE is driving force for 08–09 change in discharge | 0.00128 | 126 | E1 | 0.00257 | 60 | E1 | 0.002 | 69 | O | 0.00256 | 210 | E | 0.0026 | 231 | E |
| Conoco Phillips, Santa Maria Refinery | Arroyo Grande, CA | No DMR data; grams is driving force for 08–09 change in discharge | 0.0675 | 26 | M2 | 0.0133 | 311 | M2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| BP Products North American Whiting | Whiting, IN | No DMR data; grams is driving force for 08–09 change in discharge | 0.000015 | 8 | O | 0.000013 | 12 | O | NR | NR | NR | NR | NR | NR | 0.000011 | 1.8 | O |
| Premcor Refining Group, Inc. | Delaware City, DE | No DMR data; new to report in 2009 | 0.0000363 | 4 | O | NR | NR | NR | 0.0001 | 3.13 | O | 0.000097 | 2 | O | 0.022 | 559 | O |

## Table 5-10. Dioxin and Dioxin-Like Discharges from Petroleum Refineries Reported to TRI in 2004–2009

| Refinery Name | Location | Comments | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate |
| Suncor Energy Commerce City Refinery | Commerce City, CO | No DMR data; grams is driving force for 08–09 change in discharge | 0.35 | 4 | E1 | 0.35 | 8,176 | E1 | NR | NR | NR | 0.111 | 9,104 | M | 0.037 | 3,333 | M |
| Conoco Phillips, Ferndale Refinery | Ferndale, WA | No DMR data; grams is driving force for 08–09 change in discharge | 0.2251 | 3 | M2 | 0.2284 | 25,883 | M2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Martin Operating Ptnr LP | Smackover, AR | No DMR data; grams is driving force for 08–09 change in discharge | 0.0005 | 0.1 | O | 0.00005 | 1 | O | NR | NR | NR | NR | NR | NR | NR | NR | NR |

Sources: *TRIReleases2009_v2; TRIReleases2008_v3; TRIReleases2007_v2; TRIReleases2005_v2;* and *TRIReleases2004_v3*.
NR: Not reported.
For indirect discharges, the mass shown is the mass transferred to the POTW that is ultimately discharged to surface waters, accounting for an estimated 83% removal of dioxin and dioxin-like compounds by the POTW.
Refineries reported basis of estimate in TRI as: M (monitoring data/measurements); M2 (periodic monitoring data/measurements); C (mass balance calculations); E (published emission factors); and O (other approaches, such as engineering calculations).

## Table 5-11. 2010 DMR Metals Data from DMR Loading Tool

| Refinery Name [a] (Location) | Aluminum | | Arsenic | | Chromium | | Copper | | Lead | | Mercury | | Nickel | | Selenium | | Vanadium | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| Tesoro Kenai (Kenai, AK) | | | | | | | | | | | 0.00011 | 0.00011 | | | | | | | | |
| Hunt Tuscaloosa (Tuscaloosa, AL) | | | | | 0.0027 | 0.0056 | | | | | | | | | | | | | | |
| Shell Saraland (Saraland, AL) | | | | | 0.018 | 0.072 | | | | | 0.00022 | 0.00072 | | | | | | | | |
| Lion Oil (El Dorado, AR) | | | | | 0.00046 | 0.0108 | | | 0.00068 | 0.019 | | | | | 0.015 | 0.0903 | | | 0.012 | 0.11 |
| Berry (Stephens, AR) | | | | | | | | | | | | | | | | | | | 0.0066 | 0.12 |
| Conoco Arroyo (Arroyo Grande, CA) | | | | | | | 0.015 | 0.015 | | | 0.00022 | 0.00022 | | | | | | | | |
| Chevron El Segundo (El Segundo, CA) | | | 0.0086 | 0.0094 | 0.0019 | 0.0035 | 0.0071 | 0.008 | | | | | 0.0095 | 0.01 | 0.13 | 0.2 | | | 0.11 | 0.74 |
| Tosco Martinez (Martinez, CA) | 0.051 | 0.12 | 0.0042 | 0.0042 | 0.00022 | 0.0058 | 0.0014 | 0.0026 | 0.0015 | 0.0027 | 0.0000053 | 0.00001 | 0.0092 | 0.011 | 0.0108 | 0.032 | | | 0.0052 | 0.0052 |
| Conoco Rodeo (Rodeo, CA) | 0.057 | 0.085 | 0.0034 | 0.0049 | 0.00042 | 0.00072 | 0.0057 | 0.0096 | 0.00062 | 0.0019 | 4.39E-09 | 4.39E-09 | 0.0036 | 0.0095 | 0.013 | 0.0309 | | | 0.024 | 0.037 |
| Chevron Richmond (Richmond, CA) | | | | | 0.0014 | 0.00407 | 0.0033 | 0.0044 | 0.00048 | 0.00076 | 2.37E-08 | 2.37E-08 | 0.013 | 0.0207 | 0.013 | 0.018 | | | | |
| Valero Benicia (Benicia, CA) | 0.22 | 1.7 | 0.0017 | 0.0018 | | | 0.0037 | 0.008 | | | 0.0000098 | 0.000061 | 0.011 | 0.011 | 0.0203 | 0.023 | | | 0.017 | 0.051 |
| Martinez (Martinez, CA) | | | | | 0.00015 | 0.00069 | 0.0023 | 0.0041 | | | 7.42E-09 | 7.42E-09 | 0.019 | 0.056 | 0.028 | 0.033 | | | 0.019 | 0.038 |
| Suncor (Commerce City, CO) | | | 0.0065 | 0.023 | 0.0015 | 0.0059 | 0.0011 | 0.013 | 0.00041 | 0.006 | 0.000044 | 0.00038 | | | 0.022 | 0.106 | | | 0.025 | 0.19 |
| Conoco Roxana (Roxana, IL) | | | | | 0.011 | 0.31 | | | | | | | 0.022 | 0.093 | | | | | | |
| Citgo Lemont (Lemont, IL) | | | | | 0.0104 | 0.015 | | | | | | | | | | | | | | |
| Marathon Robinson (Robinson, IL) | | | | | 0.00066 | 0.002 | | | | | | | | | | | | | | |
| American Western (Lawrenceville, IL) | | | | | 0.019 | 0.048 | | | | | | | | | | | | | | |
| BP Whiting (Whiting, IN) | | | | | | | 0.0018 | 0.0029 | 0.00801 | 0.043 | 0.0000034 | 0.0000069 | | | 0.026 | 0.032 | | | | |

## Table 5-11. 2010 DMR Metals Data from DMR Loading Tool

| Refinery Name[a] (Location) | Aluminum | | Arsenic | | Chromium | | Copper | | Lead | | Mercury | | Nickel | | Selenium | | Vanadium | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| Country Mark (Mt. Vernon, IN) | | | | | 0.0058 | 0.008 | | | | | 0.0034 | 0.0059 | | | | | | | 0.28 | 1 |
| Farmland (Coffeyville, KS) | | | | | 0.0036 | 0.00909 | | | | | | | | | | | | | | |
| Catlettsburg (Catlettsburg, KY) | 0.82 | 1.89 | 0.013 | 0.019 | | | | | | | | | 0.00308 | 0.005 | | | | | 0.109 | 0.202 |
| Conoco Westlake (Westlake, LA) | | | | | | | 0.0076 | 0.05 | | | 0.000052 | 0.00071 | 0.0035 | 0.069 | | | | | 0.45 | 6.42 |
| BP Belle Chasse (Belle Chasse, LA) | | | | | 0.00035 | 0.0042 | | | | | | | | | | | | | | |
| Motiva Norco (Norco, LA) | | | | | | | 0.005 | 0.01 | | | | | | | | | | | | |
| ExxonMobil (Chalmette, LA) | | | | | 0.0088 | 0.039 | | | | | | | | | | | | | | |
| Citgo Lake Charles (Lake Charles, LA) | | | | | | | 0.00094 | 0.0045 | 0.016 | 0.016 | 0.0000065 | 0.000018 | | | | | | | | |
| Motiva Convent (Convent, LA) | | | | | 0.0072 | 0.0072 | | | | | | | | | | | | | | |
| Calumet Shreveport (Shreveport, LA) | | | | | 0.016 | 0.016 | | | | | | | | | | | | | | |
| Marathon Garyville (Garyville, LA) | | | | | 0.0094 | 0.0094 | | | 0.000204 | 0.001 | | | | | | | | | | |
| Valero Norco (Norco, LA) | | | | | 0.0068 | 0.036 | | | | | | | | | | | | | | |
| Calcasieu (Lake Charles, LA) | | | | | 0.012 | 0.025 | 0.028 | 0.081 | 0.01 | 0.01 | 0.0016 | 0.018 | | | | | | | | |
| Marathon Saint Paul Park (Saint Paul Park, MN) | | | | | | | | | | | 0.00000207 | 0.0000046 | | | 0.015 | 0.022 | | | 0.015 | 0.025 |
| Koch (Rosemount, MN) | | | | | | | | | | | 0.000013 | 0.0000402 | | | 0.39 | 0.42 | | | | |
| Chevron Pascagoula (Pascagoula, MS) | | | | | | | 0.004005 | 0.0072 | | | | | 0.0069 | 0.016 | | | | | | |
| Hunt Sandersville (Sandersville, MS) | | | | | | | | | | | | | | | | | | | 0.0072 | 0.013 |

# Table 5-11. 2010 DMR Metals Data from DMR Loading Tool

| Refinery Name [a] (Location) | Aluminum | | Arsenic | | Chromium | | Copper | | Lead | | Mercury | | Nickel | | Selenium | | Vanadium | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| Ergon (Vicksburg, MS) | | | | | 0.00206 | 0.00405 | | | | | | | | | | | | | | |
| Conoco Billings (Billings, MT) | | | | | | | | | | | | | | | 0.109 | 0.27 | | | | |
| Tesoro Mandan (Mandan, ND) | | | | | 0.00042 | 0.0079 | | | | | | | | | | | | | | |
| Coastal (Westville, NJ) | | | | | | | 0.0057 | 0.0101 | 0.00207 | 0.0023 | | | 0.0073 | 0.0107 | | | | | 0.029 | 0.042 |
| BP Oregon (Oregon, OH) | | | | | 0.00201 | 0.00806 | | | | | 2.35E-12 | 9.309E-12 | | | 0.0102 | 0.03 | | | | |
| Premcor Lima (Lima, OH) | | | | | | | 0.0016 | 0.0064 | 0.0034 | 0.028 | 2.018E-12 | 5.87E-12 | | | 0.0045 | 0.018 | | | 0.012 | 0.057 |
| Marathon Canton (Canton, OH) | | | | | | | | | | | | | | | 0.0106 | 0.032 | | | | |
| Chevron Hooven (Hooven, OH) | | | | | | | | | 0.00078 | 0.0015 | | | | | | | | | | |
| Tulsa Refinery (Tulsa, OK) | | | | | 0.0069 | 0.013 | | | | | | | | | | | | | | |
| Valero Ardmore (Ardmore, OK) | | | | | 0.00095 | 0.011 | | | | | | | | | | | | | | |
| Sinclair (Tulsa, OK) | | | | | 0.0054 | 0.0104 | | | | | | | | | | | | | | |
| Calumet Penreco (Karns City, PA) | 0.26 | 0.42 | | | | | 0.00039 | 0.0033 | 0.00076 | 0.0011 | | | | | | | | | 0.0095 | 0.018 |
| American Refining (Bradford, PA) | | | 0.0905 | 0.0905 | 0.0089 | 0.0089 | | | | | | | | | | | | | | |
| Sunoco P1 (Philadelphia, PA) | | | | | | | 0.017 | 0.02 | 0.0087 | 0.01 | | | | | | | | | 0.032 | 0.054 |
| Sunoco P2 (Philadelphia, PA) | | | | | | | | | | | | | | | | | | | 0.0408 | 0.071 |
| Conoco Trainer (Trainer, PA) | 1.73 | 4.48 | | | 0.0017 | 0.0048 | 0.0061 | 0.01 | 0.0017 | 0.005 | | | | | 0.026 | 0.059 | | | 0.022 | 0.031 |
| Caribbean (Bayamon, PR) | | | | | 0.0013 | 0.0018 | | | | | 0.0000025 | 0.0000059 | 0.0029 | 0.0061 | 0 | 0 | | | 0.0059 | 0.016 |
| Shell Yabucoa (Yabucoa, PR) | | | | | 0.00089 | 0.0012 | 0.037 | 0.075 | 0.00098 | 0.002 | 0.00035 | 0.004 | | | 0.00095 | 0.001 | | | 0.0109 | 0.024 |

## Table 5-11. 2010 DMR Metals Data from DMR Loading Tool

| Refinery Name [a] (Location) | Aluminum | | Arsenic | | Chromium | | Copper | | Lead | | Mercury | | Nickel | | Selenium | | Vanadium | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| Phillips PR (Guayama, PR) | | | | | 0.0016 | 0.0031 | 0.00039 | 0.00047 | 0.0017 | 0.0069 | 0.0000058 | 0.000028 | | | | | | | | |
| Valero Memphis (Memphis, TN) | | | 0.034 | 0.034 | | | 0.052 | 0.21 | 0.013 | 0.065 | | | | | | | | | 0.16 | 0.76 |
| Delek (Tyler, TX) | 1.98 | 5.14 | | | | | | | | | | | | | | | | | 0.091 | 0.17 |
| Valero Houston (Houston, TX) | | | | | 0.00507 | 0.0055 | | | | | | | | | | | | | 0.072 | 0.12 |
| Houston Refinery (Houston, TX) | | | 0.01 | 0.02 | 0.0033 | 0.01 | | | | | | | | | | | | | 0.46 | 1.2 |
| BP Texas City (Texas City, TX) | | | | | 0.0033 | 0.0098 | | | | | | | | | | | | | 0.014 | 0.036 |
| Atofina (Port Arthur, AR) | | | | | 0.015 | 0.0904 | | | | | | | | | | | | | | |
| Shell Deer Park (Deer Park, TX) | | | | | | | 0.0053 | 0.011 | | | | | | | | | | | | |
| Port Arthur (Port Arthur, TX) | | | | | 0.000086 | 0.00103 | 0.19 | 1.705 | | | | | | | | | | | | |
| Premcor Port Arthur (Port Arthur, TX) | | | | | 0.0092 | 0.036 | 0.0021 | 0.0052 | 0.006009 | 0.014 | | | | | | | | | | |
| Valero Texas City (Texas City, TX) | | | | | 0.0052 | 0.013 | | | | | | | | | 0 | 0 | | | 0 | 0 |
| Citgo CC (Corpus Christi, TX) | | | | | 0.0063 | 0.0308 | | | 0.0019 | 0.0024 | | | | | | | | | | |
| Valero CC E. (Corpus Christi, TX) | | | | | 0.0027 | 0.0041 | 0.0012 | 0.0018 | | | | | | | 0.064 | 0.08 | | | | |
| Phillips Brazoria (Brazoria, TX) | | | | | | | | | | | 0.000109 | 0.0002 | | | 0.13 | 0.15 | | | 0.06 | 0.15 |
| Borger (Borger, TX) | | | 0.011 | 0.036 | 0.022 | 0.04 | | | 0.0087 | 0.14 | | | | | 0.0044 | 0.017 | | | | |
| LNVA (Beaumont, TX) | | | | | | | | | | | | | | | | | 0.012 | 0.012 | | |
| Valero CC (Corpus Christi, TX) | | | | | | | | | | | | | | | | | | | 0.011 | 0.035 |
| Diamond (Three Rivers, TX) | | | | | 0.020005 | 0.029 | 0.039 | 0.056 | | | | | | | 0.011 | 0.014 | | | 0.012 | 0.024 |

## Table 5-11. 2010 DMR Metals Data from DMR Loading Tool

| Refinery Name [a] (Location) | Aluminum | | Arsenic | | Chromium | | Copper | | Lead | | Mercury | | Nickel | | Selenium | | Vanadium | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max | Avg | Max |
| Seadrift Coke, L.P. (Seadrift, TX) | | | | | | | 0.00051 | 0.0052 | | | | | | | | | | | | |
| BTP Refining LLC (Corpus Christi, TX) | | | | | | | | | | | | | | | | | | | 0.071 | 0.13 |
| Hess (St. Croix, VI) | | | | | 0.024 | 0.065 | | | | | | | | | | | | | | |
| Murphy Oil (Superior, WI) | | | 0.01 | 0.01 | 0.00054 | 0.00061 | | | | | 0.0000024 | 0.0000034 | | | 0.026 | 0.029 | | | 0.01 | 0.01 |
| Newell (Newell, WV) | | | 0.22 | 0.32 | 0.00025 | 0.00032 | 0.044 | 0.075 | | | | | | | | | | | 0.061 | 0.085 |
| Method Detection Limit (from 40 CFR 136, except Hg which is from EPA Method 1613E) | 0.045 | 0.045 | 0.053 | 0.053 | 0.0061 | 0.0061 | 0.0054 | 0.0054 | 0.042 | 0.042 | 0.0000002 | 0.0000002 | 0.015 | 0.015 | 0.075 | 0.075 | 0.0075 | 0.0075 | 0.0018 | 0.0018 |
| 5X MDL | 0.225 | 0.225 | 0.265 | 0.265 | 0.0305 | 0.0305 | 0.027 | 0.027 | 0.21 | 0.21 | 0.000001 | 0.000001 | 0.075 | 0.075 | 0.375 | 0.375 | 0.0375 | 0.0375 | 0.009 | 0.009 |
| Lowest Comparison Treatment Performance Data (taken from Table 5-9)[b] | 0.05 | 0.05 | 0.0103 | 0.0103 | 0.01 | 0.01 | 0.0025 | 0.0025 | 0.0015 | 0.0015 | 0.0000013 | 0.0000013 | 0.05 | 0.05 | 0.0825 | 0.0825 | 0.0021 | 0.0021 | 0.01 | 0.01 |
| Total Number of Refineries with Monitoring Data | 7 | 7 | 12 | 12 | 47 | 47 | 29 | 29 | 21 | 21 | 23 | 23 | 12 | 12 | 24 | 24 | 1 | 1 | 33 | 33 |
| Total Number of Refineries with Conc > Treatment Performance Levels | 7 | 7 | 5 | 7 | 10 | 19 | 18 | 27 | 12 | 17 | 18 | 18 | 0 | 3 | 4 | 6 | 1 | 1 | 26 | 30 |
| Percent of Refineries with Conc > Treatment Performance Levels | 100 | 100 | 42 | 58 | 21 | 40 | 62 | 93 | 57 | 81 | 78 | 78 | 0 | 25 | 17 | 25 | 100 | 100 | 79 | 91 |

Source: DMR Loading Tool.
Note: Pink shading denotes when the average or maximum concentration of the metal exceeded the "Lowest Treatment Performance Level" for that metal (as identified for each metal in the fourth row from the bottom of the table).
Note: All concentrations provided in mg/L.
a – For the purpose of this table, refinery names have been abbreviated. See Table 5-12 for list of the full refinery names.
b – Lowest comparison treatment performance data represents the treatability concentrations from the Steam DSR (Table 5-8) and the Argonne National Laboratory and Purdue University study.

## Table 5-12. List of Full Refinery Names

| Refinery Abbreviation (As Shown in Table 5-11) | Full Refinery Name |
|---|---|
| Tesoro Kenai | Tesoro Alaska Petroleum Co. |
| Hunt Tuscaloosa | Hunt Refining Company A Corporation |
| Shell Saraland | Shell Chemical Company |
| Lion Oil | Lion Oil Co. El Dorado Refinery |
| Berry | Berry Petroleum Company |
| Conoco Arroyo | ConocoPhillips Co. |
| Chevron El Segundo | Chevron USA Products Company |
| Tosco Martinez | Tosco Corp Amorco Wharf |
| Conoco Rodeo | ConocoPhillip San Francisco Area Refinery at Rodeo |
| Chevron Richmond | Chevron Prods. Co. Richmond Refy |
| Valero Benicia | Valero Refining Co. California Benicia Refinery |
| Martinez | Martinez Refinery |
| Suncor | Suncor Denver Refinery |
| Conoco Roxana | ConocoPhillips Co. |
| Citgo Lemont | Citgo Petroleum Corp. |
| Marathon Robinson | Marathon Petroleum Co. LLC. |
| American Western | American Western Ref Acquis-LC |
| BP Whiting | BP Amoco Oil Company Whiting Refinery |
| Country Mark | CountryMark Cooperative Inc. |
| Farmland | Farmland Industries |
| Catlettsburg | Catlettsburg Refining, LLC |
| Conoco Westlake | ConocoPhillips Co., Lake Charles Refinery |
| BP Belle Chasse | BP Oil Company Alliance Refinery |
| Motiva Norco | Motiva Enterprises LLC, Norco Refinery |
| ExxonMobil | ExxonMobil Refinery Complex |
| Citgo Lake Charles | Citgo Petroleum Corporation |
| Motiva Convent | Motiva Enterprises Convent Refinery |
| Calumet Shreveport | Calumet Lubricants and Waxes LLC |
| Marathon Garyville | Marathon Ashland Petroleum LLC |
| Valero Norco | Valero Refining, New Orleans |
| Calcasieu | Calcasieu Refining Company |
| Marathon Saint Paul Park | Marathon Petroleum Co. LLC |
| Koch | Koch Pipeline Co., Rosemount |
| Chevron Pascagoula | Chevron Products Company, Pascagoula Refinery |
| Hunt Sandersville | Hunt Southland Refining Company |
| Ergon | Ergon Refining Inc. |
| Conoco Billings | Conoco Incorporated Refinery |
| Tesoro Mandan | Tesoro Mandan Refinery Wastewater Laboratory |
| Coastal | Coastal Eagle Point Oil Co. |

## Table 5-12. List of Full Refinery Names

| Refinery Abbreviation (As Shown in Table 5-11) | Full Refinery Name |
|---|---|
| BP Oregon | BP Oil Co. Toledo Refinery |
| Premcor Lima | Premcor Refining Group Inc. |
| Marathon Canton | Marathon Ashland Petroleum LLC Canton Refinery |
| Chevron Hooven | Chevron USA Inc. Cincinnati Refinery |
| Tulsa Refinery | Tulsa Refinery |
| Valero Ardmore | Valero Refining Co. Oklahoma Valero Ardmore Refinery |
| Sinclair | Sinclair Oil Tulsa Refinery Tulsa Trucking |
| Calumet Penreco | Calumet Penreco |
| American Refining | American Refining Group Inc. |
| Sunoco P1 | Sunoco Point Breeze Processing Area 1 |
| Sunoco P2 | Sunoco Point Breeze Processing Area 2 |
| Conoco Trainer | ConocoPhillips Trainer Ref. |
| Caribbean | Caribbean Petroleum Refining LP |
| Shell Yabucoa | Shell Chemical Yabucoa Inc. |
| Phillips PR | Phillips Puerto Rico Core Incorporated |
| Valero Memphis | Valero Memphis Refinery |
| Delek | Delek Tyler Refinery |
| Valero Houston | Valero Refining Houston Refinery |
| Houston Refinery | Houston Refinery |
| BP Texas City | BP Products North America |
| Atofina | Atofina Petrochemicals Incorporated |
| Shell Deer Park | Shell Chemical Shell Oil Deer Park |
| Port Arthur | Port Arthur Refinery |
| Premcor Port Arthur | Premcor Refining Group Incorporated Port Arthur Refinery |
| Valero Texas City | Valero Refining Company Texas |
| Citgo CC | Citgo Corpus Christi Refinery East Plant |
| Valero CC E. | Valero Corpus Christi Refinery East Plant |
| Phillips Brazoria | Phillips 66 Company Sweeny Complex |
| Borger | Borger Refinery |
| LNVA | LNVA North Regional Treatment Plant |
| Valero CC | Valero Corpus Christi Refinery |
| Diamond | Diamond Shamrock Refining Valero |
| Seadrift Coke, L.P. | Seadrift Coke, L.P. |
| BTP Refining LLC | BTP Refining LLC |
| Hess | Hess Oil Virgin Islands Corp. |
| Murphy Oil | Murphy Oil USA Inc. |
| Newell | Newell West Virginia Refinery |

Source: DMR Loading Tool.

## 5.3 Pulp, Paper, and Paperboard (40 CFR Part 430)

During the 2011 Annual Review, EPA identified the Pulp, Paper, and Paperboard (Pulp and Paper) Category (40 CFR Part 430) for preliminary review because it ranked high, in terms of toxic-weighted pound equivalents (TWPE), in the 2011 toxicity rankings analysis. See Table 4-3 in Section 4.1.6 of the *Preliminary 2012 Effluent Guidelines Program Plan* (U.S. EPA, 2013). EPA needed additional data to complete the preliminary category review and continued its review of the Pulp and Paper Category in the 2012 review (U.S. EPA, 2012). EPA previously reviewed discharges from pulp and paper facilities as part of the Preliminary and Final Effluent Guidelines Program Plans in 2004–2010 (U.S. EPA, 2004, 2006a, 2007, 2008, 2009, 2011). During its 2006 Final Effluent Guidelines Program Plan review, EPA also conducted a detailed study of this industry (U.S. EPA, 2006b). This section summarizes the findings from the 2011 and 2012 Annual Reviews associated with the Pulp and Paper Category. Based on findings from the 2011 Annual Review, EPA continued to review discharges of dioxin and dioxin-like compounds from the 2009 Toxics Release Inventory (TRI), because of their high TWPE relative to other pollutants in the Pulp and Paper Category.

### *5.3.1 Pulp and Paper Category Background*

Table 5-13 compares the toxicity rankings analysis results for all pollutants for the Pulp and Paper Category from the 2007 through 2011 Annual Reviews. See Section 20.1 of EPA's 2011 Annual Review Report for more background on the category (U.S. EPA, 2012).

**Table 5-13. Pulp and Paper Category TRI and DMR Discharges for 2007 Through 2011 Toxicity Rankings Analysis**

| Year of Discharge | Year of Review | Pulp and Paper Manufacturing Category | | |
|---|---|---|---|---|
| | | TRI TWPE[a] | DMR TWPE[b] | Total |
| 2004 | 2007 | 669,000 | 165,000 | 833,000 |
| 2007 | 2009 | 460,000[c] | 2,730,000[d] | 3,190,000[d] |
| 2008 | 2010 | 523,000 | 348,000 | 871,000 |
| 2009 | 2011 | 956,000 | 287,000 | 1,240,000 |

Sources: *TRIReleases2004_v3; PCSLoads2004_v3; TRIReleases2005_v2; TRIReleases2007_v2; DMRLoads2007_v4; TRIReleases2008_v3; DMRLoads2008_v3; TRIReleases2009_v2;* and *DMRLoads2009_v2*.
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Discharges include transfers to POTWs and account for POTW removals.
[b] DMR data from 2004 through 2007 include only major dischargers. 2008 and 2009 DMR data include both minor and major dischargers.
[c] Includes discharges from facilities reporting NAICS code 326112. These discharges should be associated with the Plastics Molding and Forming Category (40 CFR Part 463). EPA has corrected recent versions of the database to reflect this change.
[d] During the 2009 Annual Review, EPA contacted facilities to verify the concentrations of dioxin and dioxin-like compounds in PCS and ICIS-NPDES and found that for all facilities contacted, there were either unit errors (e.g., measurements reported in ng/L but in the database as mg/L) or missing non-detect indicators. After corrections, the new 2009 category total TWPE was 712,000.

### *5.3.2 Results of the 2011 Annual Review*

EPA's 2011 review of the Pulp and Paper Category focused on the 2009 TRI and discharge monitoring report (DMR) discharges because both contribute to the category's combined TWPE. During the 2011 Annual Review EPA identified dioxin and dioxin-like compounds and manganese and manganese compounds as the top TRI pollutants of concern because they account for 83 percent of the total 2009 TRI TWPE (see Table 20-2 in Section 20.2 of the 2011 Annual Review Report) (U.S. EPA, 2012). Similarly, EPA identified sulfide and aluminum as the top DMR pollutants, because they account for more than 73 percent of the total 2009 DMR TWPE. In reviewing the 2009 TRI and DMR database pollutants of concern, EPA reached the following conclusions as part of the 2011 Annual Review:

- Manganese, sulfide, and aluminum in pulp and paper wastewater were all measured at concentrations below treatable levels and do not present a hazard based on current data (U.S. EPA, 2012);
- Dioxin and dioxin-like compounds contributed 52 percent of the total 2009 TRI TWPE and increased by more than 14 times from reporting years 2008 to 2009; and
- EPA's 2006 Pulp and Paper Detailed Study showed that the estimated releases of dioxin and dioxin-like compounds reported to TRI are based on pollutant concentrations below the Method 1613B Minimum Levels (MLs). Measurements of concentrations below the MLs may not be accurate and may not accurately reflect industry discharges. During the 2011 Annual Review, EPA began collecting data to verify the 2009 loads. EPA continued to review dioxin and dioxin-like compounds discharges from pulp and paper category facilities during the 2012 Annual Review (U.S. EPA, 2012).

### *5.3.3 Results of the 2012 Annual Review*

EPA's review for the Pulp and Paper Category as part of the 2012 Annual Review focused on dioxin and dioxin-like compound discharges. The goal was to determine if the dioxin and dioxin-like compounds are being discharged at concentrations above the Method 1613B ML. EPA evaluated the discharges by reviewing detailed TRI dioxin distribution data, contacting pulp and paper facilities and trade associations, and contacting the Washington Department of Ecology (WADOE). This level of review parallels the review done for the 2006 Pulp and Paper Detailed Study.

#### 5.3.3.1 Top Dioxin and Dioxin-Like Compound Discharging Facilities in the 2009 TRI Database

EPA's review focused on 2007 and 2009[10] TRI dioxin data. Before 2008, TRI allowed a facility to report only one dioxin congener distribution, even if dioxin compounds were released to more than one medium (releases to air, receiving streams, land, underground wells, and several other categories). Starting in 2008, TRI allowed facilities to report release-specific

[10]EPA did not use 2008 dioxin discharge data to compare to 2009 dioxin discharges due to errors with downloading 2008 TRI data on dioxin distributions.

distributions, possibly resulting in increased water-specific dioxin discharge reporting. For more information, see Section 4.2.2 of the *Technical Support Document for the 2010 Effluent Guidelines Program Plan* (U.S. EPA, 2011). Table 5-20, presented at the end of this section, lists the pulp and paper mills that reported dioxin and dioxin-like compound discharges to TRI in 2004 through 2009.

To verify the accuracy of the 2009 TRI loads, EPA collected data directly from mills with the highest loads, in terms of TWPE. EPA identified 20 mills that account for 98 percent of the 2009 dioxin and dioxin-like compound TRI TWPE during the 2011 Annual Review. As part of the 2012 Annual Review, EPA contacted the American Forest and Paper Association (AF&PA) and the National Council for Air and Stream Improvement (NCASI) about the 2009 dioxin discharges from these 20 facilities. AF&PA is the national trade association of the forest, pulp, paper, paperboard, and wood products industry; NCASI is a nonprofit research institute funded by the North American forest products industry, including pulp and paper facilities. Many of the companies that fund NCASI are also members of AF&PA. Along with AF&PA and NCASI, EPA contacted some of the pulp and paper facilities directly.

When reporting chemical releases to TRI, pulp and paper mills estimate their releases using monitoring data, NCASI engineering calculations, or other engineering estimation methods (*TRICalculations2009_v2.mdb*). Reporting facilities may use data collected before the year for which they are reporting discharges if they believe the data are representative of reporting-year operations. For example, some facilities base discharges on 2002 monitoring data concentrations and an updated flow for the reporting year. NCASI's engineering calculations are based on its published emission factors, found in *Table 14, PCDD/F Concentrations in Eight ECF Bleached Chemical Pulp Mill Treated Effluents* of *The SARA Handbook* (Wiegand, 2005a, 2005b). The pulp and paper mills multiply their annual wastewater discharge flow by the average total concentration from the NCASI emission factors to calculate the annual mass discharge of dioxin and dioxin-like compounds reported to TRI. Other estimation methods include those based on emission factors or mass balance and can include a combination of the two methods already mentioned. In the following sections, EPA presents the results of the information collected from AF&PA, NCASI, and specific facilities by grouping the pulp and paper facilities by the method of reporting dioxin and dioxin-like compounds to TRI. The reporting methods EPA identified for the above mentioned 20 facilities are monitoring data, NCASI engineering calculations, and other estimation methods.

#### 5.3.3.2 Monitoring Data

Twelve facilities reported that they used monitoring data to estimate 2009 dioxin TRI discharges. The dioxin and dioxin-like compound category includes 17 individual congeners, each with its own toxicity weighting factor (TWF). Facilities report a single mass number for the dioxin and dioxin-like compounds, but can also report the proportion of individual congeners in a separate field (referred to as the dioxin distribution). For facilities that indicated they estimated releases based on monitoring data, EPA collected facility-measured effluent concentrations to determine if the congener concentration exceeded the Method 1613B ML. Table 5-14 lists the 12 facilities and their TRI dioxin discharges for 2009, provided by the specific mills through AF&PA and NCASI. In some cases, the facilities updated the estimated grams of dioxin released when submitting data to EPA, compared to their 2009 TRI submission. Table 5-14 presents the most current data.

**Table 5-14. Facilities Using Monitoring Data to Estimate 2009 TRI Dioxin and Furans Discharges**

| Name of Mill | Location | Total Dioxin Grams | TWPE |
|---|---|---|---|
| Simpson Tacoma Kraft Co., LLC | Tacoma, WA | 2.24 | 229,000 |
| Boise White Paper, LLC | Wallula, WA | 2.3 | 156,000 |
| S.D. Warren Co. | Skowhegan, ME | 0.184 | 37,900 |
| Rayonier Performance Fibers | Fernandina Beach, FL | 5.2 | 37,800 |
| Boise White Paper | Jackson, AL | 2.28 | 4,030 |
| Rock-Tenn Mill Co. | Demopolis, AL | 2.17 | 3,840 |
| International Paper | Riegelwood, NC | 0.07 | 3,510 |
| Weyerhauser | Vanceboro, NC | 1.36 | 2,720 |
| Domtar Paper Co. | Plymouth, NC | 3.48 | 2,370 |
| Clearwater Paper Corp. | Arkansas City, AR | 1.83 | 1,250 |
| Nippon Paper Industries | Port Angeles, WA | 0 | 0 |
| AbitibiBowater Calhoun Operations | Calhoun, TN | 0 | 0 |

Sources: Wiegand, 2011a, 2011b.
Note: Green shading denotes those facilities with detected dioxin congeners in their effluent wastewater.

- Six facilities estimated discharges based on non-detect dioxin and furan values. These facilities assumed that dioxin was present in the wastewater at concentrations below detection, although no dioxin was ever measured above detection limits. This estimation method is consistent with EPA's TRI program guidance. However, because there is more uncertainty in quantifying a concentration measurement when it is below the detection level, EPA assumes a concentration of zero for annual review purposes.

  Two facilities, **Nippon Paper Industries** and **AbitibiBowater Calhoun Operations**, used monitoring data to estimate their 2009 TRI discharges, but all congeners were measured at concentrations below detection. Therefore, as for previous annual reviews, EPA zeroed the total dioxin grams and TWPE for these two facilities.

  Four facilities, **Boise White Paper (Jackson)**, **Rock-Tenn Mill Co.**, **Domtar Paper Co.**, and **Clearwater Paper Co.**, sampled for 2,3,7,8-TCDD or 2,3,7,8-TCDF and used NCASI engineering calculations to estimate discharges for the remaining dioxin congeners. None of the facilities detected 2,3,7,8-TCDD or 2,3,7,8-TCDF in their effluent.

  For all six of these facilities, EPA considers their discharges as either zero or too low to be considered a hazard priority at this time.

- The other six facilities, Simpson Tacoma Kraft Co., LLC, Boise White Paper, LLC (Wallula), S.D. Warren Co., Rayonier Performance Fibers, International Paper, and Weyerhauser (highlighted green in Table 5-14), detected dioxin congeners in their effluent wastewater, as shown in Table 5-15. Of these, only two facilities detected congener concentrations above the Method 1613B ML: Boise White Paper, LLC, and Rayonier Performance Fibers. EPA does not typically consider regulating pollutants at concentrations below a parameter ML because measurements below the method ML may not be accurate.
- Boise White Paper, LLC (Wallula) detected 2,3,7,8-TCDF at 18.2 pg/L and estimated a release of 0.47 grams in 2009. EPA estimates the TWPE associated with the discharged congener as 45,400, shown in Table 5-16.
- Rayonier Performance Fibers detected 1,2,3,4,6,7,8,9-OCDD at 172.6 pg/L and 2,3,7,8-TCDF at 14.5 pg/L, and estimated a release of 3.75 grams of these congeners in 2009. EPA estimates the TWPE associated with those discharged congeners as 27,700, shown in Table 5-16.

**Table 5-15. Pulp and Paper Dioxin and Furans at Mills with Detectable Concentrations (pg/L)[a]**

| Dioxin Congener Number | Dioxin Congener | Method 1613B ML (pg/L) | Simpson Tacoma | Boise White Paper | S.D. Warren | Rayonier Performance Fibers | International Paper | Weyerhauser |
|---|---|---|---|---|---|---|---|---|
| 1 | 2,3,7,8-TCDD | 10 | ND | 1.34 | ND | ND | ND | ND |
| 2 | 1,2,3,7,8-PeCDD | 50 | ND | ND | 0.702 | ND | ND | ND |
| 3 | 1,2,3,4,7,8-HxCDD | 50 | 3.05 | ND | ND | ND | ND | ND |
| 4 | 1,2,3,6,7,8-HxCDD | 50 | 5.07 | ND | ND | ND | ND | ND |
| 5 | 1,2,3,7,8,9-HxCDD | 50 | 4.03 | ND | ND | 0.8 | ND | ND |
| 6 | 1,2,3,4,6,7,8-HpCDD | 50 | 19.3 | 15.1 | 1.91 | 23.9 | ND | ND |
| 7 | 1,2,3,4,6,7,8,9-OCDD | 100 | 38.4 | 87.1 | 13.2 | 176.2[b] | 0.6323 | 63.3 |
| 8 | 2,3,7,8-TCDF | 10 | 4.76 | 18.2[b] | ND | 14.5[b] | 0.8079 | ND |
| 9 | 1,2,3,7,8-PeCDF | 50 | 3.52 | 1.17 | ND | ND | 0.0522 | ND |
| 10 | 2,3,4,7,8-PeCDF | 50 | 7.01 | 1.76 | ND | 0.4 | ND | ND |
| 11 | 1,2,3,4,7,8-HxCDF | 50 | 2.45 | ND | 1.11 | ND | ND | ND |
| 12 | 1,2,3,6,7,8-HxCDF | 50 | 2.97 | ND | ND | ND | ND | ND |
| 13 | 1,2,3,7,8,9-HxCDF | 50 | ND | ND | ND | ND | ND | ND |
| 14 | 2,3,4,6,7,8-HxCDF | 50 | 2.95 | ND | 0.665 | ND | ND | ND |
| 15 | 1,2,3,4,6,7,8-HpCDF | 50 | ND | ND | 0.773 | 3.6 | ND | ND |
| 16 | 1,2,3,4,7,8,9-HpCDF | 50 | ND | ND | ND | ND | ND | ND |
| 17 | 1,2,3,4,6,7,8,9-OCDF | 100 | 4.51 | 6.84 | 2.68 | 44.5 | ND | ND |
| **Total** | | | **99.02** | **131.51** | **22.04** | **263.9** | **1.4924** | **63.3** |
| **Data Source** | | | 2009 Effluent Sampling | 2009 Effluent Sampling | 2002 Effluent Sampling | 2009 Effluent Sampling | 2000 Effluent Sampling | 2009 Effluent Sampling |

Sources: Wiegand, 2011a, 2011b.
ND: Non-detect results.
[a] Of the mills with monitoring data, only six measured dioxins and furans at detectable concentrations. The other six mills measured dioxins and furans at concentrations below detection.
[b] Discharges are above the Method 1613 ML.

**Table 5-16. Grams and TWPE Associated with Discharges Above the ML**

| Congener Above the ML | Congener TWF | Grams of Congener Released[a] | Total TWPE Released |
|---|---|---|---|
| **Boise White Paper** | | | |
| 2,3,7,8-TCDF | 43,819,554 | 0.47 | 45,400 |
| **Rayonier Performance Fibers** | | | |
| 1,2,3,4,6,7,8,9-OCDD | 6,586 | 3.47 | 50.4 |
| 2,3,7,8-TCDF | 43,819,554 | 0.286 | 27,600 |
| **Total** | | **4.23** | **73,100** |

Sources: Wiegand, 2011a, 2011b, *TRIReleases2009_v2.mdb*.
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Data obtained from the facility through AF&PA and NCASI.

EPA found that only six of the twelve mills measured dioxin and furan concentrations above detection limits, and only two above the Method 1613B ML. This is consistent with the *2006 Pulp and Paper Detailed Study* (U.S. EPA, 2006b), in which EPA found that a majority of the estimated releases of dioxin are based on pollutant concentrations measured below the ML. EPA has previously concluded that concentrations below the ML may not be accurate, and the measurements may not accurately reflect industry discharges. For the two mills with analytical data showing dioxin and furan concentrations above the ML, EPA estimated a load of 73,100 TWPE per year.

#### 5.3.3.3 NCASI Engineering Calculations

Five facilities, presented in Table 5-17, stated that they estimated their 2009 dioxin TRI discharges using NCASI engineering calculations, which are based on published emission factors. For details on the calculations underlying the NCASI-published emission factors, see Section 5.3.2 of the 2006 Pulp and Paper Detailed Study (U.S. EPA, 2006b). The monitoring-based average concentrations used by NCASI, described in the 2006 Pulp and Paper Detailed Study, are all less than the Method 1613B ML (U.S. EPA, 2006b).

**Table 5-17. Facilities Using Engineering Calculations to Estimate 2009 TRI Discharges**

| Name of Mill | Location | Total Dioxin Grams | TWPE |
|---|---|---|---|
| Georgia-Pacific, Naheola Mill | Pennington, AL | 3.6 | 10,800 |
| International Paper | Franklin, VA | 2.14 | 10,400 |
| Georgia-Pacific | Crossett, AR | 5.09 | 8,900 |
| Evergreen Packaging | Pine Bluff, AR | 3.21 | 5,690 |
| Georgia-Pacific Corp. | Palatka, FL | 1.4 | 2,480 |

Source: Wiegand, 2011a.

#### 5.3.3.4 Other Estimation Methods

Three facilities, listed in Table 5-18, stated that they use a different method to estimate their 2009 dioxin TRI discharges:

- **Kimberly-Clark (Everett)** confirmed that they use mass balances based on historical congener data—not actual discharge measurements—to estimate their dioxin TRI discharges. This mill shut down in April 2012 (Fryer, 2012; Wiegand, 2011b).
- **Clearwater Paper Corp.** (formerly Potlatch Corporation) in Lewiston documented that its 2009 dioxin TRI discharges were estimated using data from an experimental methodology known as “high-volume sampling.” EPA Region 10 conducted the procedure, which involved the separate collection of solid and dissolved fractions of up to 1,000 liters of effluent that were then filtered to a more concentrated aliquot (Wiegand, 2011b). EPA conducted the procedure as part of the Tier 1 Endangered Species Act Monitoring and NPDES Permit Compliance Monitoring between 2005 and 2007 in order to monitor the effluent and natural waters above and below the Clearwater facility. Using this methodology, Region 10 detected all dioxin congeners and furans during the study, but all at concentrations below the 1613B ML. 1,2,3,4,6,7,8,9-OCDD was detected most frequently but the maximum detection was 5.47 pg/L in 2007, which is well below the 1613B ML of 100 pg/L. Region 10 concluded that the Clearwater’s effluent has no influence on downstream dioxin measurements (Nickel, 2012).
- **Procter & Gamble Paper Products (Mehoopany)** documented that the mill used its Dioxin Congener Tool to calculate 2009 dioxin TRI discharges. The Dioxin Congener Tool is a company-specific tool that uses Procter & Gamble pulp analysis data and the mill-specific pulp usage data to determine a weight percentage for each of the dioxin congeners. The mill applies the weight percentage breakdown to each estimated release value to provide a dioxin-congener specification of each reportable release. The pulp congener analysis data are based on the best available data, obtained directly from the pulp vendors. Depending on the pulp, these data may come from direct sampling from the pulp vendors, NCASI data, or estimates based on other pulps from the same supplier (Childress, 2011). Because the mill’s TRI estimate is not calculated using actual wastewater sampling data, and the discharges are partially based on NCASI engineering calculations, there are no analytical data to confirm the presence of dioxin at measureable concentrations.

**Table 5-18. Facilities Using Other Methods to Estimate 2009 TRI Discharges**

| Name of Mill | Location | Total Dioxin Grams | TWPE |
|---|---|---|---|
| Kimberly-Clark | Everett, WA | 0.419 | 55,300 |
| Clearwater Paper Corp. | Lewiston, ID | 0.4 | 15,500 |
| Procter & Gamble Paper Products | Mehoopany, PA | 0.02 | 4,520 |

Sources: Wiegand, 2011b; Childress, 2011.

#### 5.3.3.5 Washington State Department of Ecology Data

In addition to obtaining monitoring data from facilities, EPA contacted WADOE about monitoring data from pulp and paper mill discharges in Washington State. EPA previously contacted WADOE as part of the 2006 Pulp and Paper Detailed Study. WADOE provided mill effluent dioxin sampling data for one dioxin congener, 2,3,7,8-TCDD, for three facilities, presented in Table 5-19. The 2011 concentration in wastewater from Boise White Paper, LLC, was found to be equal to the Method 1613B ML; the remaining concentrations provided by WADOE are below the Method 1613B ML. WADOE stated that the concentration for 2011 was not a permit violation because a footnote in the mill's NPDES permit states that compliance is demonstrated if the 2,3,7,8-TCDD concentrations are equal to or less than the Method 1613 ML (McCormack, 2012).

**Table 5-19. Dioxin Data from WADOE**

| Mill Name | Mill Location | Year of Measurement | 2,3,7,8-TCDD Measurement (pg/L) |
|---|---|---|---|
| Simpson Tacoma | Tacoma, WA | 2005 | 2.09 |
| Kimberly-Clark | Everett, WA | 2005 | 0.848 |
| Boise White Paper, LLC | Wallula, WA | 2007 | 4 |
| | | 2008 | 1 |
| | | 2009 | 1 |
| | | 2011 | 10[a] |

Source: McCormack, 2012.
[a] Discharges are equal to the Method 1613 ML for 2,3,7,8-TCDD of 10 pg/L.

### *5.3.4 Summary of Findings from EPA's Review of Pulp and Paper Category*

Using data collected for the 2012 Annual Review, EPA identified the following for the pulp and paper category:

- Several pulp and paper mills do appear to discharge dioxins and furans, but at concentrations that are below the ML (or potential regulatory action level). Only two facilities measured dioxins and furans at concentrations above the ML. This updated data collected for the 2012 Annual Review is largely consistent with the findings of the *2006 Pulp and Paper Detailed Study*.
- Since the vast majority of data underlying the estimated releases of dioxin and dioxin-like compounds reported to TRI are based on pollutant concentrations below the Method 1613B MLs, EPA is suspect about the magnitude of these discharges from facilities in the Pulp and Paper Category. TRI-reported discharges of dioxin and dioxin-like compounds for this category are most likely significantly overestimated, and thus may not accurately reflect current industry discharges.

EPA prioritizes point source categories with existing regulations for potential revision based on the greatest estimated toxicity to human health and the environment, measured as

TWPE. Based on the above findings, EPA is assigning this category a lower priority for revision—i.e., this category is marked “(3)” in the “Findings” column in Table 7-1 in the Final 2012 and Preliminary 2014 Effluent Guidelines Program Plans (U.S. EPA, 2014).

### *5.3.5 References for Pulp and Paper Category*

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15. Wiegand, Paul. 2005a. Memorandum from Paul Wiegand, National Council for Air and Stream Improvement, to Jerry Schwartz, American Forest and Paper Association. Table 14: PCDD/F Concentrations in Eight EFC Bleached Chemical Pulp Mill Treated Effluents (NCASI 2002). (April 29). EPA-HQ-OW-2004-0032-0500.

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**Table 5-20. Dioxin and Dioxin-Like Discharges from Pulp and Paper Category Reported to TRI in 2004–2009**

| | | | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TRI ID** | **Mill Name** | **Location** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** | **Grams Released** | **TWPE** | **Basis of Estimate** |
| 98421-SMPSN-801PO | Simpson Tacoma Kraft Co. | Tacoma, WA | 2.243 | 228,696 | M2 | NR | NR | NR | 0.12 | 208 | E1 | 0.154 | 277 | E | 0.135 | 242 | E |
| 98201-SCTTP-2600F | Kimberly-Clark Worldwide | Everett, WV | 0.419 | 55,269 | C | 0.487 | 874 | C | NR | NR | NR | 1.33 | 2,380 | C | 2.7 | 4,846 | C |
| 04976-SDWRR-RFD3U | S.D. Warren Co. | Skowhegan, ME | 0.184 | 37,877 | E2 | 0.187 | 335 | E2 | 0.15 | 269 | E2 | 0.168 | 302 | O | 0.17 | 305 | O |
| 32034-TTRYN-FOOTO | Rayonier Performance Fibers, LLC | Fernandina Beach, FL | 5.197 | 37,842 | M1 | 0.66 | 1,184 | M1 | NR | NR | NR | 0.56 | 1,000 | M | 1 | 1,794 | M |
| 37309-BWTRS-ROUTE | AbitibiBowater Calhoun Operations | Calhoun, TN | 0.6854 | 24,888 | E1 | 0.6875 | 1,234 | E1 | 0.73 | 1,319 | E1 | 0.87 | 1,560 | M | 0.94 | 1,690 | M |
| 83501-PTLTC-805MI | Clearwater Paper Corp, Idaho Pulp & Paperboard | Lewiston, ID | 0.4 | 15,465 | M2 | 0.4 | 718 | M2 | 0.44 | 789 | M2 | 0.441 | 792 | E | 4.18 | 7,501 | E |
| 99363-BSCSC-POBOX | Boise White Paper LLC | Wallula, WA | 0.20886 | 13,745 | O | 0.205513 | 369 | O | 5.58 | 10,014 | O | 0.083 | 149 | O | 0.83 | 1,496 | O |
| 23851-NNCMP-HIGHW | International Paper-Franklin Mill | Franklin, VA | 2.1364 | 10,440 | E1 | 1.3677 | 2,454 | E1 | NR | NR | NR | NR | NR | NR | 2.28 | 4,086 | E |
| 71635-GRGPC-PAPER | Georgia-Pacific Crossett Ops. | Crossett, AR | 5.0851 | 8,993 | E1 | 5.327 | 77 | E1 | 5.6 | 10,043 | E1 | 4.87 | 8,740 | E | 5.49 | 9,850 | E |
| 36916-JMSRV-ROUTE | Georgia-Pacific Consumer Products LP | Pennington, AL | 2 | 8,488 | E1 | 3.44 | 50 | E1 | 3.2 | 5,742 | E1 | 3.6 | 6,460 | M | 3.3 | 5,921 | M |
| 98362-DSHWM-MARIN | Nippon Paper Industries USA Co. Ltd. | Port Angeles, WA | 0.034969 | 8,367 | M2 | 0.03689 | 66 | M2 | NR | NR | NR | 0.92 | 1,650 | M | 1.82 | 3,266 | M |
| 71611-NTRNT-FAIRF | Evergreen Packaging | Pine Bluff, AR | 3.2139 | 5,684 | O | 3.3431 | 49 | O | 3.4 | 6,101 | O | 3.7 | 6,640 | O | 3.6 | 6,459 | O |

## Table 5-20. Dioxin and Dioxin-Like Discharges from Pulp and Paper Category Reported to TRI in 2004–2009

| TRI ID | Mill Name | Location | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate |
| 18629-PRCTR-ROUTE | Procter & Gamble Paper Products Co. | Mehoopany, PA | 0.020003 | 4,517 | E1 | 0.018 | 32 | E1 | 0.02 | 29 | E1 | 0.087 | 156 | E | 0.012 | 22 | C |
| 36545-BSCSC-307WE | Boise White Paper LLC | Jackson, AL | 2.2812 | 4,032 | E1 | 2.3119 | 34 | E1 | 2.21 | 3,965 | E1 | 2.1 | 3,770 | E | 2.1 | 3,768 | E |
| 36732-GLFST-HIGHW | Rock-Tenn Mill Co., LLC | Demopolis, AL | 2.1694 | 3,838 | E1 | 1.9993 | 29 | E1 | 1.84 | 3,301 | E1 | 0.292 | 524 | E | 0.32 | 575 | E |
| 28456-FDRLP-RIEGE | International Paper Riegelwood Mill | Riegelwood, NC | 0.0663 | 3,507 | E1 | 0.0304881 | 55 | E1 | 0.0304 | 54 | E1 | 0.0304 | 55 | E | 0.0305 | 55 | E |
| 71654-PTLTC-HIGHW | Clearwater Paper Corp., Arkansas City | Arkansas City, AR | 0.456 | 3,222 | O | 0.984 | 1,766 | O | NR | NR | NR | 0.204 | 365 | O | 0.97 | 1,737 | O |
| 28560-WYRHS-STREE | Weyerhaeuser | Vanceboro, NC | 1.35604 | 2,715 | E1 | 1.657323 | 24 | E1 | 1.71 | 3,069 | E1 | 1.7 | 3,050 | E | 1.74 | 3,119 | E |
| 32078-GRGPC-STATE | Georgia-Pacific Corp, Palatka | Palatka, FL | 1.4041 | 2,483 | E1 | 1.4 | 20 | E1 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 27962-WYRHS-TROWB | Domtar Paper Co. Plymouth Mill | Plymouth, NC | 3.4794 | 2,373 | E1 | 4.2028 | 7,541 | E1 | 4.33 | 7,777 | E1 | 0.989 | 1,770 | E | 0.91 | 1,638 | E |
| 75504-NTRNT-POBOX | International Paper Texarkana Mill | Queen City, TX | 1.552 | 1,752 | M2 | 1.302 | 19 | M2 | 2.68 | 4,809 | M2 | 0.68 | 1,220 | M | 3.87 | 6,944 | M |
| 32533-CHMPN-375MU | International Paper Pensacola Mill | Cantonment, FL | 2.309 | 1,568 | E1 | 0.88 | 1,579 | E1 | NR | NR | NR | 0.8 | 1,440 | E | 0.93 | 1,669 | E |
| 37662-MDPPR-POBOX | Weyerhaeuser Co Kingsport Paper Mill | Kingsport, TN | 0.83272 | 1,473 | E1 | 0.8617 | 1,546 | O | NR | NR | NR | 3.45 | 6,190 | M | 3.4 | 6,101 | M |
| 32347-BCKYC-ROUTE | Buckeye Florida LP | Perry, FL | 0.123152 | 1,141 | M2 | 1.221887 | 18 | M2 | NR | NR | NR | 1.32 | 2,380 | M | 1.3 | 2,330 | M |

**Table 5-20. Dioxin and Dioxin-Like Discharges from Pulp and Paper Category Reported to TRI in 2004–2009**

| TRI ID | Mill Name | Location | 2009 Grams Released | 2009 TWPE | 2009 Basis of Estimate | 2008 Grams Released | 2008 TWPE | 2008 Basis of Estimate | 2007 Grams Released | 2007 TWPE | 2007 Basis of Estimate | 2005 Grams Released | 2005 TWPE | 2005 Basis of Estimate | 2004 Grams Released | 2004 TWPE | 2004 Basis of Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63702-PRCTR-POBOX | Procter & Gamble Paper Products Co. | Jackson, MO | 0.005099 | 802 | O | 0.0051 | 0 | O | 0.004 | 8.8 | O | 0.0042 | 8 | O | 0.0051 | 9.2 | O |
| 31521-BRNSW-14W9T | Brunswick Cellulose Inc. | Brunswick, GA | 0.2271 | 309 | E1 | 0.218 | 391 | E1 | 0.19 | 341 | E1 | 0.186 | 335 | E | 0.19 | 335 | E |
| 29442-NTRNT-KAMIN | International Paper Georgetown Mill | Georgetown, SC | 0.6383 | 214 | C | 0.683 | 1,225 | C | NR | NR | NR | 0.753 | 1,350 | C | 0.75 | 1,351 | C |
| 31545-TTRYN-SAVAN | Rayonier Performance Fibers, Jesup Mill | Jesup, GA | 0.00023 | 191 | O | 0.0003 | 1 | O | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 70634-BSSTH-USHIG | Boise Packaging & Newsprint LLC | Deridder, LA | 0.0893 | 156 | E1 | 0.1455 | 261 | E1 | 0.12 | 215 | E1 | 0.19 | 341 | E | 0.22 | 395 | E |
| 3676W-NTRNT-76HIG | International Paper, Pine Hill Mill | Pine Hill, AL | 3.0065 | 116 | E1 | 3.02814 | 44 | E2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 49829-MDPBL-COUNT | Escanaba Paper Co. | Escanaba, MI | 0.890943 | 85 | M2 | 5.612 | 81 | M2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 54308-THPRC-501EA | Procter & Gamble Paper Products Co. | Green Bay, WI | 0.000300 | 83 | C | 0.0006 | 0 | C | 0.0008 | 1 | C | 0.0003 | 1 | C | 0.0005 | 0.9 | C |
| 17362-PHGLT-228SO | P. H. Glatfelter Co Spring Grove Mill | Spring Grove, PA | 1.0633 | 70 | E1 | 1.105 | 1,983 | E1 | 1.02 | 1,830 | E1 | 0.946 | 1,700 | E | 0.9 | 1.616 | E |
| 12883-NTRNT-SHORE | International Paper | Ticonderoga, NY | 0.4166 | 62 | M2 | 0.4223 | 758 | M2 | 0.44 | 790 | M2 | 0.46 | 826 | E | 0.46 | 834 | E |
| 36426-CNTNR-HIGHW | Smurfit-Stone Container Enterprises Inc. | Brewton, AL | 3.0053 | 44 | M2 | 3.0053 | 44 | M2 | NR | NR | NR | NR | NR | NR | 2.5 | 4,486 | E |
| 18653-PPTLB-MAINS | Cascades Tissue Group PA Inc, Ransom Mill | Ransom, PA | 0.0179 | 32 | C | 0.0153 | 27 | C | 0.0179 | 32 | C | NR | NR | NR | NR | NR | NR |

## Table 5-20. Dioxin and Dioxin-Like Discharges from Pulp and Paper Category Reported to TRI in 2004–2009

| TRI ID | Mill Name | Location | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate |
| 29704-BWTRC-5300C | Bowater Coated & Specialty Papers Div. | Catawba, SC | 2.161 | 31 | M2 | 1.9695 | 29 | C | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 31407-STNCN-1BONN | Weyerhaeuser Port Wentworth | Port Wentworth, GA | 1.273 | 18 | E1 | 1.3648 | 2,449 | E1 | 0.61 | 1,094 | E1 | 0.679 | 1,220 | E | 0.69 | 1,239 | E |
| 29044-NNCMP-ROUTE | International Paper | Eastover, SC | 0.119 | 2 | M2 | 0.1077 | 193 | M2 | NR | NR | NR | 0.183 | 328 | O | 0.16 | 282 | O |
| 54474-WYRHS-200GR | Weyerhaeuser | Rothschild, WI | 0.063972 | 1 | M2 | 0.0633 | 114 | M2 | NR | NR | NR | 0.042 | 75 | M | 0.048 | 86 | M |
| 98607-JMSRV-NE4TH | Fort James Camas LLC | Camas, WA | 0.0025 | 0.2311 | E1 | 0.0034 | 6 | M2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| 70791-GRGPC-ZACHA | Georgia-Pacific Consumer Products LLC | Zachary, LA | 0.00163 | 0.0237 | M2 | 10 | 2,337 | E1 | 2.77 | 4,974 | E1 | 2.77 | 4,970 | E | 2.77 | 4,974 | E |
| 31068-BCKYC-OLDST | Weyerhaeuser Co. | Oglethorpe, GA | 0.0011 | 0.0160 | O | 0.001 | 2 | O | 0.001 | 1.79 | O | 0.001 | 2 | O | 0.0005 | 0.9 | O |
| **Indirect** | | | | | | | | | | | | | | | | | |
| 07407-MRCLP-1MARK | Marcal Paper Mills Inc. | Elmwood Park, NJ | 0.379098 | 1,273 | M2 | 0.1699 | 2.468 | M2 | 0.16 | 1,315 | M2 | 0.02499 | 45 | M | 0.00799 | 14 | M |
| 29681-WRGRC-803NO | Sealed Air Corp, Cryovac Div. | Simpsonville, SC | 0.011185 | 989 | O | NR | NR | NR | 0.0187 | 1,654 | O | NR | NR | NR | NR | NR | NR |
| 32401-STNCN-1EVER | Smurfit-Stone Container Corp. | Panama City, FL | 0.074799 | 256 | E1 | NR | NR | NR | 0.082 | 146 | E1 | 0.0782 | 140 | E | 0.078 | 140 | E |
| 54308-THPRC-501EA | Procter & Gamble Paper Products Co. | Green Bay, WI | 0.000850 | 234 | C | NR | NR | NR | 0.00081 | 0.997 | C | 0.00034 | 1 | C | 0.00051 | 0.9 | C |
| 31702-THPRC-USROU | Procter & Gamble Paper Products Co. | Albany, GA | 0.000663 | 111 | O | NR | NR | NR | 0.001 | 109 | O | 0.001989 | 4 | O | 0.0036 | 6.4 | O |

## Table 5-20. Dioxin and Dioxin-Like Discharges from Pulp and Paper Category Reported to TRI in 2004–2009

| | | | 2009 | | | 2008 | | | 2007 | | | 2005 | | | 2004 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRI ID | Mill Name | Location | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate | Grams Released | TWPE | Basis of Estimate |
| 55744-BLNDN-115SW | UPM Blandin Paper Co. | Grand Rapids, MN | 2.19 | 59.33 | E2 | 2.379 | 175.7 | E2 | 2.11 | 3,782 | E1 | 2.261 | 4,060 | M | 2 | 3,599 | M |
| 93030-PRCTR-800NO | Procter & Gamble Paper Products Co. | Oxnard, CA | 0.000134 | 20.27 | C | NR | NR | NR | 0.00016 | 0.45 | C | 0.0000214 | 0 | C | 0.0034 | 6.1 | C |
| 23860-STNHP-910IN | Smurfit-Stone Container Corp. | Hopewell, VA | 0.000045 | 1.239 | C | NR | NR | NR | 0.221 | 397 | C | 0.21 | 378 | O | NR | NR | NR |
| 55720-PTLTC-NORTH | Sappi Cloquet LLC | Cloquet, MN | 0.04131 | 0.5998 | M2 | NR | NR | NR | 0.04 | 78 | M2 | 0.04811 | 86 | E | 0.044 | 78 | E |
| 63702-PRCTR-POBOX | Procter & Gamble Paper Products Co. | Jackson, MO | 0.000000238 | 0.027 | E1 | NR | NR | NR | 0.00392 | 9 | O | NR | NR | NR | NR | NR | NR |

Sources: *TRIReleases2009_v2; TRIReleases2008_v3; TRIReleases2007_v2; TRIReleases2005_v2;* and *TRIReleases2004_v3.*
NR: Not reported.
For indirect discharges, the mass shown is the mass transferred to the POTW that is ultimately discharged to surface waters, accounting for an estimated 83 percent removal of dioxin and dioxin-like compounds by the POTW.
The TWPEs in this table were calculated using the 2006 TWFs (the 2006 dioxin and dioxin-like compound TWFs did not change from the August or December 2004 TWFs).
Refineries reported basis of estimate in TRI as: M (monitoring data/measurements), M2 (periodic monitoring data/measurements), C (mass balance calculations), E (published emission factors), and O (other approaches, such as engineering calculation).

# 6. NEW DATA SOURCES AND HAZARD ANALYSES

For the 2012 Annual Review, EPA explored six new data sources to supplement the toxicity rankings analysis (TRA) conducted as part of the 2011 Annual Review (78 FR 48159). EPA primarily focused on the four data sources identified during the 2011 Annual Review: Targeted National Sewage Sludge Survey (TNSSS) data, Office of Pollution Prevention and Toxics (OPPT) Chemical Action Plans, Office of Air Quality Planning and Standards (OAQPS) air regulations, and Toxics Release Inventory (TRI) sectors expansion data. EPA's goals in selecting these specific data sources were to identify new wastewater discharges or pollutants not previously regulated and to identify wastewater discharges that can be eliminated or treated more effectively.

EPA documented the data usability and quality of each source, analyzed how the data could be used to improve the characterization of industrial wastewater discharges (concentration and quantity of pollutants, wastewater treatment available for new industries/concentrations), and prioritized the findings for further review. See Appendix B of this report for more information on data usability and quality of the new data and hazard sources.

Table 6-1 lists the six data sources and provides a summary of the relevant content EPA evaluated as part of its 2012 Annual Review. EPA identified these data sources by evaluating information available within EPA Office of Water, information from other EPA offices (e.g., Office of Pollution Prevention and Toxics, Office of Research and Development), information from technical conferences and research articles, or stakeholder input and determined whether these data sources would be useful in fulfilling the objectives of the effluent guidelines planning process. Sections 6.1 through 6.6 of this report provide the detail for each of the analyses. Section 7 summarizes EPA's findings from the new data sources and hazard analyses.

**Table 6-1. Additional Hazard Data Sources Evaluated for the 2012 Annual Review**

| Data Source | Relevant Content |
|---|---|
| Office of Water 2009 TNSSS | The Office of Water's Targeted National Sewage Sludge Survey (TNSSS) measured contaminant concentrations in sewage sludge from 74 publicly owned treatment works (POTWs). EPA reviewed the TNSSS survey results in combination with indirect discharges from the 2009 TRI database to determine if the pollutants could be attributed to specific industrial wastewater discharges (or point source categories), particularly for the pollutants that may impact the beneficial use of sewage sludge. |
| Office for Chemical Safety and Pollution Prevention/Office of Pollution Prevention and Toxics(OCSPP/OPPT) Chemical Action Plans | Under TSCA, OPPT developed Chemical Action Plans for 10 classes of chemicals that potentially create health and/or environmental hazards when manufactured in or imported into the U.S. EPA reviewed these chemicals and corresponding industries to identify new pollutants or wastestreams that might warrant regulation. |

**Table 6-1. Additional Hazard Data Sources Evaluated for the 2012 Annual Review**

| Data Source | Relevant Content |
|---|---|
| Office of Air Quality Planning and Standards (OAQPS) Air Regulations:<br>• National Emission Standards for Hazardous Air Pollutants (NESHAPs)<br>• New Source Performance Standards (NSPS) | Air regulations may require air pollution controls that generate new wastewater discharges for industrial categories that did not previously exist (e.g., the use of wet scrubbers to remove air pollutants). EPA reviewed air regulations to identify any new wastewater discharges, or specific pollutant discharges, that may be associated with air pollution control requirements established for specific industrial categories, particularly since the promulgation of the respective ELGs. |
| Office of Environmental Information's (OEI) 2011 Proposed TRI Expansion Sectors | OEI is exploring the expansion of TRI reporting requirements to additional industrial sectors. The proposed rulemaking is scheduled to be published in December 2014. EPA reviewed the publicly available industry profile information and corresponding data on pollutants of concern considered as part of this rulemaking. EPA also reviewed any monitoring data and literature submitted as public comment to the rulemaking to date. |
| EPA Office of Water, Office of Ground Water and Drinking Water (OGWDW), and Office of Research and Development (ORD) Analytical Methods | Several Offices within the Agency have developed or recently revised analytical methods for measuring pollutants in industrial wastewater or in drinking water (e.g., perfluorinated compounds and other contaminants of emerging concern). EPA evaluated these new or recently revised analytical methods to help identify unregulated pollutants in industrial wastewater discharges, or changes to existing analytical methods that may provide for increased sensitivity and potentially lower detection limits for regulated pollutants. |
| Technical Papers and Research Articles on Industrial Wastewater Treatment Technologies | Industry and academic experts are continually evaluating the performance and viability of new and innovative treatment technologies to remove pollutants of concern from industrial wastewater.EPA is conducting a literature review and developing a database to capture and catalog wastewater treatment performance data as they pertain to specific point source categories and their related wastewater discharges. |

## 6.1 <u>Identification of Industrial Wastewater Pollutants in Sewage Sludge</u>

EPA is augmenting its traditional toxicity ranking analysis by examining data from additional sources—for example, existing sewage sludge data that characterize pollutants associated with industrial activity. Specifically, EPA reviewed the Targeted National Sewage Sludge Survey (TNSSS), conducted by EPA's Office of Water (OW), that measured contaminant concentrations in sewage sludge from 74 publicly owned treatment works (POTWs). Although the TNSSS did not identify the industrial wastewater discharged to the sampled POTWs, EPA used other publicly available data, including data reported to the Toxics Release Inventory (TRI) in 2009, to examine pollutants discharged to POTWs and explored how those pollutants might interfere with beneficial use of sewage sludge or "biosolids".

This review suggests the metal finishing industry may be discharging high concentrations of metals, particularly chromium, nickel, and zinc, to POTWs, which could transfer to sewage sludge and impact its beneficial use. Based on its review of the TNSSS and 2009 TRI data sets, EPA could not identify for further review any new pollutants of concern or wastewater discharges from industrial categories not currently regulated by effluent limitations guidelines and standards (ELGs). EPA focused its review on the pollutants in the TNSSS with discharge information available in TRI since TRI provided a means to link industrial wastewater sources to the pollutants found in POTW sludge.

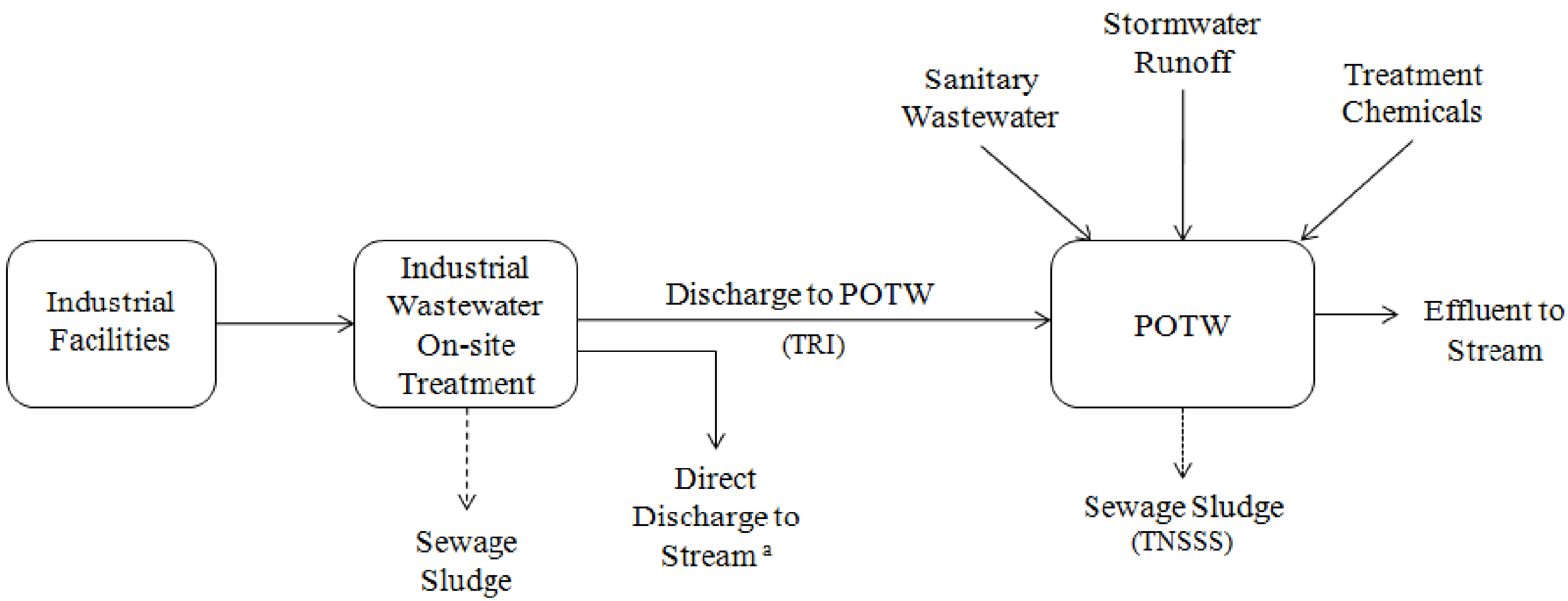
The following subsections present background on POTW sewage sludge as it relates to ELGs, data sources used in the analysis, and an overview of EPA's analyses and findings from its review of the TNSSS. Throughout this section, EPA refers to sewage sludge, the solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment facility; rather than sludge, the term commonly used for untreated or raw wastewater. For more information on the TNSSS, see http://water.epa.gov/scitech/wastetech/biosolids/tnsss-overview.cfm.

### *6.1.1 Background*

Under the Clean Water Act (CWA), EPA develops categorical pretreatment standards for industrial wastewater discharged to POTWs. These standards are intended to prevent discharge to POTWs of industrial wastewater pollutants that pass through the POTW without adequate treatment. They also prevent discharges of industrial wastewater pollutants that may interfere with POTW operation. Among other things, this includes pollutants that may interfere with sewage sludge beneficial use—for example, land application of sewage sludge as a soil amendment in agriculture and landscaping.[11]

As shown in Figure 6-1, an industrial facility may discharge wastewater to a POTW, discharge directly to a receiving stream, or split its wastewater between the two discharge options. At the POTW, industrial wastewater is typically combined with sanitary wastewater, stormwater runoff, and treatment chemicals. Because all of these discharges contribute to the pollutants in sewage sludge, it is difficult to relate pollutants found in sewage sludge from POTWs to specific industrial wastewater discharges.

[11] Current EPA regulations exist for the land application of sewage sludge, also referred to as biosolids. Biosolids are regulated under 40 CFR Part 503. For more information about the EPA Biosolids program, see http://water.epa.gov/scitech/wastetech/biosolids/




[a] Direct discharge facilities discharge wastewater directly to surface water. Indirect discharge facilities discharge wastewater to a POTW, which then discharge to a receiving stream.

**Figure 6-1. Industrial Facility Wastewater Discharge Options**

### *6.1.2 OW's TNSSS*

OW conducted the TNSSS to advance the understanding of pollutants present in treated sewage sludge (biosolids) and to develop national estimates of the concentrations of selected analytes. The collected information was intended to help OW assess if exposures to analytes were occurring and whether the concentrations in sewage sludge may be of concern for public health and the environment. For this 2012 Annual Review, EPA used the TNSSS results to examine how the quality of POTW sewage sludge and its beneficial use may be affected by industrial wastewater discharges. The following subsections provide additional background on sewage sludge regulations and the TNSSS.

#### 6.1.2.1 Sewage Sludge Regulations

Under 40 CFR Part 503 EPA regulates sewage sludge disposal and use. The regulations establish numeric limits, management practices, and operational standards to protect public health and the environment from the adverse effects of pollutants in sewage sludge. Part 503 regulates three disposal options for sewage sludge: land application, landfill/surface disposal, and incineration.

Section 405(d) of the CWA requires EPA to complete a biennial review of sewage sludge regulations. The biennial review looks at 40 CFR Part 503 standards for purposes of regulating new pollutants where sufficient data exist.[12] OW's 2003 biennial review of sewage sludge regulations identified new pollutants of concern that became the starting point for the TNSSS analysis.

#### 6.1.2.2 OW's TNSSS Analysis

In 2006 and 2007, OW collected sewage sludge samples from 74 POTWs in 35 states. For reference, there are approximately 16,000 POTWs in the U.S. (DMR Loading Tool). OW selected the sampled POTWs based on:

- Size (must treat more than one million gallons of wastewater per day);
- Geography (must be located in the contiguous U.S.); and,
- Treatment type (must employ secondary treatment or better).

The selection criteria did not account for the variety of industrial discharges to the POTWs. OW analyzed 84 sewage sludge samples, one from each facility plus and additional sample at 10 facilities for quality control purposes or because the facility had more than one treatment system. Therefore, 84 samples were collected from 74 POTWs during the TNSSS (U.S. EPA, 2009a).

Through the 2003 biennial review[13] of sewage sludge regulations and a subsequent biosolids exposure and hazard assessment, OW identified nine pollutants warranting further

[12] See EPA's webpage on the use and disposal of biosolids for further information on the biennial review: http://water.epa.gov/scitech/wastetech/biosolids/.
[13] See 68 FR 75531: https://federalregister.gov/a/03-32217.

evaluation.[14] To conduct a more refined risk evaluation and risk characterization for the nine pollutants, OW needed updated sewage sludge concentration data. OW expanded the list of analytes for the TNSSS from nine to 145 to include analytes that could be analyzed at little extra cost or because of their widespread use and emerging concern.

OW analyzed the sewage sludge samples for 145 analytes, listed in Table 6-27 at the end of this section. The analytes included metals, organics, inorganic anions, polybrominated diphenyl ethers, steroids and hormones, and pharmaceutical chemicals. Table 6-28, also at the end of this section, presents detailed information about each of the analytes including the EPA programs that address the analyte, and datasets or regulations that are relevant to the 2012 304m Annual Review.[15] For example, for the pollutant arsenic, Table 6-28 provides a toxic weighting factor (TWF) value and notes that it is listed as a CWA priority pollutant, regulated under 40 CFR Part 503, and included in TRI. Table 6-2 summarizes this information for each pollutant group. For more information on POTW and analyte selection criteria and sampling methodology, refer to the *Targeted National Sewage Sludge Survey Overview Report* (U.S. EPA, 2009a) or the *Targeted National Sewage Sludge Survey Sampling and Analysis Technical Report* (U.S. EPA, 2009b).

**Table 6-2. TNSSS Analyte Groups and Applicability to EPA Programs and Regulations**

| Pollutant Group | Number of Pollutants | Number with TWFs | Number of CWA Priority Pollutants | Number Regulated under 40 CFR 503 | Number with Chemical Action Plans[a] | Number of TRI-Listed Chemical |
|---|---|---|---|---|---|---|
| Metals | 28 | 25 | 13 | 10 | 0 | 17 |
| Organics | 6 | 5 | 4 | 0 | 1 | 3 |
| Inorganic anions | 3 | 1 | 0 | 0 | 0 | 1 |
| Polybrominated diphenyl ethers (PBDEs) | 11 | 0 | 0 | 0 | 11 | 0 |
| Steroids and hormones | 25 | 0 | 0 | 0 | 0 | 0 |
| Pharmaceutical chemicals | 72 | 1 | 0 | 0 | 0 | 0 |
| Total | 145 | 32 | 17 | 10 | 12 | 21 |

Source: U.S. EPA, 2009a.
[a] See Section 6.2 of this report for discussion of the EPA Chemical Action Plans.

#### 6.1.2.3 Findings of TNSSS

Briefly, the survey found (U.S. EPA, 2009a):

- Of the 28 metals in the study, 27 were found in virtually every sample; one metal (antimony) was found in 72 of the 84 samples.
- Of the six semivolatile organics and polycyclic aromatic hydrocarbons, four were found in at least 72 of 84 samples, one was found in 63 of 84 samples, and one was found in 39 of 84 samples.

[14] The pollutants identified for further evaluation were barium, beryllium, manganese, silver, fluoranthene, pyrene, 4-chloroaniline, nitrate, and nitrite.
[15] EPA programs, datasets and regulations reviewed include TWF values, CWA priority pollutants, 40 CFR Part 503 regulations, chemical action plans, and TRI-listed chemicals.

- Four anions were found in every sample.
- All but one flame retardant (BDE-138) were found in essentially every sample; BDE-138 was found in 54 out of 84 samples.
- Of the 25 steroids and hormones measured, three steroids (campesterol, cholestanol, and coprostanol) were found in all 84 samples and six steroids were found in at least 80 of the samples. One hormone (17a-ethynyl estradiol) was not found in any sample and five hormones were found in fewer than six samples.
- Of the 72 pharmaceuticals, three (cyprofloxacin, diphenhydramine, and triclocarban[16]) were found in all 84 samples and nine were found in at least 80 of the samples. However, 15 pharmaceuticals were not found in any sample and 29 were found in fewer than three samples.

As part of the TNSSS analysis, OW compared the maximum sewage sludge metals concentrations to the existing regulatory ceilings for sewage sludge land application (subcategory B) in 40 CFR Part 503. Exceedances of the ceilings were identified for molybdenum, zinc, and nickel. In the TNSSS, OW did not compare analyte concentrations with other regulatory ceilings or limits for sewage sludge disposal, such as surface disposal (subcategory C) and incineration (subcategory E).

In its TNSSS report, OW concluded that it is not appropriate to speculate on the significance of the results until it completes a proper evaluation and review. OW is currently evaluating the pollutants the survey identified in sewage sludge and plans to conduct an exposure and hazard assessment for these pollutants if sufficient data are available (U.S. EPA, 2009a; Stevens, 2013).

#### 6.1.2.4 Limitations of the TNSSS for EPA's 2012 Annual Review

The TNSSS has certain limitations that prevented EPA from exploring how pollutants discharged to POTWs might interfere with beneficial use of sewage sludge as part of its 2012 Annual Review:

- It does not address sources of the influent wastewater to the POTW. Specifically, industrial discharges were not identified and thus are not easily distinguished from other sources such as domestic wastewater.
- It does not consider variations in water quality, either the influent or the effluent wastewater that may affect the contaminants in sewage sludge and their quantity.
- The type and performance of the sampled treatment systems were not considered, including variations that affect sewage sludge quantity and quality.
- Although the TNSSS was a statistical sample of the 3,337 POTWs that met the study criteria,[17] because only 74 POTWs were sampled out of approximately

[16] Although trichlocarban is not a pharmaceutical, it is included in the pharmaceutical chemicals group because it is detected by the same analytical method used to measure pharmaceutical concentrations in sludge.
[17] Study criteria included: facilities that treated more than one MGD, were located in the contiguous U.S., and employ secondary treatment or better. (U.S. EPA, 2009b).

16,000 in the U.S., the study was limited in its ability to characterize pollutants from industries not discharging to the sampled POTWs.

These limitations provide challenges in using the TNSSS data to identify industrial wastewater discharges potentially affecting the quality of POTW sewage sludge and its beneficial use.

### *6.1.3 EPA's 2012 Annual Review of Sewage Sludge Analyses*

EPA used TNSSS data in combination with other publicly available data to examine pollutants identified in sewage sludge that are discharged to POTWs in industrial wastewater. The following sections discuss the completed analyses.

#### 6.1.3.1 Identifying Industrial Discharges to TNSSS POTWs

POTWs accept wastewater from a variety of domestic and industrial sources. Over 100,000 non-domestic users discharge to POTWs across the U.S. (U.S. EPA, 1991). These non-domestic users include significant industrial users (SIUs),[18] retail and commercial establishments, and industrial dischargers that do not meet EPA's definition of significant industrial user (U.S. EPA, 1991).

The TNSSS did not identify the source of the wastewater treated by the sampled POTWs. Specifically, it omitted information on the type and magnitude of industrial wastewater discharges that may be treated at the POTWs. Because of this omission, for this analysis, EPA used TRI data to identify some of the industrial facilities that discharge wastewater to the sampled POTWs. EPA also used TRI data to analyze the possible sources of the pollutants TNSSS identified in POTW sewage sludge.

TRI includes industry-reported data for 682 chemicals and chemical categories. In TRI, facilities report annual mass loads released to the environment of each chemical or chemical category. They must report the amount transferred to offsite locations, which may include direct discharges to surface water or discharges to POTWs. For discharges to POTWs, they must identify the specific POTW that receives their wastewater. With the information facilities reported to TRI, EPA evaluated industrial pollutant transfers to the POTWs included in the TNSSS and also evaluated specific industrial pollutants that may pass through the POTW and accumulate in sewage sludge.[19]

A facility must meet three criteria to be required to submit a TRI report (U.S. EPA, 2009c):

1. Be categorized in North American Industry Classification System (NAICS) code 11, 21, 22, 31 through 33, 42, 48 through 49, 51, 54, or 81 or be a federal facility.
2. Have 10 or more full-time employees or their equivalent.

[18] The CWA defines an SIU as an indirect discharger that is the focus of control efforts under the national pretreatment program; includes all indirect dischargers subject to national categorical pretreatment standards, and all other indirect dischargers that contribute 25,000 gallons per day or more of process wastewater, or which make up five percent or more of the hydraulic or organic loading to the municipal treatment plant, subject to certain expectations (40 CFR 403.3(t)).
[19] For more information on TRI, see http://www2.epa.gov/toxics-release-inventory-tri-program.

3. Manufacture, process, or otherwise use a chemical or chemical category on the TRI list above the appropriate activity threshold.

Due to these reporting requirements, TRI does not have data for all of the industrial facilities (particularly smaller facilities) that discharge to the POTWs included in the TNSSS.

EPA used information from the 2009 TRI database to identify the number of facilities that discharge directly and the number that discharge indirectly for each point source category. For some point source categories, such as petroleum refining, most facilities discharge directly to surface waters. For the analyses presented in this section, EPA only included point source categories composed primarily of indirect dischargers because these categories are most likely to have widespread impacts on POTW sewage sludge (i.e., excluded categories within which less than 30 percent of the facilities discharge to POTWs).[20]

To relate TRI data to the TNSSS, EPA used the following TRI data fields for each facility: TRI ID, release code, chemical name and Chemical Abstracts Service (CAS) number, total transfer to POTWs,[21] and NAICS code. For some of the analyses of pollutants in sewage sludge described in this section, EPA also applied a TWF to estimate toxic-weighted pound equivalents (TWPE)[22] to rank pollutant discharges and point source categories discharging to POTWs based on the toxicity of their discharge and identify trends in the data.

Of the 74 POTWs sampled in the TNSSS, EPA identified 35 POTWs that receive wastewater from industrial facilities that reported to TRI in 2009. EPA identified these 35 POTWs by matching POTW name and location between the two datasets. Table 6-3 presents all POTWs sampled in the TNSSS that are reported as receiving wastewater in TRI.

EPA identified and analyzed information for 153 industrial facilities that transfer pollutants to the 35 TNSSS POTWs that receive wastewater from industrial facilities that report to TRI. Using the facility NAICS codes, EPA matched these 153 facilities to 28 point source categories. Table 6-3 identifies the specific point source categories that are discharging to each of the 35 TNSSS POTWs. EPA then ranked the 28 point source categories by the number of facilities in TRI that reported discharges to these POTWs, shown in Table 6-4. Metal Finishing (40 CFR Part 433) was the point source category with the greatest number of facilities reporting discharges to TNSSS POTWs, with 52 facilities reporting wastewater transfers. Together with the next point source category, Electroplating (40 CFR Part 413), the two point source categories contain nearly 50 percent of the facilities reporting discharges to the 35 TNSSS POTWs.

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[20] Sixteen point source categories were omitted from the sewage sludge analyses because they had greater than 70 percent direct discharges: National Security & International Affairs (Part 97); Sugar Processing (Part 409); Cement Manufacturing (Part 411); Chlorine and Chlorinated Hydrocarbons (Part 414.1); Fertilizer Manufacturing (Part 418); Petroleum Refining (Part 419); Iron and Steel Manufacturing (Part 420); Phosphate Manufacturing (Part 422); Steam Electric Power Generating (Part 423); Timber Products Processing (Part 429); Pulp, Paper and Paperboard (Part 430); Metal Products and Machinery (Part 438); Ore Mining and Dressing (Part 440); Waste Combustors (Part 444); Explosives Manufacturing (Part 457); and Drinking Water Treatment (Part 501). EAD identified that four of these 16 categories discharged to a TNSSS POTW: Petroleum Refining (Part 419), Iron and Steel Manufacturing (Part 420), Steam Electric Power Generating (Part 423), and Pulp, Paper and Paperboard (Part 430).

[21] To evaluate industrial discharges' effects on sewage sludge, EPA examined the releases reported as transferred to POTWs. For toxicity rankings and *TRIReleases2009*, EPA applies an assumed percent of pollutant removed at the POTW, before the sewage sludge reaches the surface water. See Section 3 of the *2011 Annual Review Report* (U.S. EPA, 2012) for details on POTW removals and the toxicity rankings.

[22] See the *2011 Annual Review Report* for details on TWFs and TWPE (U.S. EPA, 2012).

**Table 6-3. TNSSS-Sampled POTWs That Receive Wastewater from Industrial Facilities Reporting to TRI**

| POTW Name from TNSSS | State | POTW Name in TRI | Point Source Categories in TRI Discharging to POTW[a] |
|---|---|---|---|
| Duncan PUA WWT | OK | City of Duncan – OMI Duncan Wastewater Treatment | 433 – Metal Finishing |
| Salisbury WWTF | MD | City of Salisbury Wastewater Treatment Plant | 463 – Plastics Molding and Forming; 432 – Meat and Poultry Products |
| Everett WWTP | WA | City of Everett Department of Public Works | 433 – Metal Finishing |
| Buffalo Bird Island STP | NY | Buffalo Sewer Authority | 405 – Dairy Products Processing; 415 – Inorganic Chemicals Manufacturing; 433 – Metal Finishing; 436 – Mineral Mining and Processing; 471 – Nonferrous Metals Forming and Metal Powders; 463 – Plastics Molding and Forming; 508 – Printing and Publishing |
| Little Miami Drainage Basin/WWTP | OH | Metropolitan Sewer District of Greater Cincinnati | 433 – Metal Finishing; 413 – Electroplating |
| Albany (WPCP No. 2) | GA | Albany WPCP | 428 – Rubber Manufacturing |
| Stockton WWTF | CA | Stockton Municipal Utilities | 406 – Grain Mills; |
| Southeast WPCP | CA | Department of Public Works | 433 – Metal Finishing |
| Middlesex Cnty UA | NJ | Middlesex Cnty Util Auth Water Reclaim Center | 73 – Business Services; 414 – Organic Chemicals, Plastics And Synthetic Fibers; 415 – Inorganic Chemicals Manufacturing; 428 – Rubber Manufacturing; 439 – Pharmaceutical Manufacturing; 455 – Pesticide Chemicals; 471 – Nonferrous Metals Forming And Metal Powders; 503 – Miscellaneous Foods and Beverages |
| Wixom STP | MI | Wixom Sewage Disposal Plant | 413 – Electroplating; 433 – Metal Finishing |
| Benton Harbor – St. Joseph | MI | Benton Harbor-St Joseph Sewage Dspl Plt | 50 – Wholesale Trade – Durable Goods; 413 – Electroplating; 433 – Metal Finishing |
| Canajoharie STP | NY | Canajoharie (V) WWTP | 503 – Miscellaneous Foods and Beverages |
| Geneva Marsh Creek WWTP | NY | Marsh Creek WWTP - Geneva | 426 – Glass Manufacturing |
| Topeka North WWTP | KS | City of Topeka WPCD | 407 – Canned And Preserved Fruits and Vegetables Processing; 406 – Grain Mills |
| Boone WWTP | IA | Boone Water Pollution Control | 432 – Meat and Poultry Products |
| Huntsville Aldridge Creek WWTP | AL | Aldridge Wastewater Treatment | 433 – Metal Finishing |
| Boulder 75th Street WWTP | CO | City of Boulder Wastewater Treatment Plant | 433 – Metal Finishing; 439 – Pharmaceutical Manufacturing; 507 – Independent And Stand Alone Labs |
| Texarkana City of | TX | Texarkana South Regional WWTP | 414 – Organic Chemicals, Plastics and Synthetic Fibers; 428 – Rubber Manufacturing |
| Santa Barbara WWTF | CA | Goleta West Sanitary District | 433 – Metal Finishing |
| Southside STP #2 | TX | City of Tyler Treatment Plant West Side | 414 – Organic Chemicals, Plastics And Synthetic Fibers; 428 – Rubber Manufacturing; 433 – Metal Finishing |

**Table 6-3. TNSSS-Sampled POTWs That Receive Wastewater from Industrial Facilities Reporting to TRI**

| POTW Name from TNSSS | State | POTW Name in TRI | Point Source Categories in TRI Discharging to POTW[a] |
|---|---|---|---|
| Spanish Fork | UT | Spanish Fork City POTW | 413 – Electroplating |
| Elizabethton WWTP | TN | Elizabethton | 433 – Metal Finishing |
| Trinity River Authority; Ellis County WWTP | TX | Trinity River Authority | 433 – Metal Finishing |
| SSSD/Lawson Fork Plant | SC | Spartanburg Sanitary Sewer District | 414 – Organic Chemicals, Plastics And Synthetic Fibers; 417 – Soap And Detergent Manufacturing; 428 – Rubber Manufacturing; 433 – Metal Finishing; 508 – Printing & Publishing |
| Valencia WRP | CA | Valencia WRP | 433 – Metal Finishing |
| Phoenix 23rd Ave WWTP | AZ | 23rd Ave Wastewater Treatment Plant | 405 – Dairy Products Processing; 413 – Electroplating; 417 – Soap And Detergent Manufacturing; 421 – Nonferrous Metals Manufacturing; 433 – Metal Finishing; 436 – Mineral Mining And Processing; 464 – Metal Molding And Casting (Foundries); 465 – Coil Coating; 469 – Electrical And Electronic Components; 503 – Miscellaneous Foods And Beverages |
| Beaver Dam WWTP | WI | Beaver Dam Wastewater Treatment Facility | 405 – Dairy Products Processing; 433 – Metal Finishing |
| Alcosan STP (Allegheny County) | PA | Allegheny County Sanitation Authority | 426 – Glass Manufacturing; 433 – Metal Finishing |
| Bedford WWTP & Sewer System | OH | Bedford POTW | 433 – Metal Finishing |
| Northeast Ohio Regional Sewer District, Southerly WWTP | OH | Northeast Ohio Sewer District Southerly WWTP | 413 – Electroplating; 433 – Metal Finishing; 464 – Metal Molding And Casting (Foundries); 467 – Aluminum Forming; 468 – Copper Forming; 471 – Nonferrous Metals Forming And Metal Powders |
| River Road WWTP | TX | City of Amarillo Industrial Waste | 405 – Dairy Products Processing |
| Mayfield STP | KY | Mayfield Electric and Water Systems | 433 – Metal Finishing |
| Bloomington STP North | IN | Bloomington Utilities | 433 – Metal Finishing |
| Richmond SD | IN | Richmond Sanitary District | 20 – Food & Kindred Products; 405 – Dairy Products Processing; 433 – Metal Finishing; 468 – Copper Forming |
| Huntington City Of | WV | City of Huntington | No point source categories discharge to this POTW with less than 70 percent direct discharges. |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.
[a] Excluding point source categories with less than 30 percent indirect discharges in the TRI database.

**Table 6-4. Ranking of Point Source Categories[a] by the Count of Facilities Discharging to a TNSSS POTW Included in TRI**

| Point Source Category Code | Point Source Category | Count of TRI Facilities Discharging to a TNSSS POTW |
|---|---|---|
| 433 | Metal Finishing | 52 |
| 413 | Electroplating | 19 |
| 414 | Organic Chemicals, Plastics and Synthetic Fibers | 17 |
| 405 | Dairy Products Processing | 7 |
| 428 | Rubber Manufacturing | 6 |
| 415 | Inorganic Chemicals Manufacturing | 6 |
| 469 | Electrical and Electronic Components | 5 |
| 468 | Copper forming | 4 |
| 508[b] | Printing and Publishing | 4 |
| 471 | Nonferrous Metals Forming and Metal Powders | 3 |
| 503[b] | Miscellaneous Foods and Beverages | 3 |
| 417 | Soap and Detergent Manufacturing | 3 |
| 464 | Metal Molding and Casting (Foundries) | 2 |
| 406 | Grain mills | 2 |
| 436 | Mineral Mining and Processing | 2 |
| 421 | Nonferrous Metals Manufacturing | 2 |
| 432 | Meat and Poultry Products | 2 |
| 426 | Glass Manufacturing | 2 |
| 463 | Plastics Molding and Forming | 2 |
| 439 | Pharmaceutical Manufacturing | 2 |
| 507[b] | Independent and Stand Alone Labs | 1 |
| 467 | Aluminum Forming | 1 |
| 407 | Canned and Preserved Fruits and Vegetables Processing | 1 |
| 465 | Coil Coating | 1 |
| 50[b] | Wholesale Trade—Durable Goods | 1 |
| 73[b] | Business Services | 1 |
| 455 | Pesticide Chemicals | 1 |
| 20[b,c] | Food and Kindred Products | 1 |
| **Total** | | **153** |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb.*

[a] Excluding point source categories with less than 30 percent indirect discharges in the TRI database.

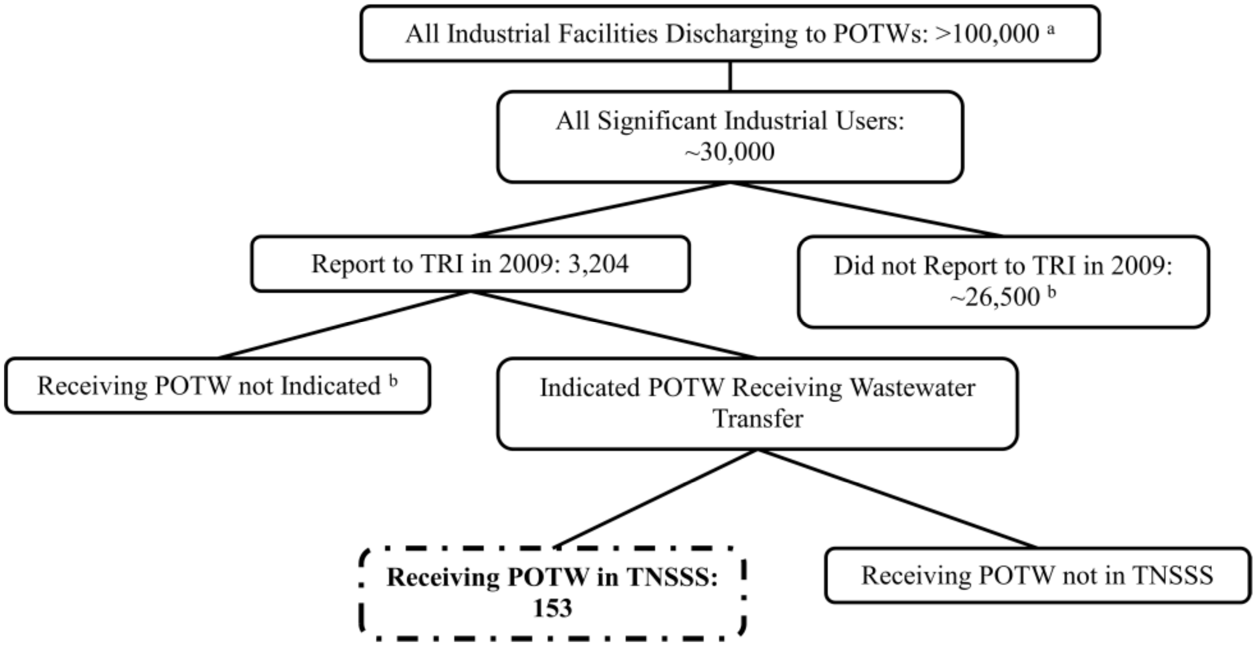
[b] Industries in this category (503) are not EPA-regulated point source categories. The point source categories with a 500 series code are potential new point source categories identified during previous annual reviews. EPA is evaluating discharges from these industries.

[c] Point source categories with two-digit code are similar industries grouped by SIC code that have not been thoroughly reviewed. Industrial discharges from Food and Kindered Products are potentially part of point source category 503 – Miscellaneous Foods and Beverages, however the discharges have not been analyzed in detail.

#### 6.1.3.2 Limitations of Using TRI and TNSSS to Characterize Industrial Discharges' Impacts on Sewage Sludge

TRI is the best available dataset to identify industrial discharges to POTWs; however, it does not represent all industrial discharges to each POTW due to the criteria for inclusion in TRI. As shown in Figure 6-2 below, of the more than 100,000 industrial facilities discharging to POTWs, approximately 25,000 SIUs are not required to report to TRI. Further, using the TRI data, EPA identified only 153 facilities reporting discharging to POTWs in the TNSSS. An additional, unknown number of facilities also discharge to these POTWs, but are not required to report to TRI.

Figure 6-3 depicts the relationship between all POTWs in the U.S., the POTWs in the TNSSS, and the POTWs receiving wastewater from facilities that report to TRI. Of the 74 POTWs in the TNSSS, EPA identified only 35 receiving wastewater from facilities that report to TRI. As a result, these 35 POTWs were the source of the information EPA used to analyze the accumulation of industrial wastewater pollutants in sewage sludge.




[a] Includes nondomestic users such as retail and commercial establishments and industries that do not meet EPA's definition of significant industrial user.
[b] An unknown number of significant industrial users discharge to the POTWs included in the TNSSS.

**Figure 6-2. Universe of Industrial Facilities and Connection to POTWs Included in TNSSS**

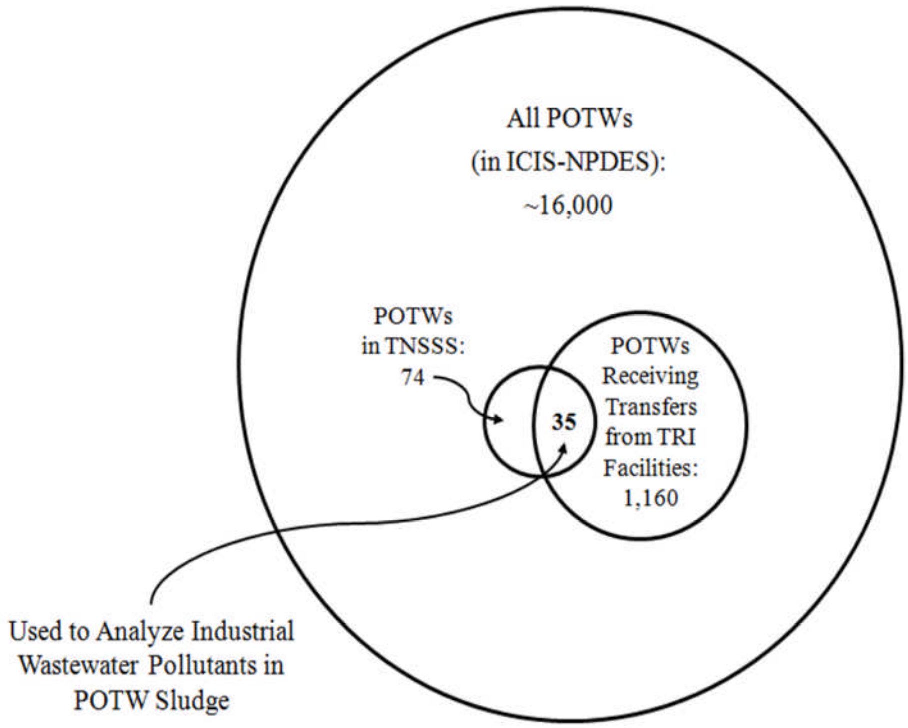



**Figure 6-3. POTW Universe and POTWs Used to Analyze Industrial Wastewater Pollutants in Sewage Sludge**

#### 6.1.3.3 Pollutants Included in Both TNSSS and TRI

To evaluate industrial wastewater discharges potentially affecting the quality of POTW sewage sludge, EPA identified pollutants included in the TNSSS that are also reported in TRI. Most pollutants in the TNSSS are not reported in TRI: of the 145 pollutants included in the TNSSS, EPA indentified only 21 pollutants or pollutant groups that facilities reported transferring to any POTW in TRI in 2009. These pollutants are shown in Table 6-5. Several of these 21 pollutants are grouped or named slightly differently. Table 6-6 explains these pollutant discrepancies and the action EPA took and/or the assumptions EPA made in order to use the data in its analyses.

**Table 6-5. Pollutants Included in Both the TNSSS and TRI**

| | | |
|---|---|---|
| Antimony | Fluoranthene[a] | Selenium |
| Arsenic | Lead | Silver |
| Barium | Manganese | Thallium |
| Cadmium | Mercury | Vanadium |
| Chromium | Molybdenum[b] | Zinc |
| Cobalt | Nickel | Benzo(a)pyrene[a] |
| Copper | Nitrate/Nitrite[d] | Bis(2-ethylhexyl) phthalate[c] |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb.*

[a] Represented by TRI chemical polycyclic aromatic compounds.
[b] Represented by TRI chemical molybdenum trioxide.
[c] Represented by TRI chemical di(2-ethylhexyl).
[d] Represented by TRI chemical nitrate compounds.

**Table 6-6. Pollutant Differences between TNSSS and TRI**

| Pollutant Difference between TNSSS and TRI | EPA Action |
|---|---|
| TRI includes only molybdenum trioxide, not any other molybdenum compounds. | Included the TRI pollutant molybdenum trioxide in the analysis to represent the TNSSS molybdenum. |
| TRI's nitrate compounds category is the closest to TNSSS's nitrate/nitrite. | Included the TRI pollutant nitrate compounds in the analysis to represent the TNSSS nitrate/nitrite. |
| Bis(2-ethylhexyl)phthalate in TNSSS is called di(2-ethylhexyl) phthalate in TRI. | Included the TRI pollutant di(2-ethylhexyl) phthalate in the analysis to represent the TNSSS bis(2-ethylhexyl) phthalate. |
| Benzo(a)pyrene and fluoranthene are polycyclic aromatic compounds (PACs), and TRI requires facilities to report PACs as a set of chemicals, not individually. | Included the TRI pollutant PACs in the analysis to represent the TNSSS benzo(a)pyrene and fluoranthene. |
| TRI only lists releases of elemental phosphorus (yellow or white), a hazardous material. TRI does not include releases of phosphate, the form of phosphorus found in wastewater. TNSSS included "water extractable phosphorus," a measure of the phosphates and organo-phosphorus compounds extractable from sewage sludge. | Did not include phosphorus in the analysis, because the TRI chemical and TNSS analyte are not comparable. |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.

#### 6.1.3.4 TRI-Reported Transfers of Pollutants Included in the TNSSS

EPA used information in TNSSS and TRI to learn more about how industrial wastewater discharges can affect the quality of POTW sewage sludge. EPA's analyses were limited to the 21 pollutants, listed in Table 6-5, that were included both in TNSSS and TRI. As stated in Section 6.1.3.1, EPA only included point source categories composed primarily of indirect dischargers because these categories are most likely to have widespread impacts on POTW sewage sludge.

Using information from the limited TRI data, EPA tallied the number of facilities reporting transfers of the pollutants included both in TNSSS and TRI, shown in Table 6-7. Of the 21 pollutants included in both TNSSS and TRI, all pollutants had reported TRI discharges to the TNSSS POTWs with the exception of thallium. No facilities, associated with point source categories composed primarily of indirect dischargers, reported transfers of thallium in TRI. Additionally, the TRI chemical polycyclic aromatic compounds, listed in Table 6-7, is represented by the TNSSS analytes fluoranthene and benzo(a)pyrene.

EPA also calculated the total pounds of each of the pollutants TRI facilities reported transferring to the TNSSS POTWs. EPA's toxicity ranking analysis calculates the mass of pollutants discharged to the receiving stream, after POTW removals. For the sewage sludge analysis, EPA looked instead at the transfers to the POTW, before any removal. As shown in Figure 6-1, an unknown portion of the pollutant mass transferred to the POTW may partition to the sewage sludge. To understand industrial wastewater pollutants that may affect POTW sewage sludge, Table 6-7 presents the total pounds transferred to the POTW, which is the quantity before any of the pollutant is removed in the POTW treatment system, and the maximum amount that may partition to sewage sludge.

Chemicals have varying toxicity. In order to compare groups of unrelated chemicals, EPA developed TWFs for use in its ELG development program. The TWF accounts for the human health and environmental hazard potential of a chemical. Using the TWF and the pounds of pollutant, EPA calculates TWPE—in other words, a weighted mass of a chemical that accounts for its relative toxicity. For further information on TWFs and TWPE calculation, see Section 5 of EPA's *Technical Support Document for the Annual Review of Existing Effluent Guidelines and Identification of Potential New Point Source Categories* (U.S. EPA, 2009c).

Table 6-7 also shows the top TNSSS pollutants included in TRI, ranked by total TWPE transferred to POTWs, and includes the number of facilities reporting transfers of each pollutant. The TRI chemical category with the highest TWPE is "nitrate compounds"; however, the TRI chemical category may differ from nitrate/nitrite compounds analyzed in the TNSSS.

**Table 6-7. Pollutants Transferred[a] to POTWs, Ranked by TWPE**

| Pollutant[b] | Total Pounds Discharged Before POTW Removals | TWPE Before POTW Removals | Facility Count |
|---|---|---|---|
| Nitrate compounds | 107,000,000 | 79,600 | 813 |
| Copper and copper compounds | 100,000 | 63,500 | 1,060 |
| Cadmium and cadmium compounds | 1,030 | 23,800 | 28 |
| Lead and lead compounds | 10,400 | 23,400 | 1,381 |
| Mercury and mercury compounds | 178 | 20,800 | 45 |
| Silver and silver compounds | 997 | 16,400 | 38 |
| Nickel and nickel compounds | 58,400 | 6,360 | 785 |
| Zinc and zinc compounds | 124,000 | 5,810 | 717 |
| Manganese and manganese compounds | 81,400 | 5,730 | 399 |
| Polycyclic aromatic compounds[c] | 56.8 | 5,720 | 20 |
| Chromium and chromium compounds | 63,500 | 4,810 | 677 |
| Arsenic and arsenic compounds | 289 | 1,170 | 21 |
| Cobalt and cobalt compounds | 7,500 | 857 | 116 |
| Selenium and selenium compounds | 519 | 582 | 7 |
| Di(2-ethylhexyl) phthalate | 1,600 | 407 | 31 |
| Antimony and antimony compounds | 23,500 | 288 | 96 |
| Barium and barium compounds | 87,800 | 175 | 64 |
| Vanadium and vanadium compounds | 3,000 | 105 | 9 |
| Molybdenum trioxide | 5,910 | 4.73 | 9 |
| **Total** | **108,000,000** | **260,000** | **6,316** |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb.*
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Excluding point source categories with less than 30 percent indirect discharges in the TRI database.
[b] No facilities reported discharges of thallium in TRI.
[c] The TRI chemical polycyclic aromatic compounds is represented by fluoranthene and benzo(a)pyrene in the TNSSS.

Based on available data from TRI, which is the only current data source linking industrial wastewater sources to pollutants found in POTW sludge, (with the exception of nitrate compounds), metals make up the largest contribution of pollutant discharges from industrial sources to POTWs. As a result, EPA focused the remainder of its review on metals discharges.

### 6.1.3.5 Metals Analysis

As shown in Table 6-7, more than 200,000 TWPE of metals are potentially transferred to POTW sewage sludge from industrial wastewater discharges reported in TRI. These metals discharges can affect the quality and potential beneficial reuse of POTW sewage sludge.

POTWs use biological treatment to remove the organic material and pathogens found in sanitary wastewater, but metals (which are found in many industrial wastewater discharges) are not easily degraded in these biological treatment systems. As a result, the mass of the metals coming into the treatment system that are not discharged (that is, the portion that is removed) is potentially transferred to sewage sludge, as shown in the equation below:

Influent = discharged + removed (potentially transferred to sewage sludge)

EPA calculated the mass of metals potentially transferred to sewage sludge using the reported mass of metals transferred to POTWs and the assumed removal efficiency for each metal in the 2009 TRI database (*TRIReleases2009_v2.mdb*). EPA calculated the pounds and TWPE of metals potentially transferred to sewage sludge for point source categories composed primarily of indirect dischargers. (This analysis included all TRI-reported transfers to POTWs, not just those facilities and point source categories that discharged to the 35 POTWs included in the TNSSS.)

Table 6-8 presents the results of this analysis, with categories ranked by TWPE. The metals included in this table are the parent metals and compounds in the TRI database; the data presented in Table 6-8 do not take into account how pollutants were matched between TRI and the TNSSS. As shown, the Metal Finishing (40 CFR Part 433) point source category accounts for the highest amount of metals TWPE potentially transferred to sewage sludge.

**Table 6-8. Point Source Category Rankings by Metals TWPE Potentially Transferred to Sewage Sludge[a]**

| Point Source Category Code | Point Source Category | Facility Count | Metals Pounds Potentially Transferred to Sewage Sludge[b] | Metals TWPE Potentially Transferred to Sewage Sludge[b] |
|---|---|---|---|---|
| 433 | Metal Finishing | 3,940 | 107,000 | 55,400 |
| 432 | Meat and Poultry Products | 6 | 1,050 | 13,700 |
| 421 | Nonferrous Metals Manufacturing | 377 | 16,000 | 12,800 |
| 413 | Electroplating | 464 | 21,200 | 12,500 |
| 414 | Organic Chemicals, Plastics and Synthetic Fibers | 416 | 47,000 | 10,200 |
| 471 | Nonferrous Metals Forming and Metal Powders | 340 | 12,200 | 7,680 |
| 464 | Metal Molding and Casting (Foundries) | 590 | 8,290 | 4,290 |
| 406 | Grain Mills | 28 | 5,120 | 3,500 |
| 415 | Inorganic Chemicals Manufacturing | 344 | 47,100 | 3,500 |
| 463 | Plastics Molding and Forming | 163 | 5,770 | 2,580 |
| 467 | Aluminum Forming | 277 | 4,170 | 2,310 |
| 425 | Leather Tanning and Finishing | 12 | 29,000 | 2,160 |
| 468 | Copper Forming | 314 | 3,690 | 2,120 |
| 410 | Textile Mills | 54 | 27,700 | 1,630 |
| Remaining point source categories | | 1,066 | 36,600 | 7,160 |
| **Total** | | **8,391** | **372,000** | **142,000** |

Sources: *TRIReleases2009_v2.mdb.*
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] Excluding point source categories with less than 30 percent indirect discharges in the TRI database.
[b] EPA calculated the pounds and TWPE of metals potentially transferred to sewage sludge by evaluating the difference between the discharges to the POTWs and the discharges from the POTWs.

As part of the TNSSS analysis, OW compared the maximum sewage sludge metals concentrations to the existing regulatory ceilings for sewage sludge land application (subcategory B) in 40 CFR Part 503. For this 2012 Annual Review, EPA included an additional comparison of the TNSSS data to surface disposal limits (subcategory C) in order to compare the sewage sludge concentrations to the most stringent limitations in 40 CFR Part 503,[23] while capturing as many pollutants as possible for the comparison. Sewage sludge land application (Subcategory B) concentrations are referred to as ceiling concentrations, while surface disposal (Subcategory C) concentrations are referred to as concentration limits in 40 CFR Part 503. Table 6-9 presents the 40 CFR Part 503 comparisons. EPA identified four pollutants with sewage sludge concentrations that exceed 40 CFR Part 503 ceilings/limits: three exceedances for land application (molybdenum, nickel, and zinc) and two exceedances for surface disposal (chromium and nickel).

**Table 6-9. Comparison of TNSSS Maximum Sewage Sludge Concentration to 40 CFR Part 503 Regulatory Limits[a]**

| Pollutant | TNSSS Maximum Concentration (mg/kg) | Land Application Ceilings (mg/kg) | Number of Samples Exceeding Land Application Ceiling | Surface Disposal Limits (mg/kg)[b] | Number of Samples Exceeding Surface Disposal Limit |
|---|---|---|---|---|---|
| Arsenic | 49.2 | 75 | 0 | 73 | 0 |
| Cadmium | 11.8 | 85 | 0 | - | - |
| **Chromium** | **1,160** | **-** | **-** | **600** | **1** |
| Copper | 2,580 | 4,300 | 0 | - | - |
| Lead | 450 | 840 | 0 | - | - |
| Mercury | 8.3 | 57 | 0 | - | - |
| **Molybdenum** | **132** | **75** | **2** | **-** | **-** |
| **Nickel** | **526** | **420** | **3** | **420** | **3** |
| Selenium | 24.7 | 100 | 0 | - | - |
| **Zinc** | **8,550** | **7,500** | **1** | **-** | **-** |

Sources: 40 CFR Part 503; U.S. EPA, 2009b.

[a] Bold indicates pollutants with sewage sludge concentrations that exceed 40 CFR 503 ceilings/limits.

[b] The surface disposal limits for Subcategory C depend on the distance to the property line. The limits listed in Table 6-9 apply to distances greater than 150 meters from the property line.

For the 2012 Annual Review analysis, EPA focused on three of the pollutants that have maximum sewage sludge concentrations exceeding 40 CFR Part 503 ceilings or limits from the comparison shown in Table 6-9: chromium, nickel, and zinc. Nickel concentrations exceeded the ceiling/limit in three of 84 sewage sludge samples; chromium and zinc concentrations exceeded the ceiling/limit in one of 84 samples. The TNSSS identified nickel and zinc as pollutants of concern because sewage sludge concentrations exceeded 40 CFR Part 503 land application ceilings; EPA also considered chromium a pollutant of concern because the TNSSS sewage sludge concentrations exceeded 40 CFR Part 503 surface disposal limits (U.S. EPA, 2009b). Molybdenum discharges were not reviewed further, even though sewage sludge concentrations exceeded land application ceilings, because the pollutant is not fully represented in the 2009 TRI database (TRI includes only molybdenum trioxide, not any other molybdenum compounds). As

[23] 40 CFR 503 Subcategory E, "Incineration," has limits for risk-specific concentration. Because these limits are in units of mass per volume (milligrams per cubic meter), they are not directly comparable to the land application or surface disposal limits.

part of the TNSSS analysis, OW found that of the POTWs observed exceeding the land application ceilings, one incinerated its treated sewage sludge on site, while the others sent their sewage sludge to landfills. Thus, results from the TNSSS indicated that POTWs were generally complying with the existing land application standards for metals (U.S. EPA, 2009b).

For each metal that exceeded a limit in 40 CRF Part 503 (except molybdenum), EPA ranked the 74 TNSSS POTWs according to sewage sludge concentration of that metal. EPA also identified the facilities in TRI that reported discharging the metal of concern to these POTWs.

***Chromium Results***

Table 6-10 presents the POTWs with the highest chromium sewage sludge concentrations in the TNSSS. EPA could only identify TRI facilities that reported transferring chromium to one of these POTWs. EPA could not identify TRI facilities for the POTW with the highest TNSSS sewage sludge chromium concentration (Punxsutawney Boro STP), suggesting that the chromium in its sewage sludge may not originate from industrial wastewater discharges of the type that must be reported to TRI.

**Table 6-10. POTWs with Highest Chromium Sewage Sludge Concentrations**

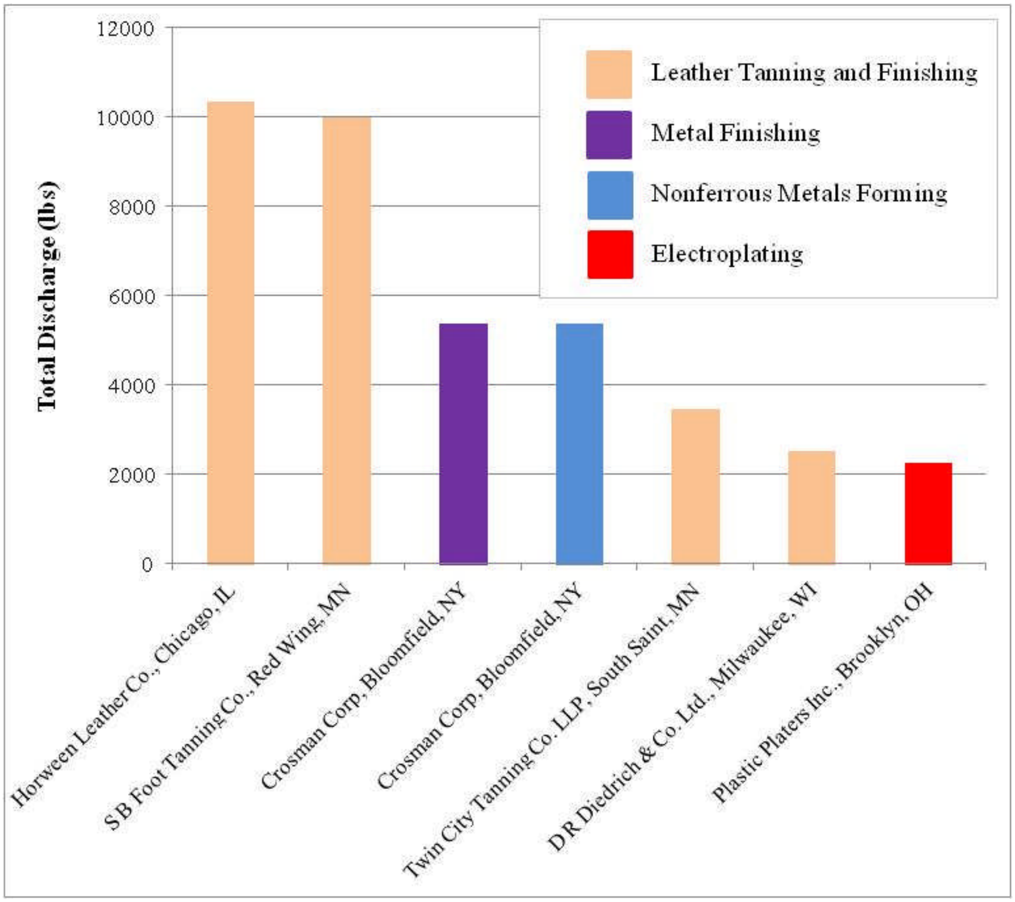
| POTW Name from TNSSS | City | State | Chromium Concentration (mg/kg)[a] | TRI Facilities Discharging Chromium to the POTW | TRI Reporters Discharging Chromium to the POTW |
|---|---|---|---|---|---|
| Punxsutawney Boro STP[b] | Punxsutawney | PA | 1,160[c] | 0 | None |
| Huntington City Of | Huntington | WV | 310 | 0 | None |
| Topeka North WWTP | Topeka | KS | 282 | 0 | None |
| Northeast Ohio Regional Sewer District, Southerly WWTP | Cleveland | OH | 271 | 3 | Sifco Forge Group, Alcoa Cleveland Works, Plastic Platers, Inc |
| North Tonawanda (c) WWTP[b] | North Tonawanda | NY | 262 | 0 | None |
| Wixom STP | Wixom | MI | 261 | 0 | None |
| Buena Vista STP[b] | Buena Vista | VA | 260 | 0 | None |

Sources: U.S. EPA, 2009a, 2009b.
[a] The 40 CFR Part 503 concentration limit for chromium is 600 mg/kg.
[b] These two POTWs are not found in TRI.
[c] Chromium discharge exceeds 40 CFR Part 503 limitations.

Only three TRI facilities reported transferring chromium to the TNSSS POTWs with high sewage sludge chromium concentrations. To learn more about facilities that discharge chromium to POTWs, EPA analyzed the TRI data by performing the following steps:

- Ranked all TRI facilities discharging chromium to POTWs by total discharge (in pounds).
- Linked the top chromium discharging facilities to point source categories.
- Ranked the point source categories by total TWPE before POTW removals.

Figure 6-4 presents the facilities that reported the greatest amounts of chromium transfers to POTWs in TRI. The top two facilities presented in the figure are in the Leather Tanning and Finishing Category (40 CFR Part 425) and account for 39 percent of the total chromium discharge.




Source: *TRIReleases2009_v2.mdb.*

**Figure 6-4. Top Chromium Discharges to POTWs in TRI**

Table 6-11 presents point source categories for the TRI facilities reporting indirect discharges of chromium, ranked by total TWPE before POTW removals. Table 6-11 also presents the total number of facilities reporting transfers of chromium to POTWs for each point source category. As shown, metal finishing has the largest number of facilities that discharge chromium (426), but ranks lower than leather tanning and finishing in terms of total TWPE before POTW removals.

**Table 6-11. TRI Point Source Categories Ranked by Total Chromium TWPE Transferred to POTWs[a]**

| Point Source Category | Number of Establishments in the U.S. (2007 Economic Census) | Number of Facilities Reporting Transfers to POTWs | TWPE before POTW Removals[b] | Percent of Total TWPE before POTW Removals[b] |
|---|---|---|---|---|
| Leather Tanning and Finishing (Part 425) | 240 | 8 | 2,120 | 44% |
| Metal Finishing (Part 433) | 142,805 | 426 | 1,080 | 22% |
| Nonferrous Metals Forming and Metal Powders (Part 471) | 873 | 22 | 469 | 10% |
| Electroplating (Part 413) | 2,720 | 65 | 390 | 8% |
| Textile Mills (Part 410) | 6,842 | 9 | 245 | 5% |
| Plastics Molding and Forming (Part 463) | 11,962 | 12 | 92 | 2% |
| Meat and Poultry Products (Part 432) | 3,757 | 1 | 83.9 | 2% |
| Inorganic Chemicals (Part 415) | 1,366 | 17 | 72.6 | 2% |
| Remaining Point Source Categories | NA | 117 | 258 | 5% |

Source: 2007 U.S. Economic Census (U.S. Census, 2007) and *TRIReleases2009_v2.mdb*.
NA: Not Applicable.
[a] The data presented in Table 6-11 were not compared to TNSSS POTWs.
[b] The TWPE before POTW removals is the total TRI-reported chromium discharges transferred to POTWs.

EPA then identified the point source categories of TRI facilities reporting transfers of chromium to the 35 TNSSS POTWs. Table 6-12 shows that these POTWs most commonly receive wastewater from TRI facilities in the metal finishing point source category, which is to be expected due to the large number of facilities reporting discharges of chromium.

To determine if industrial discharges may be contributing to higher concentrations of chromium in POTW sewage sludge, EPA compared the mean and median chromium concentrations for the POTWs in the TNSSS that are receiving discharges from industrial facilities reporting chromium to TRI to the POTWs in the TNSSS that are not receiving discharges from facilities reporting chromium to TRI. The TNSSS POTWs not in TRI were included as "TNSSS POTWs without TRI Facilities Reporting Chromium Transfers." Table 6-13 presents these results. The TNSSS POTWs with reported chromium discharges from TRI facilities have a higher mean and median chromium sewage sludge concentration. This suggests that industrial discharges of chromium in general may be contributing to higher concentrations of chromium in sewage sludge.

**Table 6-12. TNSSS POTWs Receiving Chromium Transfers from TRI Facilities**

| TNSSS | | | | TRI | | |
|---|---|---|---|---|---|---|
| **POTW Name** | **City** | **State** | **Sewage Sludge Chromium Concentration (mg/kg)[a]** | **Name of Facility** | **Total Chromium Transfer (LBY)** | **Point Source Category** |
| Northeast Ohio Regional Sewer District, Southerly WWTP | Cleveland | OH | 271 | Plastic Platers Inc. | 2,260 | Electroplating (Part 413) |
| | | | | Alcoa Cleveland Works | 8 | Aluminum forming (Part 467) |
| | | | | Alcoa Cleveland Works | 8 | Copper forming (Part 468) |
| | | | | Alcoa Cleveland Works | 8 | Nonferrous Metals Forming and Metal Powders (Part 471) |
| | | | | Sifco Forge Group Inc. | 5.4 | Metal Finishing (Part 433) |
| Phoenix 23rd Ave WWTP | Phoenix | AZ | 215 | Honeywell Aerospace – Phoenix Repair & Overhaul | 55 | Metal Finishing (Part 433) |
| | | | | Honeywell Engines Systems & Services | 26 | Metal Finishing (Part 433) |
| | | | | Dolphin Inc. | 10 | Metal Molding and Casting (Foundries) (Part 464) |
| Duncan PUA WWT | Duncan | OK | 213 | Halliburton Energy Services – Duncan Manufacturing Center | 4.8 | Metal Finishing (Part 433) |
| Buffalo (Sewer Auth.) Bird Island STP | Buffalo | NY | 136 | ITT Heat Transfer | 1.5 | Metal Finishing (Part 433) |
| Beaver Dam WWTP | Beaver Dam | WI | 72.8 | Apache Stainless Equipment Corp. | 5 | Metal Finishing (Part 433) |
| | | | | Mayville Engineering Co Inc., Phoenix Coaters Division | 1.1 | Metal Finishing (Part 433) |
| Mayfield STP | Mayfield | KY | 26 | Remington Arms Co Inc. | 24.2 | Metal Finishing (Part 433) |
| SSSD/Lawson Fork Plant | Spartanburg | SC | 13.9 | Circor Instrumentation Technologies | 1.29 | Metal Finishing (Part 433) |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb.*
[a] The 40 CFR Part 503 concentration limit for chromium is 600 mg/kg.

**Table 6-13. Chromium Sewage Sludge Concentrations from TNSSS POTWs With and Without Reporting TRI Facilities (mg/kg)**

| Chromium Sewage Sludge Concentrations at TNSSS POTWs | Mean | Median | Minimum | Maximum | POTW Count |
|---|---|---|---|---|---|
| With TRI Facilities Reporting Chromium | 123.73 | 104.4 | 13.9 | 271 | 8 |
| Without TRI Facilities Reporting Chromium | 80.06 | 33 | 6.74 | 1,160 | 66 |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.

*Nickel Results*

EPA conducted a similar set of analyses for nickel. Table 6-14 presents the nine POTWs with the highest nickel sewage sludge concentrations in the TNSSS. EPA was able to identify facilities that reported to TRI transfers of nickel to seven of the top nine TNSSS POTWs.

**Table 6-14. Identification Information for Top-Ranking TNSSS POTWs for Nickel**

| POTW Name from TNSSS | City | State | Nickel Concentration (mg/kg)[a] | TRI Facilities Discharging Nickel to the POTW | TRI Reporters Discharging Nickel to the POTW |
|---|---|---|---|---|---|
| Duncan PUA WWT | Duncan | OK | 516[b] | 1 | Halliburton Energy Services, Duncan Manufacturing Center |
| O J Riedel WWTP[c] | Schertz | TX | 255 | 0 | None |
| Elizabethton WWTP | Elizabethton | TN | 217 | 1 | Snap-on Tools Co. |
| Benton Harbor – St. Joseph | St. Joseph | MI | 174 | 2 | Siemens Industry, Inc., Whirlpool Corp, Benton Harbor Division |
| Wixom STP | Wixom | MI | 122 | 1 | Adept Plastic Finishing Plant #4 |
| Northeast Ohio Regional Sewer District, Southerly WWTP | Cleveland | OH | 120 | 4 | Sifco Forge Group, Alcoa Cleveland Works, Ford Motor Co. Cleveland Casting, Plastic Platers Inc. |
| Larkfield-Wikiup WWTF[c] | Wikiup | CA | 120 | 0 | None |
| Buffalo (Sewer Auth.) Bird Island STP | Buffalo | NY | 110 | 1 | ITT Heat Transfer |

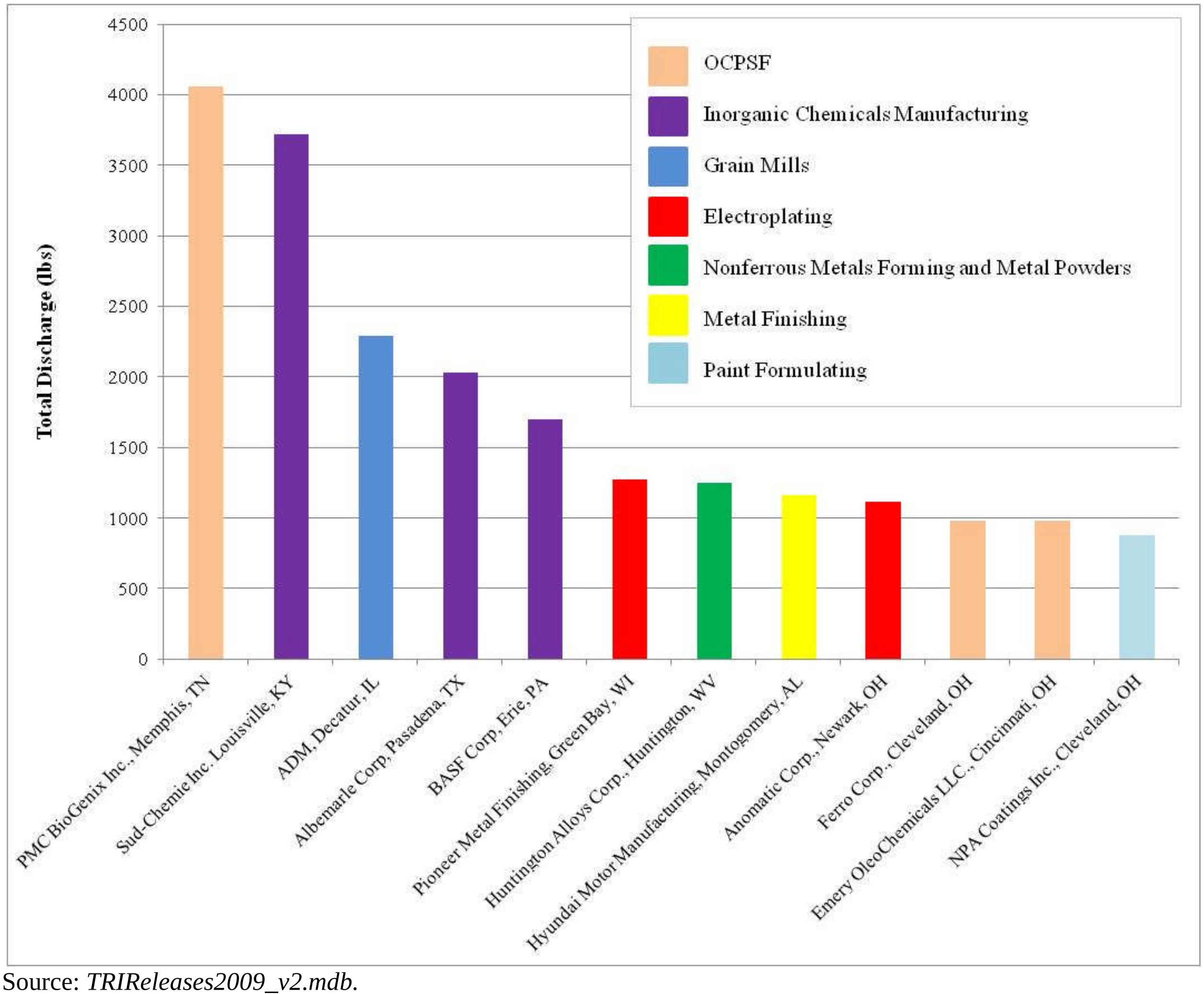
Sources: U.S. EPA, 2009a, 2009b.
[a] The 40 CFR Part 503 concentration ceiling/limit for nickel is 420 mg/kg.
[b] Nickel discharge exceeds 40 CFR Part 503 limitations.
[c] POTWs are not found in TRI.

Eleven TRI facilities reported transferring nickel to TNSSS POTWs with high sewage sludge nickel concentrations. To learn more about facilities that discharge nickel to POTWs, EPA analyzed the TRI data by performing the following steps:

- Ranked all TRI facilities discharging nickel to POTWs by total discharge (in pounds).
- Linked the top nickel discharging facilities to point source categories.
- Ranked the point source categories by total TWPE before POTW removals.

Figure 6-5 presents the facilities that reported the greatest amounts of nickel transfers to POTWs in TRI. The top facility presented in the figure is in the OCPSF category (40 CFR Part 414) and accounts for 13 percent of the total nickel discharge to POTWs in the TNSSS.

Table 6-15 presents point source categories for the TRI facilities reporting transfers of nickel to POTWs, ranked by total TWPE before POTW removals. Table 6-15 also presents the total number of facilities reporting transfers of nickel to POTWs for each point source category. As shown, the metal fishing category has the largest number of facilities reporting transfers of nickel to POTWs and the highest total TWPE. This is similar to the results from the chromium analysis; the metal finishing category had the largest number of facilities reporting transfers of chromium to POTWs. However, for nickel discharges, the metal finishing category also ranks highest, in terms of total TWPE before POTW removals.




Source: *TRIReleases2009_v2.mdb.*

**Figure 6-5. Top Nickel Dischargers in TRI**

**Table 6-15. TRI Point Source Categories Ranked by Total Nickel TWPE[a]**

| Point Source Category | Number of Establishments in the U.S. (2007 Economic Census) | Number of Facilities Reporting Transfers to POTWs | TWPE before POTW Removals[b] | Percent of Total TWPE before POTW Removals[b] |
|---|---|---|---|---|
| Metal Finishing (Part 433) | 142,805 | 474 | 1,990 | 31% |
| Electroplating (Part 413) | 2,720 | 101 | 1,080 | 17% |
| Inorganic Chemicals Manufacturing (Part 415) | 1,366 | 20 | 1,000 | 16% |
| Organic Chemicals, Plastics and Synthetic Fibers (Part 414) | 5,434 | 18 | 872 | 14% |
| Grain Mills (Part 406) | 676 | 2 | 260 | 4% |
| Nonferrous Metals Forming and Metal Powders (Part 471) | 873 | 27 | 255 | 4% |
| Aluminum Forming (Part 467) | 1,087 | 15 | 185 | 3% |
| Miscellaneous Foods and Beverages (Part 503) | 12,778 | 5 | 138 | 2% |
| Paint Formulating (Part 446) | 1,369 | 4 | 130 | 2% |
| Remaining Point Source Categories | NA | 119 | 444 | 7% |

Source: 2007 U.S. Economic Census (U.S. Census, 2007) and *TRIReleases2009_v2.mdb.*
NA: Not Applicable
[a] The data presented in Table 6-15 were not compared to TNSSS POTWs.
[b] The TWPE before POTW removals is the total TRI-reported nickel discharges transferred to POTWs.

EPA identified the point source categories of TRI facilities reporting transfers of nickel to the 35 TNSSS POTWs. Table 6-16 shows that TNSSS POTWs most commonly receive wastewater from TRI facilities in the metal finishing point source category, which is to be expected due to the large number of metal finishing facilities reporting discharges of nickel, shown in Table 6-15.

To determine if industrial discharges of nickel may be contributing to higher concentrations of nickel in POTW sewage sludge, EPA compared the mean and median nickel concentrations for the POTWs in the TNSSS that are receiving discharges from industrial facilities reporting nickel to TRI to the POTWs in the TNSSS that are not receiving discharges from facilities reporting nickel to TRI. The TNSSS POTWs not in TRI were included as “Nickel Sewage Sludge Concentrations at TNSSS POTWs Without Reporting TRI Facilities.” Table 6-17 presents these results. As shown, the TNSSS POTWs with reported nickel discharges from TRI facilities have a higher mean and median nickel sewage sludge concentration. As with the chromium analysis results, this suggests that industrial discharges of nickel in general may be related to higher concentrations of nickel in sewage sludge.

**Table 6-16. TNSSS POTWs Receiving Nickel Transfers from TRI Facilities**

| TNSSS | | | | TRI | | |
|---|---|---|---|---|---|---|
| **POTW Name** | **City** | **State** | **Sewage Sludge Nickel Concentration (mg/kg)[a]** | **Name of Facility in TRI** | **Total Discharge (LBY)** | **Point Source Category** |
| Duncan PUA WWT | Duncan | OK | 516 | Halliburton Energy Services – Duncan Manufacturing Center | 7.4 | Metal Finishing (Part 433) |
| Elizabethton WWTP | Elizabethton | TN | 217 | Snap-on Tools | 21 | Metal Finishing (Part 433) |
| Benton Harbor-St. Joseph | St. Joseph | MI | 174 | Whirlpool Corp Benton Harbor Div | 63 | Metal Finishing (Part 433) |
| | | | | Siemens Industry Inc. | 1.31 | Electroplating (Part 413) |
| Wixom STP | Wixom | MI | 122 | Adept Plastic Finishing Plant #4 | 2 | Electroplating (Part 413) |
| Northeast Ohio Regional Sewer District, Southerly WWTP | Cleveland | OH | 120 | Plastic Platers Inc. | 750 | Electroplating (Part 413) |
| | | | | Ford Motor Co. Cleveland Casting | 47 | Metal Molding and Casting (Foundries) (Part 464) |
| | | | | Alcoa Cleveland Works | 9 | Nonferrous Metals Forming and Metal Powders (Part 471) |
| | | | | Alcoa Cleveland Works | 9 | Aluminum Forming (Part 467) |
| | | | | Alcoa Cleveland Works | 9 | Copper Forming (Part 468) |
| | | | | Sifco Forge Group Inc. | 4.4 | Metal Finishing (Part 433) |
| Buffalo (Sewer Auth.) Bird Island STP | Buffalo | NY | 110 | ITT Heat Transfer | 6.13 | Metal Finishing (Part 433) |
| Phoenix 23rd Ave WWTP | Phoenix | AZ | 79 | Hydro Aluminum NA | 65.3 | Nonferrous Metals Manufacturing (Part 421) |
| | | | | Honeywell Engines Systems & Services | 16 | Metal Finishing (Part 433) |
| | | | | Dolphin Inc. | 10 | Metal Molding and Casting (Foundries) Part 464 |
| | | | | Honeywell Aerospace – Phoenix Repair & Overhaul | 5 | Metal Finishing (Part 433) |
| Little Miami Drainage Basin/WWTP | Cincinnati | OH | 40.4 | D-G Custom Chrome LLC | 10 | Electroplating (Part 413) |
| Southeast WPCP | San Francisco | CA | 31 | U.S. Department of the Treasury U.S. Mint San Francisco CA | 5 | Metal Finishing (Part 433) |
| Boulder 75th Street WWTP | Boulder | CO | 27.1 | Dieterich Standard Inc. | 1 | Metal Finishing (Part 433) |
| Beaver Dam WWTP | Beaver Dam | WI | 26.5 | Apache Stainless Equipment Corp. | 5 | Metal Finishing (Part 433) |
| Huntsville Aldridge Creek WWTP | Huntsville | AL | 23.6 | TW Cylinders LLC | 11 | Metal Finishing (Part 433) |
| Trinity River Authority, Ellis | Arlington | TX | 19.5 | GMC Truck Group Arlington Assembly | 540 | Metal Finishing (Part 433) |

**Table 6-16. TNSSS POTWs Receiving Nickel Transfers from TRI Facilities**

| TNSSS | | | | TRI | | |
|---|---|---|---|---|---|---|
| POTW Name | City | State | Sewage Sludge Nickel Concentration (mg/kg)[a] | Name of Facility in TRI | Total Discharge (LBY) | Point Source Category |
| County WWTP | | | | Plant | | |
| Bloomington STP North | Bloomington | IN | 18.6 | GEA BPO LLC | 44 | Metal Finishing (Part 433) |
| SSSD/Lawson Fork Plant | Spartanburg | SC | 12.9 | Circor Instrumentation Technologies | 0.7 | Metal Finishing (Part 433) |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.
[a] The 40 CFR Part 503 concentration ceiling/limit for nickel is 420 mg/kg.

**Table 6-17. Nickel Sewage Sludge Concentrations from TNSSS POTWs With and Without Reporting TRI Facilities (mg/kg)**

| Nickel Sewage Sludge Concentrations at TNSSS POTWs | Mean | Median | Minimum | Maximum | POTW Count |
|---|---|---|---|---|---|
| With TRI Facilities Reporting Nickel | 118.50 | 39.70 | 12.9 | 526 | 18 |
| Without TRI Facilities Reporting Nickel | 28.2 | 19.4 | 7.77 | 255 | 56 |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.

### *Zinc Results*

Table 6-18 presents the 12 POTWs with the highest zinc sewage sludge concentrations in the TNSSS. EPA was able to identify facilities that reported to TRI that reported transfers of zinc to three of the top 12 POTWs.

**Table 6-18. Identification Information for Top-Ranking TNSSS POTWs for Zinc**

| POTW Name from TNSSS | City | State | Zinc Concentration (mg/kg)[a] | TRI Facilities Discharging Zinc to the POTW | TRI Reporters Discharging Zinc to the POTW |
|---|---|---|---|---|---|
| Punxsutawney Boro STP [b] | Punxsutawney | PA | 8,550[c] | 0 | None |
| Wixom STP | Wixom | MI | 5,050 | 1 | Tiodize/Michigan Inc. |
| Verona STP [b] | Verona | NY | 4,150 | 0 | None |
| O J Riedel WWTP [b] | Schertz | TX | 2,120 | 0 | None |
| Benton Harbor-St. Joseph | St. Joseph | MI | 2,040 | 0 | None |
| River Road WWTP | Amarillo | TX | 1,730 | 0 | None |
| Alum Creek WWTP & Sewers [b] | Columbus | OH | 1,730 | 0 | None |
| Everett WWTP | Everett | WA | 1,570 | 0 | None |
| Topeka North WWTP | Topeka | KS | 1,530 | 1 | Delmonte Topeka Pet Food |
| GTR Pottsville Area – Main STP[b] | Pottsville | PA | 1,340 | 0 | None |
| Salisbury WWTF | Salisbury | MD | 1,310 | 1 | Spartech FCD LLC |
| Three Oaks WWTP[b] | Fort Meyers | FL | 1,300 | 0 | None |

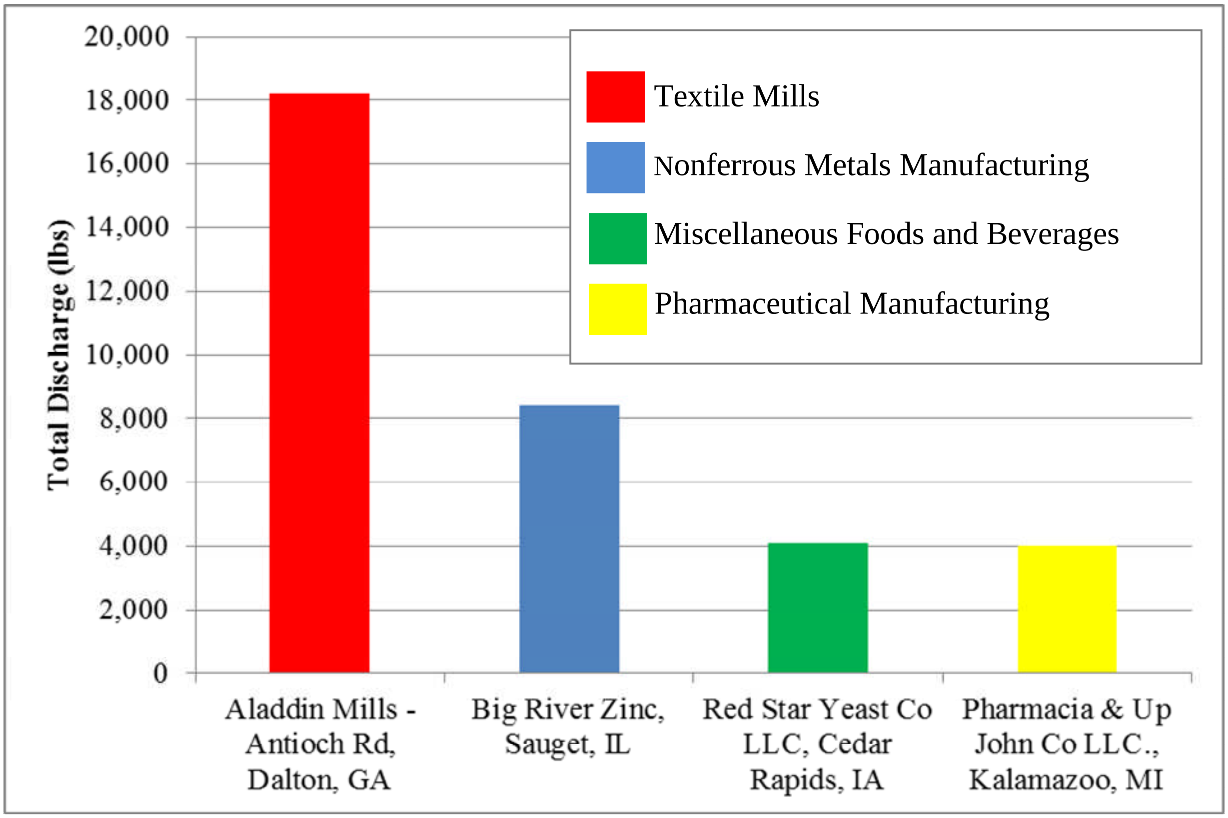
Sources: U.S. EPA, 2009a, 2009b.
[a] The 40 CFR Part 503 land application ceiling for zinc is 7,500 mg/kg.
[b] These POTWs are not found in TRI.
[c] Zinc discharge exceeds 40 CFR Part 503 limitations.

Only three TRI facilities reported transferring zinc to TNSSS POTWs with high sewage sludge zinc concentrations. To learn more about facilities that discharge zinc to POTWs, EPA analyzed the TRI data by performing the following steps:

- Ranked all TRI facilities discharging zinc to POTWs by total discharge (in pounds).
- Linked the top zinc discharging facilities to point source categories.
- Ranked the point source categories by total TWPE before POTW removals.

Figure 6-6 presents the facilities that reported the greatest amounts of zinc transfer to POTWs in TRI. The top facility presented in the figure is in the Textile Mills category (40 CFR Part 410) and accounts for 10 percent of the total zinc discharge to POTWs in TRI.

Table 6-19 presents point source categories for the TRI facilities reporting transfers of zinc to POTWs, ranked by total TWPE before POTW removals. Table 6-19 also presents the total number of facilities reporting transfers of zinc to POTWs for each point source category. As shown, the metal fishing category has the largest number of facilities reporting transfers of zinc to POTWs and the highest total TWPE. This is similar to the results from the chromium and nickel analyses; the metal finishing category had the largest number of facilities reporting transfers of chromium to POTWs. Additionally, for the nickel and zinc analysis, the metal finishing category also ranks highest, in terms of total TWPE before POTW removals.




Source: *TRIReleases2009_v2.mdb.*

**Figure 6-6. Top Zinc Dischargers in TRI**

**Table 6-19. TRI Point Source Categories Ranked by Total Zinc TWPE Transferred to POTWs[a]**

| Point Source Category | Number of Establishments in the U.S. (2007 Economic Census) | Number of Facilities Reporting Transfers to POTWs | TWPE before POTW Removals[b] | Percent of Total TWPE before POTW Removals[b] |
|---|---|---|---|---|
| Metal Finishing (Part 433) | 142,805 | 222 | 1,060 | 18% |
| Organic Chemicals, Plastics and Synthetic Fibers (Part 414) | 5,434 | 59 | 966 | 17% |
| Textile Mills (Part 410) | 6,842 | 8 | 933 | 16% |
| Nonferrous Metals Manufacturing (Part 421) | 944 | 14 | 551 | 9% |
| Rubber Manufacturing (Part 428) | 2,843 | 116 | 537 | 9% |
| Electroplating (Part 413) | 2,720 | 90 | 369 | 6% |
| Pharmaceutical Manufacturing (Part 439) | 1,960 | 8 | 223 | 4% |
| Grain Mills (Part 406) | 676 | 13 | 221 | 4% |
| Miscellaneous Foods and Beverages | 12,778 | 2 | 193 | 3% |
| Inorganic Chemicals Manufacturing (Part 415) | 1,366 | 26 | 156 | 3% |
| Gum and Wood Chemicals Manufacturing (Part 454) | 51 | 2 | 123 | 2% |
| Soap and Detergent Manufacturing (Part 417) | 878 | 7 | 104 | 2% |
| Paint Formulating (Part 446) | 1,369 | 17 | 82.9 | 1% |
| Remaining Point Source Categories | NA | 133 | 288 | 5% |

Source: 2007 U.S. Economic Census (U.S. Census, 2007) and *TRIReleases2009_v2.mdb.*
NA: Not Applicable.
[a] The data presented in Table 6-19 were not compared to TNSSS POTWs.
[b] The TWPE before POTW removals is the total TRI-reported zinc discharges transferred to POTWs.

EPA identified the point source categories of TRI facilities reporting transfers of zinc to the 35 TNSSS POTWs. Table 6-20 shows that TNSSS POTWs most commonly receive wastewater from TRI facilities in the metal finishing and rubber manufacturing point source categories, which is to be expected due to the large number of metal finishing and rubber manufacturing facilities reporting discharges of zinc, shown in Table 6-19.

To determine if industrial discharges of zinc may be contributing to higher concentrations of zinc in POTW sewage sludge, EPA compared the mean and median zinc concentrations for the POTWs in the TNSSS that are receiving discharges from industrial facilities reporting zinc to TRI to the POTWs in the TNSSS that are not receiving discharges from facilities reporting zinc to TRI. The TNSSS POTWs not in TRI were included as “Zinc Sewage Sludge Concentrations at TNSSS POTWs Without Reporting TRI Facilities.” Table 6-21 presents these results. As shown, the TNSSS POTWs with reported zinc discharges from TRI facilities have a higher mean and median zinc sewage sludge concentration. Similar to the chromium and nickel analysis results, this suggests that industrial discharges of zinc in general may be related to higher concentrations of zinc in sewage sludge.

**Table 6-20. TNSSS POTWs Receiving Zinc Transfers from TRI Facilities**

| TNSSS | | | | TRI | | |
|---|---|---|---|---|---|---|
| **POTW Name** | **City** | **State** | **Sewage Sludge Zinc Concentration (mg/kg)** | **Name of Facility** | **Total Zinc Transfer (LBY)** | **Point Source Category** |
| Wixom STP | Wixom | MI | 5,050 | Tiodize/Michigan Inc. | 95 | Metal Finishing (Part 433) |
| Topeka North WWTP | Topeka | KS | 1,530 | Delmonte Topeka Pet Food | 37.2 | Grain Mills (Part 406) |
| Salisbury WWTF | Salisbury | MD | 1,310 | Spartech FCD LLC | 5 | Plastics Molding and Forming (Part 463) |
| Huntsville Aldridge Creek WWTP | Huntsville | AL | 1,240 | TW Cylinders LLC | 18 | Metal Finishing (Part 433) |
| Middlesex Cnty UA | Sayreville | NJ | 1,190 | Cary Compounds LLC | 7.4 | Rubber Manufacturing (Part 428) |
| | | | | Veolia Es Technical Solutions LLC | 7.33 | Business Services (Part 73) |
| | | | | Madison Industries | 250 | Inorganic Chemicals Manufacturing (Part 415) |
| | | | | Akcros Chemicals Inc. | 4 | Organic Chemicals, Plastics and Synthetic Fibers (Part 414) |
| | | | | NBTY NJ (Nutro Laboratories) | 25 | Miscellaneous Foods and Beverages (Part 503) |
| Albany (WPCP No 2) | Albany | GA | 1,100 | Cooper Tire & Rubber Co. | 390 | Rubber Manufacturing (Part 428) |
| Bloomington STP North | Bloomington | IN | 872 | GEA BPO LLC. | 49 | Metal Finishing (Part 433) |
| Trinity River Authority; Ellis County WWTP | Arlington | TX | 770 | GMC Truck Group Arlington Assembly Plant | 250 | Metal Finishing (Part 433) |
| Richmond SD | Richmond | IN | 659 | Provimi North America Inc. | 0.001 | Food & Kindred Products (Part 20) |
| | | | | Belden | 23 | Copper Forming (Part 468) |
| SSSD/Lawson Fork Plant | Spartanburg | SC | 392 | RR Donnelley & Sons | 24 | Printing & Publishing (Part 508) |
| | | | | Circor Instrumentation Technologies | 3.04 | Metal Finishing (Part 433) |
| | | | | Michelin NA Inc. | 110 | Rubber Manufacturing (Part 428) |
| | | | | Goodyear Tire & Rubber Co. | 9 | Rubber Manufacturing (Part 428) |
| Southside STP #2 | Tyler | TX | 324 | Rex-Hide Industries Inc. | 250 | Rubber Manufacturing (Part 428) |
| | | | | Hargis Industries LP | 13.2 | Metal Finishing (Part 433) |
| City of Texarkana | Texarkana | TX | 308 | Cooper Tire Co. | 244 | Rubber Manufacturing (Part 428) |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.
[a] The 40 CFR Part 503 concentration ceiling for zinc is 7,500 mg/kg.

**Table 6-21. Zinc Sewage Sludge Concentrations from TNSSS POTWs With and Without Reporting TRI Facilities (mg/kg)**

| Zinc Sewage Sludge Concentrations at TNSSS POTWs | Mean | Median | Minimum | Maximum | POTW Count |
|---|---|---|---|---|---|
| With TRI Facilities Reporting Zinc | 1,210 | 991 | 308 | 5,050 | 14 |
| Without TRI Facilities Reporting Zinc | 1,010 | 750 | 216 | 8,550 | 60 |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb.*

#### 6.1.3.6 Evaluation of Pollutants Without a TWF

To compare the human health and environmental hazard potential of different chemicals, EPA uses TWFs and calculates a toxic-equivalent mass value. However, EPA has not developed TWFs for all chemicals found in wastewater. The TNSSS included many chemicals without TWFs, such as pharmaceuticals, detergents, and natural and synthetic hormones. EPA is studying the environmental contamination of pharmaceuticals, detergents, and natural and synthetic hormones, collectively referred to contaminants of emerging concern (CECs).[24] EPA began studying the fate of these contaminants in POTWS because POTW treatment systems are not designed to specifically remove CECs (U.S. EPA, 2009d).

The CECs OW included in the TNSSS were pharmaceutical chemicals, steroids and hormones, and polybrominated diphenyl ethers (PBDEs) (see Table 6-27). Most CECs found in the wastewater routed to POTWs are from domestic sources (U.S. EPA, 2009d), but they may also come from industrial sources, such as discharges from organic chemical or pharmaceutical manufacturing facilities.

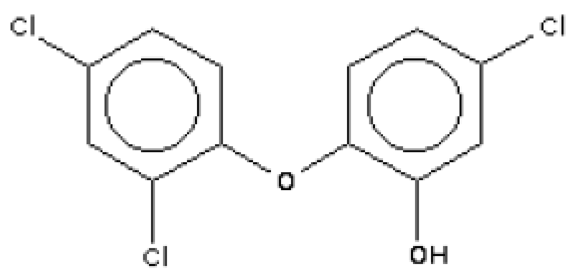
EPA examined the POTWs in the TNSSS that receive wastewater from pharmaceutical manufacturers or OCPSF facilities (as reported to TRI) to determine if any have detectable concentrations of pharmaceuticals, steroids, or hormones in sewage sludge. EPA found that two facilities in TRI discharge wastewater from pharmaceutical operations to two of the TNSSS POTWs. However, as discussed below, the two pharmaceutical facilities do not report transferring pharmaceutical chemicals to the POTWs, because pharmaceuticals are not EPCRA §313 chemicals.

In the TNSSS, OW analyzed samples for 72 CECs including pharmaceutical chemicals, steroids and hormones, and PBDEs (see Table 6-27), but none of the CECs are EPCRA §313 chemicals and therefore facilities are not required to report their discharges of these chemicals to TRI. Because of the lack of useful information from TRI, EPA analyzed the results of the TNSSS, in the general context of industrial wastewater discharges. EPA focused on three contaminants to review in detail for this analysis: the disinfectant triclosan and hormones estriol and estrone. Note, however, that past EPA studies have found that triclosan, estriol, and estrone are present at highest concentrations in domestic wastewater, not industrial discharges (U.S. EPA, 2009d).

[24] For further information on EPA's review of CECs, see http://water.epa.gov/scitech/cec/. For further information on pharmaceuticals and personal care products in water, see http://water.epa.gov/scitech/swguidance/ppcp/.

### *Triclosan*

Triclosan is a chlorinated aromatic compound, shown in Figure 6-7. It is manufactured in the U.S. by several companies, including pharmaceutical companies. Triclosan's beneficial antibacterial, antifungal, and antiviral properties make it a popular ingredient in hundreds of common commercial products. These products include soaps, dishwashing products, laundry detergents and softeners, plastics, toothpaste and mouthwashes, deodorants, cosmetics, bedding, trash bags, and surgical scrubs. Triclosan is also a registered pesticide. The primary transfer of triclosan to domestic wastewater is from household use of triclosan-containing commercial products (APUA, 2011; U.S. EPA, 2010). Up to 95 percent of triclosan is removed at POTWs that employ mechanical clarification, biological treatment or nitrification, flocculation, and filtration. The majority of triclosan is removed via biological degradation while less than 15 percent is adsorbed to the sewage sludge (APUA, 2011).




Source: *APUA, 2011*.

**Figure 6-7. Triclosan (2,4,4′-Trichloro-2′-Hydroxy-Diphenyl Ether)**

The TNSSS POTWs with the highest concentrations of triclosan in their sewage sludge are listed in Table 6-22. Table 6-23 presents statistical data for all TNSSS POTWs sampled for triclosan. The one TNSSS POTW included in TRI did not receive discharges from facilities identified in TRI as pharmaceutical manufacturers or other companies that likely manufacture triclosan.

**Table 6-22. Top TNSSS POTWs Sampled for Triclosan**

| POTW Name | Concentration (µg/kg) | Point Source Categories in TRI Discharging to POTW |
|---|---|---|
| O J Riedel WWTP, Schertz, TX | 133,000 | POTW not found in TRI |
| Verona STP, Verona, NJ | 37,500 | POTW not found in TRI |
| Buena Vista STP, Buena Vista, VA | 34,000 | POTW not found in TRI |
| Stockton WWTF, Stockton, CA | 33,300 | 406 – Grain Mills; 423 – Steam Electric Generating |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.

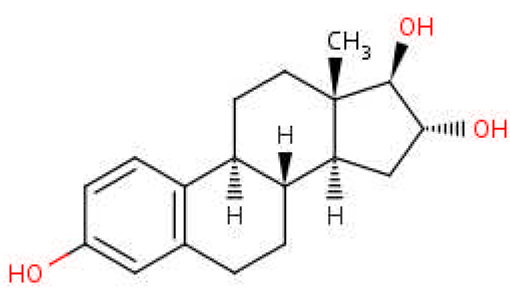
**Table 6-23. Data for All TNSSS POTWs Sampled for Triclosan**

| Statistical Measurement | Triclosan Sewage Sludge Concentration (µg/kg) |
|---|---|
| Range of concentration | 334–133,000 |
| Median concentration | 8,245 |

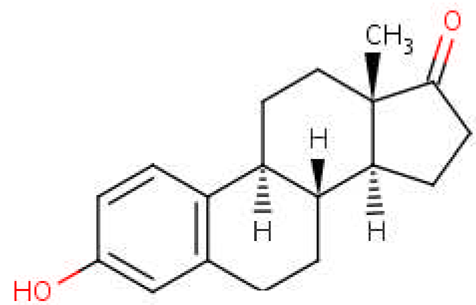
Sources: U.S. EPA, 2009a, 2009b.

### *Estriol and Estrone*

Estriol and estrone are steroidal estrogen hormones with chemical structures shown in Figure 6-8. The naturally occurring female hormones estradiol, estriol, and estrone are all types of estrogen. Estrogen compounds are essential for the growth and function of tissues in humans (NTP, 2011; U.S. EPA, 2013).



Estriol



Estrone

Source: U.S. EPA, 2013.

**Figure 6-8. Estriol and Estrone Chemical Structures**

Both natural and synthetic estriol and estrone are found in urine from men and non-pregnant women. In addition, estriol is found in elevated concentrations in the urine from pregnant women and estrone is used in combination with a progestogen for hormone-replacement therapy, in oral contraceptives, and in veterinary pharmaceuticals, all of which lead to discharges in domestic wastewater. Some cosmetic products also include traces of estrone. Consequently, although estriol and estrone are manufactured in the U.S., the primary transfer of estriol and estrone to wastewater streams is through household domestic use and sanitary wastewater, rather than industrial discharges (NTP, 2011).

EPA identified the three TNSSS POTWs with the highest concentrations of estriol and estrone in their sewage sludge. As shown in Table 6-24, two of the TNSSS POTWs received transfers of estriol and estrone reported in TRI, but neither receive wastewater from pharmaceutical manufactures or other companies that likely manufacture estriol or estrone. Table 6-25 presents statistical data for all TNSSS POTWs sampled for estriol and estrone. Both tables further support studies documenting that estriol and estrone discharges result from domestic rather than industrial sources (U.S. EPA, 2009d).

**Table 6-24. Top Estriol and Estrone Sewage Sludge Concentrations from TNSSS POTWs**

| POTW Name | Concentration (µg/kg) | Point Source Categories in TRI Discharging to POTW |
|---|---|---|
| **Estriol Concentrations** | | |
| Benton Harbor-St. Joseph, St. Joseph, MI | 232 | 413 – Electroplating; 433 – Metal Finishing |
| Wixom STP, Wixom, MI | 189 | 413 – Electroplating; 433 – Metal Finishing |
| Verona STP, Verona, NJ | 157 | POTW not found in TRI |
| **Estrone Concentrations** | | |
| Benton Harbor-St. Joseph, St. Joseph, MI | 965 | 413 – Electroplating; 433 – Metal Finishing |
| Bloomington STP North, Bloomington, IN | 768 | 433 – Metal Finishing |

Sources: U.S. EPA, 2009a, 2009b; *TRIReleases2009_v2.mdb*.

**Table 6-25. Data for All TNSSS POTWs Sampled for Estriol and Estrone**

| Statistical Measurement | Estriol/Estrone Sewage Sludge Concentration (µg/kg) |
|---|---|
| **POTWs Sampled for Estriol** | |
| Range of concentration | 6.49–232 |
| Median concentration | 24.95 |
| **POTWs Sampled for Estrone** | |
| Range of concentration | 19.7–965 |
| Median concentration | 60.5 |

Sources: U.S. EPA, 2009a, 2009b.

### *6.1.4 Additional Analyses Completed*

In addition to the sewage sludge analyses discussed above, EPA identified the watersheds receiving treated effluent from the TNSSS POTWs and their impairment status. EPA used data available in EPA's Watershed Assessment, Tracking & Environmental Results (WATERS) database to identify the TNSSS POTWs' receiving watersheds and their identified water quality impairments. EPA investigated relationships between industries discharging to TNSSS POTWs and impairments in receiving waterways.

Table 6-26 presents the receiving watersheds, impairment status, and point source categories covered by the TRI facilities discharging to each POTW for the 25 TNSSS POTWs with data available in the WATERS database. EPA only included point source categories composed primarily of indirect dischargers because these categories are most likely to have widespread impacts on POTW sewage sludge. As shown, about half of the waterways are not impaired. Of the waterways that are listed as impaired, the majority are impaired by sediments and fecal coliform. These pollutants are often associated with non-point source discharges and are not likely to originate from industrial wastewater that passes through the POTW. Waterways receiving wastewater from two POTWs, Buffalo Bird Island STP in Buffalo, New York, and Alcosan STP in Pittsburgh, Pennsylvania, are impaired for pollutants that could be linked to the point source categories in TRI discharging to the POTWs. This is a tentative association; EPA found no clear relationship between industries discharging to TNSSS POTWs and impairments in receiving waterways.

## Table 6-26. Receiving Watershed Data for TNSSS POTWs

| POTW Name[a] | City | State | Receiving Watershed Name | Impairment Status | Point Source Categories in TRI Discharging to POTW[b] |
|---|---|---|---|---|---|
| Salisbury WWTF | Salisbury | MD | Tonytank Creek-Wicomico River | Impaired by fecal coliform | 432 – Meat and Poultry Products; 463 – Plastics Molding and Forming |
| Buffalo (Sewer Auth.) Bird Island STP | Buffalo | NY | Twomile Creek-Niagara River | Impaired by PCBs, phosphorus, PAHs, floatables, pathogens, sediment/siltation, organochlorine pesticides, oxygen demand | 405 – Dairy Products Processing; 415 – Inorganic Chemicals Manufacturing; 433 – Metal Finishing; 436 – Mineral Mining and Processing; 463 – Plastics Molding and Forming; 471 – Nonferrous Metals Forming and Metal Powders |
| North Tonawanda WWTP | North Tonawanda | NY | City of North Tonawanda-Niagara River | Impaired by PAHs, organochlorine pesticides, PCBs | POTW not found in TRI |
| Little Miami Drainage Basin/WWTP | Cincinnati | OH | Duck Creek | Impaired by siltation, habitat alteration, unknown toxicity, flow alteration, organic enrichment/low dissolved oxygen | 413 – Electroplating; 433 – Metal Finishing |
| Southeast WPCP | San Francisco | CA | San Francisco Bay Estuaries | Impaired by ammonia, dieldrin (sediment), contaminated sediments (PAHs), chlordane (sediment), hydrogen sulfide, sediment toxicity | 433 – Metal Finishing |
| Wixom STP | Wixom | MI | Newburgh Lake-Middle River Rouge | Impaired by dissolved oxygen, PCBs, PCBs in fish tissue | 413 – Electroplating; 433 – Metal Finishing |
| Geneva Marsh Creek WWTP | Geneva | NY | Castle Creek-Seneca Lake | Not impaired | 426 – Glass Manufacturing |
| Elizabeth City WWTP | Elizabeth City | NC | Elizabeth City-Pasquotank River | Not impaired | POTW not found in TRI |
| Buena Vista STP | Buena Vista | VA | Bennetts Run-Maury River | Not impaired | POTW not found in TRI |
| Elizabethton WWTP | Elizabethton | TN | Gap Creek-Watauga river | Not impaired | 433 – Metal Finishing |
| Elkins WWTF | Elkins | WV | Files Creek | Not impaired | POTW not found in TRI |
| SSSD/Lawson Fork Plant[c] | Spartanburg | SC | Lawson Fork Creek | Not impaired | 414 – Organic Chemicals, Plastics And Synthetic Fibers; 417 – Soap And Detergent Manufacturing; 428 – Rubber Manufacturing; 433 – Metal Finishing |
| Hillsborough WWTP | Hillsborough | NC | Stony Creek-Eno River | Not impaired | POTW not found in TRI |
| Alcosan STP (Allegheny County) | Pittsburgh | PA | Kilbuck Run-Ohio River | Impaired by Suspended Solids, pH, Metals (other than mercury) | 426 – Glass Manufacturing; 433 – Metal Finishing |

## Table 6-26. Receiving Watershed Data for TNSSS POTWs

| POTW Name[a] | City | State | Receiving Watershed Name | Impairment Status | Point Source Categories in TRI Discharging to POTW[b] |
|---|---|---|---|---|---|
| Bedford WWTP & Sewer System | Bedford | OH | Brandywine Creek | Impaired by PCBs in fish tissue | 433 – Metal Finishing |
| Alum Creek WWTP & Sewers | Columbus | OH | Kebler Run | Not impaired | POTW not found in TRI |
| Mingo Junction WWTP & Sewer System | Mingo Junction | OH | Wills Creek-Ohio River | Impaired by iron, bacteria, 2,3,7,8-tetrachlorodibenzo-p-dioxin; PCBs, PCBs in fish tissue | POTW not found in TRI |
| Punxsutawney Boro STP | Punxsutawney | PA | Perryville Run-Mahoning Creek | Not impaired | POTW not found in TRI |
| Brush Creek STP | Irwin | PA | Brush Creek | Not impaired | POTW not found in TRI |
| Northeast Ohio Regional Sewer District, Southerly WWTP | Cleveland | OH | City of Cleveland-Cuyahoga River | Impaired by PCBs in fish tissue | 413 – Electroplating; 433 – Metal Finishing; 464 – Metal Molding and Casting (Foundries); 467 – Aluminum Forming; 468 – Copper Forming; 471 – Nonferrous Metals Forming and Metal Powders |
| Dale Mabry AWWTP | Tampa | FL | Double Bayou-Rocky Creek Frontal | Impaired by turbidity, nutrients, fecal coliform, total coliform, dissolved oxygen, total suspended solids, coliforms | POTW not found in TRI |
| Bloomington STP North | Bloomington | IN | Buck Creek-Beanblossom Creek | Not impaired | 433 – Metal Finishing |
| Richmond SD | Richmond | IN | Rocky Fork-East Fork Whitewater River | Not impaired | 405 – Dairy Products Processing; 433 – Metal Finishing; 468 – Copper Forming |
| Huntington City Of | Huntington | WV | Smith Creek-Guyandotte River | Not impaired | POTW not found in TRI |
| Middle East Fork WWTP & Sewers | Batavia | OH | Fivemile Creek-East Fork Little Miami River | Impaired by nutrients, organic enrichment/low DO, siltation | POTW not found in TRI |

Sources: DMR Loading Tool; Envirofacts; U.S. EPA, 2009a, 2009b.

[a] EPA is updating the WATERS database, so the analysis relied on an incomplete dataset: only 25 of 74 POTWs had data available.

[b] Excluding point source categories with less than 30 percent indirect discharges in the TRI database.

[c] The SSSD/Lawson Fork Plant is not found in the DMR databases. According to Envirofacts, the facility is inactive. Receiving waters information was pulled from Envirofacts.

### *6.1.5 Summary of Findings from EPA's Review of Industrial Wastewater Pollutants in Sewage Sludge*

EPA used TNSSS data in combination with data from TRI to identify industrial wastewater discharges potentially affecting the quality of POTW sewage sludge and its beneficial use. Because the TNSSS did not identify industrial discharges to POTWs, EPA used TRI reports of transfers of toxic chemicals to identify possible industrial dischargers to the POTWs included in the TNSSS. EPA identified the following:

- Of the 74 POTWs in the TNSSS, 35 POTWs receive wastewater from at least one industrial facility reporting to TRI, representing 47 percent of the POTWs in the TNSSS. The remaining 39 TNSSS POTWs likely also receive industrial wastewater, but the specific facilities discharging to the POTWs are not required to report to TRI.
- In TRI, 153 facilities reported transferring toxic chemicals to 35 of 74 POTWs that were included in the TNSSS. Because of the TRI reporting thresholds, it is likely that additional industrial facilities discharged to these POTWs, but are not required to report to TRI.
- The 153 facilities that reported transferring toxic chemicals to TNSSS POTWs have wastewater discharges covered by ELGs for 28 different point source categories.[25] Of the reported TRI transfers to the TNSSS POTWs, the Metal Finishing point source category (40 CFR Part 433) had the highest number of facilities reporting discharges to TNSSS POTWs (52 out of 153).
- Only 21 pollutants are included in both the TNSSS and TRI. When the TNSSS pollutant transfers reported in TRI are ranked by TWPE before POTW removals, nitrate compounds is the top pollutant. TNSSS measured nitrite/nitrate in every sewage sludge sample.
- Of the 21 pollutants in both the TNSSS and TRI, 17 are metals. Because the metals will not easily biodegrade, they are expected to accumulate in sewage sludge. TNSSS found the metals in virtually every sewage sludge sample.

  Of the point source categories in TRI, Metal Finishing (40 CFR Part 433) contributes the greatest amount of TWPE potentially transferred to sewage sludge (to all POTWs with TRI reported data, not just the POTWs included in the TNSSS).

- Chromium, nickel, and zinc concentrations in some of the TNSSS samples exceeded 40 CFR Part 503 land application ceilings/surface disposal limits. Nickel concentrations exceeded the ceiling/limit in three of 84 sewage sludge samples; chromium and zinc concentrations exceeded the ceiling/limit in one of 84 samples.

  As Table 6-13, Table 6-17, and Table 6-21 show, EPA found that POTWs for which industrial wastewater transfers were reported in TRI have higher mean and

[25] EPA only included point source categories composed primarily of indirect dischargers because these categories are most likely to have widespread impacts on POTW sludge.

median chromium, nickel, and zinc concentrations than those without TRI-reported discharges. This suggests that industrial discharges of chromium, nickel, and zinc in general may be related to higher concentrations of these metals in sewage sludge.

- As part of the TNSSS analysis, OW found that of the POTWs observed exceeding the land application ceilings, one incinerated its treated sewage sludge on site, while the others sent their sewage sludge to landfills. Thus, results from the TNSSS indicated that POTWs were generally complying with the existing land application standards for metals.
- In reviewing CECs discharges, EPA could not identify industrial facilities discharging triclosan, estriol, and estrone. Because of the source and use of these chemicals, triclosan, estriol, and estrone present in sewage sludge most likely result from domestic wastewater discharges, not industrial discharges.

### *6.1.6 References for Industrial Wastewater Pollutants in Sewage Sludge*

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## Table 6-27. Analytes Sampled in the TNSSS[a]

| | | |
|---|---|---|
| **Metals** | | |
| Aluminum | *Copper* | *Selenium* |
| *Antimony* | Iron | *Silver* |
| *Arsenic* | *Lead* | Sodium |
| *Barium* | Magnesium | *Thallium* |
| Beryllium | *Manganese* | Tin |
| Boron | *Mercury* | Titanium |
| *Cadmium* | *Molybdenum*[b] | *Vanadium* |
| Calcium | *Nickel* | Yttrium |
| *Chromium* | Phosphorus[c] | *Zinc* |
| *Cobalt* | | |
| **Organics** | | |
| 2-Methylnaphthalene | *Benzo(a)pyrene*[d] | *Fluoranthene*[d] |
| 4-Chloroaniline | *Bis(2-ethylhexyl)phthalate*[e] | Pyrene |
| **Inorganic Anions** | | |
| Fluoride | Water-extractable phosphorus | *Nitrate/nitrite*[f] |
| **PBDEs** | | |
| BDE-28 | BDE-99 | BDE-154 |
| BDE-47 | BDE-100 | BDE-183 |
| BDE-66 | BDE-138 | BDE-209 |
| BDE-85 | BDE-153 | |
| **Steroids and Hormones** | | |
| 17 alpha-dihydroequilin | Campesterol | Ergosterol |
| 17 alpha-estradiol | Cholestanol | Estriol |
| 17 alpha-ethinyl-estradiol | Cholesterol | Estrone |
| 17 beta-estradiol | Coprostanol | Norethindrone |
| Androstenedione | Desmosterol | Norgestrel |
| Andrasterone | Epicoprostanol | Progesterone |
| Beta stigmastanol | Equilenin | Stigmasterol |
| Beta-estradiol 3-benzoate | Equilin | Testosterone |
| Beta-sitosterol | | |
| **Pharmaceutical Chemicals** | | |
| 1,7-dimethylxanthine | Demeclocycline | Oxolinic acid |
| 4-epianhydrochlortetracycline (EACTC) | Digoxigenin | Oxytetracycline (OTC) |
| 4-epianhydrotetracycline (EATC) | Digoxin | Penicillin G |
| 4-epichlortetracycline (ECTC) | Diltiazem | Penicillin V |
| 4-epioxytetracycline (EOTC) | Diphenhydramine | Ranitidine |
| 4-epitetracycline (ETC) | Doxycycline | Roxithromycin |
| Acetaminophen | Enrofloxacin | Sarafloxacin |
| Albuterol | Erythromycin-total | Sulfachloropyridazine |
| Anhydrochlortetracycline (ACTC) | Flumequine | Sulfadiazine |
| Anhydrotetracycline (ATC) | Fluoxetine | Sulfadimethoxine |
| Azithromycin | Gemfibrozil | Sulfamerazine |
| Caffeine | Ibuprofen | Sulfamethazine |
| Carbadox | Isochlortetracycline (ICTC) | Sulfamethizole |
| Carbamazepine | Lincomycin | Sulfamethoxazole |
| Cefotaxime | Lomefloxacin | Sulfanilamide |
| Chlortetracycline (CTC) | Metformin | Sulfathiazole |
| Cimetidine | Miconazole | Tetracycline (TC) |
| Ciprofloxacin | Minocycline | Thiabendazole |

**Table 6-27. Analytes Sampled in the TNSSS[a]**

| | | |
|---|---|---|
| Clarithromycin | Naproxen | Triclocarban[g] |
| Clinafloxacin | Norfloxacin | Triclosan[g] |
| Cloxacillin | Norgestimate | Trimethoprim |
| Codeine | Ofloxacin | Tylosin |
| Cotinine | Ormetoprim | Virginiamycin |
| Dehydronifedipine | Oxacillin | Warfarin |

Sources: U.S. EPA, 2009a, 2009b.

[a] Italics indicate pollutants reported as discharged in the 2009 TRI Database.

[b] TRI includes only molybdenum trioxide, not any other molybdenum compounds; EPA included the TRI pollutant molybdenum trioxide in the analysis to represent the TNSSS molybdenum.

[c] TRI only lists discharges from phosphorus (yellow or white), and facilities have incorrectly reported discharges of total phosphorus as phosphorus (yellow or white); therefore, TRI phosphorus discharges to POTWs or surface water do not necessarily represent industrial discharges (Bicknell and Finseth, 2006). EPA did not include phosphorus in the analysis.

[d] Benzo(a)pyrene and fluoranthene are polycyclic aromatic compounds (PACs), and TRI requires facilities to report total PACs, not individual chemicals; EPA included the TRI pollutant PACs in the analysis to represent the TNSSS benzo(a)pyrene and fluoranthene.

[e] Bis(2-ethylhexyl) phthalate in TNSSS is called di(2-ethylhexyl) phthalate in TRI; EPA included the TRI pollutant di(2-ethylhexyl)phthalate in the analysis to represent the TNSSS bis(2-ethylhexyl) phthalate.

[f] TRI includes the toxic chemical group "nitrate compounds." Because "nitrate compounds" is the TRI chemical group that is closest to the TNSSS analyte, "nitrate/nitrite," EPA used "nitrate compounds" in the analysis to represent the TNSSS analyte "nitrate/nitrite." Nitrate/nitrite compounds in sewage sludge are of concern because they are nutrients.

[g] Triclocarban and triclosan are disinfectants, not pharmaceutical chemicals. However, in the TNSSS disinfectants are grouped under pharmaceutical chemicals because they are detected with the same analytical method.

**Table 6-28. Analytes Analyzed in the TNSSS: Applicability of Relevant EPA Programs**

| Pollutant Group | Pollutant[a] | CAS Number[a] | TWF[b] | CWA Priority Pollutant[c] | Regulated under 40 CFR 503[d] | CAPs[e] | TRI-Listed Chemical[b] |
|---|---|---|---|---|---|---|---|
| Inorganic Anions | Fluoride | 16984488 | NA | No | No | No | No |
| | Nitrate/nitrite | C005 (14797558/ 14797650) | 7.47E-04 | No | No | No | Yes |
| | Water-extractable phosphorus | C055 (7723140) | NA | No | No | No | No |
| Metals | Aluminum | 7429905 | 0.06 | No | No | No | No |
| | Antimony | 7440360 | 0.01 | Yes | No | No | Yes |
| | Arsenic | 7440382 | 4.04 | Yes | Yes | No | Yes |
| | Barium | 7440393 | 1.99E-03 | No | No | No | Yes |
| | Beryllium | 7440417 | 1.05 | Yes | No | No | No |
| | Boron | 7440428 | 8.34E-03 | No | No | No | No |
| | Cadmium | 7440439 | 23.1 | Yes | Yes | No | Yes |
| | Calcium | 7440702 | NA | No | No | No | No |
| | Chromium | 7440473 | 0.07 | Yes | Yes | No | Yes |
| | Cobalt | 7440484 | 0.11 | No | No | No | Yes |
| | Copper | 7440508 | 0.63 | Yes | Yes | No | Yes |
| | Iron | 7439896 | 5.60E-03 | No | No | No | No |
| | Lead | 7439921 | 2.24 | Yes | Yes | No | Yes |
| | Magnesium | 7439954 | 8.66E-04 | No | No | No | No |
| | Manganese | 7439965 | 0.07 | No | No | No | Yes |
| | Mercury | 7439976 | 117 | Yes | Yes | No | Yes |
| | Molybdenum | 7439987 | 0.2 | No | Yes | No | Yes |
| | Nickel | 7440020 | 0.1 | Yes | Yes | No | Yes |
| | Phosphorus[f] | 7723140 | NA | No | No | No | No |
| | Selenium | 7782492 | 1.12 | Yes | Yes | No | Yes |
| | Silver | 7440224 | 16.5 | Yes | No | No | Yes |
| | Sodium | 7440235 | 5.49E-06 | No | No | No | No |
| | Thallium | 7440280 | 1.02 | Yes | No | No | Yes |
| | Tin | 7440315 | 0.3 | No | No | No | No |
| | Titanium | 7440326 | 0.02 | No | No | No | No |
| | Vanadium | 7440622 | 0.03 | No | No | No | Yes |
| | Yttrium | 7440655 | NA | No | No | No | No |
| | Zinc | 7440666 | 0.04 | Yes | Yes | No | Yes |
| Organics | 2-Methylnaphthalene | 91576 | NA | No | No | No | No |
| | Benzo(a)pyrene | 50328 | 101 | Yes | No | No | Yes |

## Table 6-28. Analytes Analyzed in the TNSSS: Applicability of Relevant EPA Programs

| Pollutant Group | Pollutant[a] | CAS Number[a] | TWF[b] | CWA Priority Pollutant[c] | Regulated under 40 CFR 503[d] | CAPs[e] | TRI-Listed Chemical[b] |
|---|---|---|---|---|---|---|---|
| | Fluoranthene | 206440 | 1.28 | Yes | No | No | Yes |
| | Pyrene | 129000 | 0.09 | Yes | No | No | No |
| | 4-chloroaniline | 106478 | 0.02 | No | No | No | No |
| | Bis(2-ethylhexyl)phthalate | 117817 | 0.25 | Yes | No | Yes | Yes |
| PBDEs | BDE-138 | 182677301 | NA | No | No | Yes | No |
| | BDE-153 | 68631492 | NA | No | No | Yes | No |
| | BDE-154 | 207122154 | NA | No | No | Yes | No |
| | BDE-183 | 207122165 | NA | No | No | Yes | No |
| | BDE-209 | 1163195 | NA | No | No | Yes | No |
| | BDE-28 | 41318756 | NA | No | No | Yes | No |
| | BDE-47 | 5436431 | NA | No | No | Yes | No |
| | BDE-66 | 189084615 | NA | No | No | Yes | No |
| | BDE-85 | 182346210 | NA | No | No | Yes | No |
| | BDE-99 | 60348609 | NA | No | No | Yes | No |
| | BDE-100 | 189084648 | NA | No | No | Yes | No |
| Pharmaceutical chemicals | 4-epi-anhydrochlortetracycline (EACTC) | 158018532 | NA | No | No | No | No |
| | 4-epi-anhydrotetracycline (EATC) | 4465650 | NA | No | No | No | No |
| | 4-epi-chlortetracycline (ECTC) | 14297939 | NA | No | No | No | No |
| | 4-epi-oxytetracycline (EOTC) | 14206587 | NA | No | No | No | No |
| | 4-epi-tetracycline (ETC) | 23313806 | NA | No | No | No | No |
| | Anhydrochlortetracycline (ACTC) | 4497089 | NA | No | No | No | No |
| | Anhydrotetracycline (ATC) | 4496859 | NA | No | No | No | No |
| | Azithromycin | 83905015 | NA | No | No | No | No |
| | Carbadox | 6804075 | NA | No | No | No | No |
| | Cefotaxime | 63527526 | NA | No | No | No | No |
| | Chlortetracycline (CTC) | 57625 | NA | No | No | No | No |
| | Ciprofloxacin | 85721331 | NA | No | No | No | No |
| | Clarithromycin | 81103119 | NA | No | No | No | No |
| | Clinafloxacin | 105956976 | NA | No | No | No | No |
| | Cloxacillin | 61723 | NA | No | No | No | No |
| | Demeclocycline | 127333 | NA | No | No | No | No |

## Table 6-28. Analytes Analyzed in the TNSSS: Applicability of Relevant EPA Programs

| Pollutant Group | Pollutant[a] | CAS Number[a] | TWF[b] | CWA Priority Pollutant[c] | Regulated under 40 CFR 503[d] | CAPs[e] | TRI-Listed Chemical[b] |
|---|---|---|---|---|---|---|---|
| | Doxycycline | 564250 | NA | No | No | No | No |
| | Enrofloxacin | 93106606 | NA | No | No | No | No |
| | Erythromycin—total | 114078 | NA | No | No | No | No |
| | Flumequine | 42835256 | NA | No | No | No | No |
| | Isochlortetracycline (ICTC) | 514534 | NA | No | No | No | No |
| | Lincomycin | 154212 | NA | No | No | No | No |
| | Lomefloxacin | 98079517 | NA | No | No | No | No |
| | Minocycline | 10118908 | NA | No | No | No | No |
| | Norfloxacin | 70458967 | NA | No | No | No | No |
| | Ofloxacin | 82419361 | NA | No | No | No | No |
| | Ormetoprim | 6981186 | NA | No | No | No | No |
| | Oxacillin | 66795 | NA | No | No | No | No |
| | Oxolinic acid | 14698294 | NA | No | No | No | No |
| | Oxytetracycline (OTC) | 79572 | NA | No | No | No | No |
| | Penicillin G | 61336 | NA | No | No | No | No |
| | Penicillin V | 87081 | NA | No | No | No | No |
| | Roxithromycin | 80214831 | NA | No | No | No | No |
| | Sarafloxacin | 98105998 | NA | No | No | No | No |
| | Sulfachloropyridazine | 80320 | NA | No | No | No | No |
| | Sulfadiazine | 68359 | NA | No | No | No | No |
| | Sulfadimethoxine | 122112 | NA | No | No | No | No |
| | Sulfamerazine | 127797 | NA | No | No | No | No |
| | Sulfamethazine | 57681 | NA | No | No | No | No |
| | Sulfamethizole | 144821 | NA | No | No | No | No |
| | Sulfamethoxazole | 723466 | NA | No | No | No | No |
| | Sulfanilamide | 63741 | NA | No | No | No | No |
| | Sulfathiazole | 72140 | NA | No | No | No | No |
| | Tetracycline (TC) | 60548 | NA | No | No | No | No |
| | Triclocarban | 101202 | NA | No | No | No | No |
| | Triclosan | 3380345 | NA | No | No | No | No |
| | Trimethoprim | 738705 | NA | No | No | No | No |
| | Tylosin | 1401690 | NA | No | No | No | No |
| | Virginiamycin | 11006761 | NA | No | No | No | No |
| | 1,7-dimethylxanthine | 611596 | NA | No | No | No | No |

**Table 6-28. Analytes Analyzed in the TNSSS: Applicability of Relevant EPA Programs**

| Pollutant Group | Pollutant[a] | CAS Number[a] | TWF[b] | CWA Priority Pollutant[c] | Regulated under 40 CFR 503[d] | CAPs[e] | TRI-Listed Chemical[b] |
|---|---|---|---|---|---|---|---|
| | Acetaminophen | 103902 | NA | No | No | No | No |
| | Albuterol | 18559949 | NA | No | No | No | No |
| | Caffeine | 58082 | NA | No | No | No | No |
| | Carbamazepine | 298464 | NA | No | No | No | No |
| | Cimetidine | 51481619 | NA | No | No | No | No |
| | Codeine | 76573 | NA | No | No | No | No |
| | Cotinine | 486566 | NA | No | No | No | No |
| | Dehydronifedipine | 67035227 | NA | No | No | No | No |
| | Digoxigenin | 1672464 | NA | No | No | No | No |
| | Digoxin | 20830755 | NA | No | No | No | No |
| | Diltiazem | 42399417 | NA | No | No | No | No |
| | Diphenhydramine | 58731 | NA | No | No | No | No |
| | Fluoxetine | 54910893 | NA | No | No | No | No |
| | Gemfibrozil | 25812300 | NA | No | No | No | No |
| | Ibuprofen | 15687271 | NA | No | No | No | No |
| | Metformin | 657249 | NA | No | No | No | No |
| | Miconazole | 22916478 | NA | No | No | No | No |
| | Naproxen | 22204531 | NA | No | No | No | No |
| | Norgestimate | 35189287 | NA | No | No | No | No |
| | Ranitidine | 66357355 | NA | No | No | No | No |
| | Thiabendazole | 148798 | 7.99E-03 | No | No | No | No |
| | Warfarin | 81812 | NA | No | No | No | No |
| Steroids and Hormones | 17 alpha-dihydroequilin | 651558 | NA | No | No | No | No |
| | 17 alpha-estradiol | 57910 | NA | No | No | No | No |
| | 17 alpha-ethinyl estradiol | 57636 | NA | No | No | No | No |
| | 17 beta-estradiol | 50282 | NA | No | No | No | No |
| | Androstenedione | 63058 | NA | No | No | No | No |
| | Androsterone | 53418 | NA | No | No | No | No |
| | Beta-estradiol-3-benzoate | 50500 | NA | No | No | No | No |
| | Equilenin | 517099 | NA | No | No | No | No |
| | Equilin | 474862 | NA | No | No | No | No |
| | Estriol | 50271 | NA | No | No | No | No |
| | Estrone | 53167 | NA | No | No | No | No |
| | Norethindrone | 68224 | NA | No | No | No | No |

**Table 6-28. Analytes Analyzed in the TNSSS: Applicability of Relevant EPA Programs**

| Pollutant Group | Pollutant[a] | CAS Number[a] | TWF[b] | CWA Priority Pollutant[c] | Regulated under 40 CFR 503[d] | CAPs[e] | TRI-Listed Chemical[b] |
|---|---|---|---|---|---|---|---|
| | Norgestrel | 6533002 | NA | No | No | No | No |
| | Progesterone | 57830 | NA | No | No | No | No |
| | Testosterone | 58220 | NA | No | No | No | No |
| | Beta-sitosterol | 83465 | NA | No | No | No | No |
| | Beta-stigmastanol | 19466478 | NA | No | No | No | No |
| | Campesterol | 474624 | NA | No | No | No | No |
| | Cholestanol | 80977 | NA | No | No | No | No |
| | Cholesterol | 57885 | NA | No | No | No | No |
| | Coprostanol | 360689 | NA | No | No | No | No |
| | Desmosterol | 313042 | NA | No | No | No | No |
| | Epi-coprostanol | 516927 | NA | No | No | No | No |
| | Ergosterol | 57874 | NA | No | No | No | No |
| | Stigmasterol | 83487 | NA | No | No | No | No |

NA: Not applicable.
No: Information was not available for the pollutant.
[a] U.S. EPA, 2009b.
[b] DMR Loading Tool.
[c] 40 CFR 423, Appendix A.
[d] 40 CFR 503.
[e] U.S. EPA Chemical Action Plans.
[f] Phosphorus (yellow or white) is a TRI-listed chemical. Yellow and white phosphorus, both allotropes of elemental phosphorus, are hazardous chemicals that spontaneously ignite in air. EPA determined that facilities were incorrectly reporting discharges of total phosphorus (i.e., the phosphorus portion of phosphorus-containing compounds) as phosphorus (yellow or white). Elemental phosphorus is insoluble in water and POTWs do not accept wastewater containing it because of the hazard associated with the chemical (Bicknell and Finseth, 2006). The phosphorus measured in the TNSSS was total phosphorus and is not applicable to TRI.

## 6.2 Review of Chemical Action Plans

As part of EPA's chemicals management program under the Toxic Substances Control Act (TSCA), the Office of Chemical Safety and Pollution Prevention's (OCSPP) Office of Pollution Prevention and Toxic Substances (OPPT) had developed chemical action plans (CAPs) for commercial chemicals that it determined posed a concern to the public. Between 2009 and 2011, OPPT published CAPs for 10 chemicals or classes of chemicals. The CAPs summarize each chemical's available hazard, exposure, and use information; outline the risks that each chemical may present; and identify the specific steps OPPT is taking to address those risks.

In February 2012, OPPT modified its approach for evaluating existing chemicals under TSCA and began the Work Plan Chemicals initiative. For this effort, OPPT identified a work plan of 83 chemicals for further assessment. OPPT initially identified seven chemicals from the plan for detailed risk assessment in 2012 and continues to identify new chemical for risk assessment each year. OPPT intends to use the TSCA Work Plan Chemicals list to help focus and direct the activities of the Existing Chemicals Program over the next several years.

For its 2012 Annual Review, EPA's Office of Water (OW) reviewed the 10 existing CAPs as a source of data to augment its traditional toxicity rankings analysis (TRA) conducted in the odd-year reviews. OW reviewed the CAPs to determine which industries may produce, process, or release the chemicals to the environment, particularly through wastewater discharges directly to surface water or indirectly to publicly owned treatment works (POTWs). This section summarizes information contained in the CAPs related to chemical manufacturing and use and potential wastewater discharges. Where possible, OW used information from the CAPs, along with data from other sources (such as discharge monitoring reports (DMR) and/or the Toxics Release Inventory (TRI)), to identify any unregulated industrial wastewater discharges or new pollutant discharges from regulated industries that are not addressed or adequately controlled by existing ELGs. OW used information in the CAPs to identify chemicals for potential further review.

From this initial CAP review, OW found the following:

- Of the 10 chemicals for which OPPT developed CAPs, one category is being phased out of U.S. commerce; OW does not intend to pursue further review for Penta, Octa, and Decabromodiphenyl Ethers (PBDEs).
- Six of the chemicals or classes of chemicals for which OPPT developed CAPs have continued production and known or potential wastewater discharges: Benzidine dyes, Bisphenol A (BPA), Hexabromocyclododecane (HBCD), Nonylphenol and Nonylphenol Ethoxylates, Perfluorinated Chemicals (PFCs), and Phthalates.
- Although SCCPs are no longer manufactured in the U.S., they have been used in metal working and have the potential to be discharged in wastewater from this industry.
- Two of the chemicals, Methylene Diphenyl Diisocyanate (MDI) and Toluene Diisocyanate (TDI) do not have significant wastewater discharges. However, OW identified that the hydrolysis byproducts of TDI and MDI, toluene diamine and methyl diphenyl diamine, may be present in industrial wastewater.

### *6.2.1 OPPT Chemical Action Plans Background*

OPPT's existing chemicals program addresses pollution prevention, risk assessment, hazard and exposure assessment and characterization, and risk management for chemical substances in commercial use, as authorized by TSCA. The TSCA Inventory of chemicals in commerce now exceeds 84,000 chemicals. Periodic TSCA chemical data reporting indicates that there are approximately 7,000 chemicals currently produced at volumes of 25,000 pounds or greater. For chemicals with well-characterized hazard concerns and the possibility of significant exposure, OPPT performs risk assessments and may evaluate risk mitigation strategies. The existing chemicals program focuses assessments on consumer exposure from product use, but may include some data on wastewater pollutant generation from chemical manufacturing, where it is available or relevant (U.S. EPA, 2012a).

In 2009, OPPT began to identify chemicals that pose a concern to the public and initiated appropriate actions to alleviate those concerns. OPPT selected 10 commercial chemicals for initial action plan development based on whether they were:

- Identified as persistent, bioaccumulative, and toxic.
- High production volume chemicals.
- Found in consumer products.
- Potentially of concern for their impact on children's health due to reproductive or developmental effects.
- Subject to review and potential action in international forums.
- Found in human bio-monitoring programs.
- Part of a category generally identified as being of potential concern in the new chemicals program.

From 2009 through 2011, OPPT developed CAPs for the following 10 commercial chemicals or classes of chemicals:

1. Benzidine dyes (August 2010);
2. Bisphenol A (March 2010);
3. Hexabromocyclododecane (August 2010);
4. Methylene diphenyl diisocyanate (April 2011);
5. Nonylphenol and nonylphenol ethoxylates (August 2010);
6. Perfluorinated chemicals (December 2009);
7. Penta-, octa-, and decabromodiphenyl ethers (December 2009);
8. Phthalates (March 2012);
9. Short-chain chlorinated paraffins (December 2009); and
10. Toluene diisocyanate (April 2011).[26]

[26] Toluene diisocyanate is similar to methylene diphenyl diisocyanate; therefore, OW discusses both chemicals together in Section 6.2.2.4.

OPPT also identified actions it intends to take to address the outlined concerns. Table 6-29 describes some of the specific actions OPPT may take.

**Table 6-29. Potential Actions Identified in CAPs**

| Action | Authorization | Description |
|---|---|---|
| Add chemical to the Toxics Release Inventory (TRI) | Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) | Section 313 of EPCRA requires U.S. facilities to report annually how much of specific listed chemicals they release into the environment through emissions to air, water, or land disposal. This information is stored in the TRI database and is available to the public. |
| Develop additional data (Section 4 test rules) | Section 4(a) of TSCA | Section 4(a) of TSCA allows EPA to require the development of data to determine whether a specific chemical presents an unreasonable risk of injury to the environment. This may include hazard data and exposure monitoring. |
| Develop or revise Significant New Use Rule (SNUR) for specific new uses of the chemical | Section 5(a) of TSCA | A SNUR requires manufacturers who intend to use a chemical for the identified significant new use to submit an application to the Agency for review prior to beginning that activity. This process gives OPPT a chance to regulate the manufacture, import, or processing of that chemical substance. |
| Prohibit or limit the chemical’s manufacture, processing, or distribution into commerce | Section 6 of TSCA | If EPA finds that there is a reasonable basis to conclude that a chemical’s manufacture, processing, distribution, use, or disposal presents an unreasonable risk, EPA may take action to:<br>• Prohibit or limit manufacture, processing, or distribution in commerce.<br>• Prohibit or limit the manufacture, processing, or distribution in commerce of the chemical substance above a specified concentration.<br>• Require adequate warnings and instructions with respect to use, distribution, or disposal.<br>• Require manufacturers or processors to make and retain records.<br>• Prohibit or regulate any manner of commercial use.<br>• Prohibit or regulate any manner of disposal.<br>• Require manufacturers or processors to give notice of unreasonable risk of injury, and to recall products if required. |
| Issue a data call-in | Section 8(c) of TSCA | EPA can require companies to record, retain, and report allegations of significant adverse reactions to any substance/mixture that they produce, import, process, or distribute. |
| Require reporting of relevant data | Section 8(d) of TSCA | EPA can initiate rulemaking for one-time reporting of relevant unpublished health and safety studies. |
| Conduct Design for the Environment (DfE) alternatives assessment | None, EPA Partnership Program | Through DfE, EPA may assess alternatives to specific chemicals that it can encourage industry to use, and to move away from using certain chemicals, instead of, or in addition to any regulatory action taken under TSCA. |
| Other voluntary initiatives | None | EPA may work with industry to develop voluntary agreements to phase out the use of certain chemicals. |

Depending upon the action initiated, OPPT may generate or have access to data that can characterize industrial wastewater sources, determine the presence of the chemical in industrial wastewater, and potentially quantify the amount of chemical discharged. For instance, if a chemical is added to TRI, the quantity of chemical released directly to surface waters or indirectly to POTWs must be reported. In addition, if OPPT takes action to ban certain chemicals, the chemicals likely will not be of concern in the future. In its review of the CAPs in the following sections, OW outlines OPPT's current or planned actions for each chemical.

### *6.2.2 OPPT Chemicals Reviewed*

OW reviewed the 10 CAPs available on OPPT's website to identify industrial categories currently manufacturing and using the chemicals. OW also reviewed information in the CAPs on whether the chemicals, or any of their degradation products, enter the wastewater and are discharged to surface waters or POTWs.

The following subsections provide a brief overview of OPPT's CAPs, including:

- Chemical production and use data.
- Potential presence and, if available, quantity of the chemicals in industrial wastewater discharge.
- Toxicity and exposure routes.
- Actions that OPPT is initiating that may generate additional industrial wastewater discharge data in the future.

In each section, OW also identifies, based on the chemical production and use data described in the CAP, which industries may produce or process the chemical and thus may be potential sources of release into the environment.

In addition, OW includes a discussion of toxic weighting factors (TWFs), if available, in the "toxicity and exposure routes" discussion for each chemical. OW has calculated TWFs for 1,064 chemicals based on the concentrations in water at which they become harmful to aquatic life, and the levels in fish tissue at which they become harmful to humans. OW uses this information to weight the toxicity of chemicals relative to copper, a common toxic pollutant in industrial waste streams. TWFs range from 0.000000131 to over 940 million for the most toxic pollutants, such as Radium 228 (U.S. EPA, 2007). TWFs enable OW to assess the toxicity of a wastestream containing varying amounts of different chemicals (each with a different toxicity) by calculating the total toxic-weighted pounds in the wastestream, referred to as toxic-weighted pound equivalents (TWPE). OW uses the TWPE during effluent guidelines program planning to rank industries by their total annual toxic weighted discharges, identifying those that may warrant additional research (U.S. EPA, 2012b).

Finally, each section ends with a summary of OPPT's planned actions and OW's findings from its initial review of each chemical.

#### 6.2.2.1 Benzidine Dyes

***Chemical Production and Use***

The Dyes Derived from Benzidine and Its Congeners CAP (Benzidine Dyes CAP) focuses on four benzidine-based dyes and 44 benzidine congener–based dyes (U.S. EPA, 2010a). For a complete list of the chemicals, see Appendix 1 of the Benzidine Dyes CAP.

Benzidine based-dyes and congener-based dyes (also called azo dyes) are used in textiles, paints and coatings, and pharmaceutical production; paper and leather dyeing; and plastics converting and compounding (U.S. EPA, 2010a). Dye production in the U.S. has been steadily declining for the past decade, largely due to the increase in imported finished textiles. Only two of the 48 benzidine dyes were reported on the 2006 Inventory Update Rule (IUR),[27] which required manufacturers and importers of over 25,000 pounds of chemical per year to provide OPPT with information on the production and use of the chemicals. OPPT further indicates that only 12 of the 44 congener-based dyes are likely available in the U.S., and all in quantities below the IUR threshold of 25,000 pounds per year (U.S. EPA, 2010a).

***Presence in Industrial Wastewater***

The industrial categories that produce or use benzidine or its congener dyes in the processes listed above may include:

- Textiles (40 CFR Part 410)
- Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) (40 CFR Part 414)
- Leather Tanning and Finishing (40 CFR Part 425)
- Pulp, Paper and Paperboard (40 CFR Part 430)
- Paint Formulating (40 CFR Part 446)
- Ink Formulating (40 CFR Part 447)
- Plastics Molding and Forming (40 CFR Part 463)

OW was not able to identify any readily available wastewater generation or discharge data from the CAP or other sources, including DMR and TRI data.

***Toxicity and Exposure Routes***

Benzidine and its congeners are important precursors in the synthesis of dyes. Some of these dyes have the potential to metabolize to carcinogenic aromatic amines; therefore, OPPT's focus is on human exposure, particularly oral, dermal, or inhalation routes (U.S. EPA, 2010a). OPPT is currently not certain of the risk to the general population from release to the environment. Biodegradation studies indicate that the dyes biodegrade at negligible to slow rates under aerobic conditions in the environment. In anaerobic soils, the dyes may be reduced, but it is unclear whether metabolites from these reductions exist in large concentrations or locations of concern to the public (U.S. EPA, 2010a).

Benzidine and its congeners do not currently have TWFs. If OW identifies discharges of these chemicals in industrial wastewater in the future, it may consider developing a TWF to characterize the relative toxicity of the discharges more fully.

[27] During the time in which OW reviewed OPPT's CAPs as part of the 2012 Annual Review, the 2006 IUR provided the most recent data source for chemical manufacturing, processing, and use as well as production volume information. In February 2013, EPA released the results of its 2012 Chemical Data Reporting (CDR) Rule, which provides updated chemical inventory and use data (see http://epa.gov/cdr/). Due to the timing of its release, OW did not consider the 2012 CDR in its 2012 Annual Review.

***OPPT Actions***

OPPT has taken and is planning the following actions related to benzidine and its congener-based dyes:

- In March 2012, proposed a rulemaking to add nine benzidine dyes to an existing SNUR for benzidine-based chemical substances, di-n-pentyl phthalate, and alkanes C12-13, chloro (77 FR 18752). Potentially affected entities include manufacturers, importers, or processors of any of these chemicals; entities that plan to use the chemicals in conjunction with apparel and other finished products made from fabrics, leather, and similar materials; entities which plan to use the chemicals in conjunction with paper and allied products; and manufacturers, importers, or processors of the chemical substances in printing inks.
- Consider additional regulatory action, if OPPT determines that there are other ongoing uses for these dyes and that it needs information to determine whether those uses present concerns that should be addressed.

***OW's Findings***

Dye production has been declining over the past decade due to an increase in imported finished textiles and, as a result, OPPT is focused on consumer exposure to finished products. However, based on the available information, OW has determined that benzidine dyes may be present in industrial wastewater discharges from several regulated industrial categories most likely including OCPSF; textiles; leather tanning and finishing; pulp, paper, and paperboard; and ink formulating.

#### 6.2.2.2 Bisphenol A

***Chemical Production and Use***

Bisphenol A (BPA) is widely used in the manufacture of plastics and epoxy resins for containers (food and beverage containers, containers used in the healthcare industry), flame retardants, coatings (such as those used in the electronics, appliances, and the automobile industry), and pipes and tanks requiring chemical resistant resins (U.S. EPA, 2010b). A small number of companies manufacture most of the BPA in the U.S., but numerous companies process BPA-based materials into final goods.

***Presence in Industrial Wastewater***

BPA is listed under the TRI[28] as 4-4' Isopropylidenediphenol (CAS 80-05-7). Table 6-30 shows the industrial categories reporting direct and indirect discharges of BPA to TRI in 2011. The ELGs for the regulated point source categories listed in Table 6-30 (denoted with a 40 CFR Part number) do not regulate BPA.

[28] For a complete listing of the TRI listed chemicals see: http://www2.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals.

**Table 6-30. Discharges of BPA by Point Source Category as Reported to TRI in 2011**

| 40 CFR Part | Point Source Category Description | Direct Release (lb/yr) | Indirect Release (lb/yr) | Total Release (lb/yr) | Total TWPE (lbs-eq/yr) |
|---|---|---|---|---|---|
| -- | Industry Category Not Assigned in TRI | 2,750 | 4 | 2,760[a] | 6.49 |
| 430 | Pulp, paper and paperboard | 0 | 1,100 | 1,100 | 2.58 |
| 433 | Metal Finishing | 0 | 118 | 118 | 0.278 |
| 464 | Metal molding and casting (foundries) | 0 | 22 | 22 | 0.051 |
| 414 | Organic chemicals, plastics and synthetic fibers (OCPSF) | 1,910 | 14 | 1,930 | 4.53 |
| 417 | Soap and detergent manufacturing | -- | 4 | 4 | 0.010 |
| 446 | Paint formulating | -- | 4 | 4 | 0.009 |
| Total | | 4,660 | 1,260 | 5,930 | 13.9 |

Source: DMR Loading Tool
Note: Sums of individual values may not equal the total presented, due to rounding.
[a] A majority of the releases are from a single facility without an assigned industry category in TRI, however, this facility also reports to DMR and is assigned to OCPSF (40 CFR Part 414).

Washing manufactured products that contain BPA can release BPA into facility wastewater. However, discharges to wastewater are minor compared to releases to air and land. Wastewater releases accounted for less than 1 percent of the BPA releases reported to TRI in 2011 (TRI Explorer). In 2011, less than 6,000 pounds of BPA were discharged to surface waters or indirectly to POTWs.

Based on the limited data available in the CAP, OPPT only identified one study from 2001 to 2002 that assessed the discharge of BPA from a wastewater treatment plant in Louisiana. BPA was not detected in the plant's effluent (detection limit was 0.001 ug/L) (U.S. EPA, 2010b).

***Toxicity and Exposure Routes***

BPA is a reproductive, developmental, and systemic toxicant in animal studies and is weakly estrogenic, therefore OPPT has concerns about its potential impact particularly on children's health and the environment. Most human exposures come from food packaging materials, and are under FDA's jurisdiction. However, this exposure accounts for only about five percent of the BPA produced (U.S. EPA, 2010b). As a result, OPPT's focus is on human and environmental exposure from manufacturing, processing, and industrial uses, commercial uses, select consumer uses, incidental ingestion from consumer products, and ingestion of BPA in drinking water contaminated by wastewater releases to surface water, by landfill leachate, or from distribution systems with BPA-based pipes (U.S. EPA, 2010b).

OPPT assessed limited data regarding the concentrations of BPA in the environment. Most environmental monitoring results show concentrations of BPA in waterbodies at levels less than 1 ug/L, with a median concentration of 0.14 ug/L. This median concentration is lower than any calculated predicted no effect concentration (PNEC) (U.S. EPA, 2010b). However, OPPT indicates additional data are needed to determine how many areas exceed PNEC values or concentrations of concern, how often these concentrations are exceeded, and what pathways lead to BPA presence in the environment from manufacturing, processing, distribution in commerce, use, or disposal.

Further, recent and novel low-dose studies describe subtle effects in laboratory animals at very low concentrations, though the translation to human health effects is currently unclear. The studies are of concern because they indicate effects at or approaching levels measured in the environment. In addition, endocrine-related effects in fish, aquatic invertebrates, amphibians, and reptiles have been reported at exposure levels lower than those required for acute toxicity (U.S. EPA, 2010b).

BPA has a TWF of 0.002354074 (U.S. EPA, 2007), though this TWF has not been updated since at least 2003. According to the CAP, several government assessments and numerous toxicological studies have evaluated the effects of BPA since 2004. Some of the assessments suggest that BPA potentially elicits endocrine-related effects at low doses, lower than those usually seen to elicit effects in standard toxicity tests (U.S. EPA, 2010b). Though total reported releases of BPA (as shown in Table 6-30) are low, OW is concerned that the current TWF may be underestimating the discharge hazard.

***OPPT Actions***

OPPT has taken and is planning the following actions related to BPA:

- On January 29, 2014, EPA published a final alternatives assessment for *Bisphenol A (BPA) Alternatives in Thermal Paper* (U.S. EPA, 2014a). A draft of this assessment was open for public review and comment period from July 31, 2012, to October 1, 2012.
- Consider initiating a rulemaking to develop additional data to determine whether BPA presents an unreasonable risk of injury to the environment. This rulemaking may include testing or monitoring data near landfills, manufacturing facilities, or similar locations to determine the potential for BPA to enter surface water, ground water, and drinking water.

***OW's Findings***

Several industrial categories reported discharges of BPA in 2011 to TRI; however, BPA is not currently regulated by existing ELGs. Though quantity and total TWPE of reported BPA discharges are low (less than 15 lb-eq/yr) (DMR Loading Tool), OW has concerns that the associated risks are underestimated and the TWF may need to be reevaluated. The current TWF does not account for new toxicity data, which suggests endocrine-related affects may occur at much lower doses.

#### 6.2.2.3 Hexabromocyclododecane

***Chemical Production and Use***

Hexabromocyclododecane (HBCD) is a category of brominated flame retardants consisting of 16 possible isomers. It is used to make flame retardant additives, thermal insulation foam, and plastic enclosures. HBCD may also be used as a flame retardant in the backcoating of textiles for upholstered furniture, upholstery seating, draperies, wall coverings, mattress ticking, and interior textiles (though the 2006 IUR indicated that less than one percent of the total commercial and consumer use of HBCD was used for fabrics, textiles, and apparel). In addition, HBCD is used in high-impact polystyrene in electrical and electronic appliances (U.S. EPA, 2010c).

In the 2006 IUR, five facilities reported either manufacturing or importing at least 25,000 pounds (the IUR reporting threshold) of HBCD: Albemarle (2 facilities), BASF, LG Chem America, and Chemtura (U.S. EPA, 2006).

***Presence in Industrial Wastewater***

The industrial categories that produce or use HBCD in the processes listed above may include:

- Textiles (40 CFR Part 410);
- OCPSF (40 CFR Part 414);
- Rubber Manufacturing (40 CFR Part 428);
- Plastics Molding and Forming (40 CFR Part 463); and
- Electrical and Electronic Components (40 CFR 469).

The ELGs for the categories listed above do not regulate HBCDs.

HBCD is an additive flame retardant, meaning it is not chemically bound to the matrix of the material it protects, and thus may enter the environment when finished products are washed (U.S. EPA, 2010c).The HBCD CAP and other readily available information did not provide wastewater generation or discharge information relevant to the U.S. However, the European Chemicals Agency (ECHA) reported that in 2008, 50 percent of the releases of HBCD were to wastewater, as compared to other environmental media (U.S. EPA, 2010c). A Swedish source indicated that the primary source of release in Europe is from textile applications, though these data may not translate to the U.S. Based on the 2006 IUR, less than one percent of the total volume of HBCD was used for textile applications, therefore OPPT expects releases from this source to be relatively small (U.S. EPA, 2010c).

***Toxicity and Exposure Routes***

HBCD is typically manufactured as a powder, a portion of which is micronized. The small size of the particles make human inhalation a concern. HBCD also is persistent, bioaccumulative, and has toxic properties (PBT), particularly to aquatic organisms. It has been measured in a variety of environmental media including air, sediment, marine mammals, freshwater fish, aquatic invertebrates, and birds (U.S. EPA, 2010c).

OPPT did not identify any readily available information on the release of HBCD to the environment in the U.S. However, ECHA reported a release of 3,100 kg/year in Europe, 50 percent of which went to wastewater, 29 percent to surface water, and 21 percent to air (ECHA, 2009). Data from the United Kingdom indicate that the primary sources of HBCD release are fugitive emissions during its manufacture and subsequent use in products, leaching from landfills, and incinerator emissions (U.S. EPA. 2010c).

Currently, HBCD does not have a TWF. If OW identifies discharges of HBCD in industrial wastewater in the future, it may need to consider developing a TWF to more fully characterize and understand the relative toxicity of the discharges.

***OPPT Actions***

OPPT has taken and is planning the following actions related to HBCD:

- In March 2012, proposed a SNUR covering HBCD's use in consumer textiles other than motor vehicles (77 FR 17386).
- Consider initiating a rulemaking to add HBCD to TRI.
- In April 2011, began coordinating with DfE on a Partnership on Flame Retardant Alternatives for Hexabromocyclododecane (HBCD).[29] In September 2013, EPA posted the draft DfE alternatives assessment for public comment.

***OW's Findings***

Based on the available information, HBCD may be present in industrial wastewater discharges from several industrial point source categories. Studies in Europe suggest that there could be significant wastewater discharges, though OW is currently uncertain about the specific sources and significance of the discharge in the U.S.

#### 6.2.2.4 Methylene Diphenyl Diisocyanate and Toluene Diisocyanate

***Chemical Production and Use***

Methylene diphenyl diisocyanate (MDI) and toluene diisocyanate (TDI) are chemically similar, but may be used in different applications. According to the 2006 IUR, MDI is used in adhesives and sealants, paints and coatings, transportation products, rubber and plastic products, and lubricants, greases and fuel additives (U.S. EPA, 2011a). TDI is primarily used in the production of flexible foams, but may also be used in coatings, adhesives, binders, and sealants (U.S. EPA, 2011b). MDI and TDI are generally supplied as raw materials to formulators who combine them with other chemicals to create different polyurethanes with a wide variety of applications (U.S. EPA, 2011a, 2011b).

***Presence in Industrial Wastewater***

The industrial categories that produce or use MDI or TDI in the processes listed above may include:

- Textiles (40 CFR Part 410);
- OCSPF (40 CFR Part 414);
- Rubber Manufacturing (40 CFR Part 428);
- Paint Formulating (40 CFR Part 446);
- Plastics Molding and Forming (40 CFR Part 463); and

[29] For more information on the DfE Partnership on Flame Retardant Alternatives for Hexabromocyclododecane see http://www.epa.gov/dfe/pubs/projects/hbcd/index.htm.

- Electrical and Electronic Components (40 CFR Part 469).

In water, TDI will hydrolyze into toluene diamine (U.S. EPA, 2011b) and MDI will hydrolyze into methyl diphenyl diamine (U.S. EPA, 2011a). Toluene diamine is a TRI listed chemical. In 2011, only one facility reported discharges of toluene diamine to TRI, with a total discharge of 5 pounds per year (DMR Loading Tool). OPPT has not regulated methyl diphenyl diamine under TRI; therefore, OW does not have any data to characterize its presence in industrial wastewater.

The ELGs for the categories listed above do not regulate TDI, MDI or their hydrolysis byproducts.

***Toxicity and Exposure Routes***

The hazards associated with TDI and MDI have centered on human health effects because of their low ecotoxicity profiles. Toxicological data indicate moderate to low toxicity in aquatic organisms (U.S. EPA, 2011a, 2011b).

In humans, diisocyanates are documented as dermal and inhalation sensitizers. However, exposure to products containing cured polyurethanes has not generally been a concern because cured products are considered inert and nontoxic. OPPT developed CAPs for MDI and TDI to address more recent concerns about the presence of uncured MDI and TDI in products used by or around consumers as well as unprotected building occupants (primarily as an inhalation and dermal exposure concern) (U.S. EPA, 2011a, 2011b).

MDI and TDI do not currently have TWFs; however, toluene diamine (a TDI hydrolysis byproduct) is a TRI-listed chemical and has a TWF of 0.3388 (U.S. EPA, 2007). OPPT has not regulated methyl diphenyl diamine (an MDI hydrolysis byproduct) under TRI, and OW has not developed an associated TWF. If OW identifies discharges of methyl diphenyl diamine in industrial wastewater in the future, it may need to consider developing a TWF to more fully characterize and understand the relative toxicity of the discharges.

***OPPT Actions***

OPPT is planning the following actions related to MDI:

- In September 2012, sent a letter to nine companies requesting information on curing times for polyisocyanate products. OPPT is in the process of looking at data received in response to the letter for exposure information. If, after considering the data submitted, OPPT determines more information is still needed, the Agency will consider developing a proposed rule under TSCA Section 8(d) to require chemical manufacturers (including importers) to submit unpublished health and safety data on diisocyanates.

OPPT is planning the following actions related to TDI:

- Develop a SNUR for uncured TDI and its related polyisocyanates in consumer products. The Proposed SNUR for TDI and related compounds for consumer use is scheduled for publication in Fall 2014. The SNUR contains a SNU for seven

TDI and related compounds. For this proposed rule, the general SNUR article exemption for persons who import or process TDI and related compounds would not apply.

- In September 2012, sent a letter to nine companies requesting information on curing times for polyisocyanate products. OPPT is in the process of looking at data received in response to the letter for exposure information. If, after considering the data submitted, OPPT still believes more data is needed, the Agency will consider developing a proposed rule under TSCA Section 8(d) to require chemical manufacturers (including importers) to submit unpublished health and safety data on diisocyanates.

***OW's Findings***

In water, TDI will hydrolyze into toluene diamine and MDI will hydrolyze into methyl diphenyl diamine; therefore, MDI and TDI may not directly pose a significant source or hazard in industrial wastewater discharge. However, available information suggests that the MDI and TDI hydrolysis byproducts may be present in industrial wastewater, though OW is currently uncertain of the extent of concern. In 2011, one facility reported discharges of toluene diamine to TRI, with a total discharge of 5 pounds per year (DMR Loading Tool). OW does not currently have any data characterizing discharges of methyl diphenyl diamine.

#### 6.2.2.5 Nonylphenol and Nonylphenol Ethoxylates

***Chemical Production and Use***

Nonylphenol (NP) and nonylphenol ethoxylates (NPEs) are used to manufacture resin and synthetic rubber (stabilizer), printing ink, and soap (including industrial laundry detergents) and cleaning products (U.S. EPA, 2010d). Kirk-Othmer states that the major use for NPEs is in the production of nonionic surfactants, constituting 80 percent of the total use (Kirk-Othmer, 2003). The primary use of NP is as an intermediate in the manufacture of NPEs (U.S. EPA, 2010d).

***Presence in Industrial Wastewater***

The industrial categories that produce or use NP or NPEs in the processes listed above may include:

- Textiles (40 CFR Part 410);
- OCSPF (40 CFR Part 414);
- Soap and Detergent Manufacturing (40 CFR Part 417);
- Rubber Manufacturing (40 CFR Part 428);
- Pulp, Paper and Paperboard (40 CFR Part 430);
- Oil and Gas Extraction (40 CFR Part 435);
- Paint Formulating (40 CFR Part 446); and
- Ink Formulating (40 CFR Part 447).

The ELGs for the categories listed above do not regulate NP or NPEs. Further, OW was not able to identify, through either the CAP or other readily available information, data on wastewater generation or discharge of NP and NPEs in the U.S. However, information from the European Union and Canada indicates environmental releases to water during the manufacture and use of NP and NPEs (EU, 2002 and Environment Canada, 2001).

Industrial laundries, which are not currently regulated by ELGs, may also be significant sources of discharge because of the continued use of detergents containing NPEs. In fact, industrial laundry detergents are the current focus of OPPTs voluntary initiatives to phase out the use of NPEs.

OW previously evaluated industrial laundry discharges when it developed proposed pretreatment standards for this industry in 1997. The proposed pretreatment standards included limits for 11 pollutants, but did not include NPs or NPEs (U.S. EPA, 2000). In 1999, OW ultimately decided not to promulgate national pretreatment standards for industrial laundries (64 FR 45071). OW determined that the discharges to POTWs did not represent a problem warranting national regulation because the pretreatment options determined to be economically achievable would remove only a small amount of pollutants. In addition, OW believed that POTWs were generally not experiencing problems from industrial laundry discharges, and that any discharges would be adequately controlled by the existing pretreatment program.

***Toxicity and Exposure Routes***

NP is persistent in the aquatic environment, moderately bioaccumulative, and extremely toxic to aquatic organisms. NPEs, though less toxic than NP, are also highly toxic to aquatic organisms and, in the environment, tend to degrade to NP, which is more environmentally persistent (U.S. EPA, 2010d). EPA has developed water quality criteria for NP, as shown in Table 6-31 (U.S. EPA, 2005).

**Table 6-31. NP Water Quality Criteria**

| Species | Acute Water Quality Criteria | Chronic Water Quality Criteria |
|---|---|---|
| Freshwater species | 28 ug/L | 6.6 ug/L |
| Saltwater species | 7 ug/L | 1.7 ug/L |

According to the CAP, there is likely significant environmental exposure to NP and NPEs from facilities that manufacture NP- and NPE-containing products and that are discharging to surface waters. A range of surface water and sediment levels have been measured in the U.S: some measurements of NP near industrial discharges exceeded the water quality criteria (U.S. EPA, 2010d). In addition, sewage treatment plants are common receivers of NPE discharges, possibly due to the use of industrial laundry detergents. At sewage treatment plants, NPEs degrade to shorter-chain NPEs and are expected to partition to sludge (U.S. EPA, 2010d).

Currently NP and NPEs do not have TWFs. If OW identifies discharges of NP and NPEs in industrial wastewater in the future, it may need to consider developing TWFs to more fully characterize and understand the relative toxicity of the discharges.

#### *OPPT Actions*

OPPT has taken and is planning the following actions related to NP and NPEs:

- In May 2012, coordinated with DfE to release *An Alternatives Assessment for Nonylphenol Ethoxylates* (U.S. EPA, 2012c).
- Support and encourage the voluntary phase-out of NPEs in industrial laundry detergents in coordination with DfE Safer Detergents Stewardship Initiative.[30] This program will end the use of NPEs in industrial laundry detergents by 2013 for liquid detergents and 2014 for powdered detergents.
- Encourage manufacturers of all NPE-containing direct release products to move to NPE-free formulations.
- Develop an alternatives analysis and encourage the elimination of NPEs in other industries that discharge NPEs to water, such as the pulp and paper and textile processing sectors.
- Initiate rulemaking to propose a SNUR for NP and NPEs for use of NPEs no longer being manufactured. The Proposed NP/NPE SNUR is currently scheduled for publication in 2014.
- In June 2009, issued an advanced notice of proposed rule under TSCA Section 4 test rules to require the development of information necessary to determine the effects that NP and NPEs have on human health or the environment (74 FR 28654). EPA intends to evaluate how releases and exposures are mitigated through the phase-out action; and plans to finalize any proposed testing actions accordingly.
- Initiate rulemaking to add NP and NPEs to TRI. On June 20, 2013 EPA published a proposed Nonylphenol Category to TRI (78 FR 37176).

#### *OW's Findings*

Though NP and NPEs may phase out of use in industrial laundry detergents over the next few years, available data and information suggest that they likely are present in wastewater discharge from several industrial categories. NP and NPEs have been measured in surface water and sediment in the U.S. and data from the European Union and Canada suggest there have been environmental releases to water during the manufacture and use of NP and NPEs.

### 6.2.2.6 Perfluorinated Chemicals (Long-Chain)

#### *Chemical Production and Use*

Long-chain perfluorinated compounds (PFCs) are a family of fluorine-containing chemicals with unique properties that make materials resistant to stains and to sticking. PFCs are used to manufacture wire, cable, and apparel. Additionally, PFCs are used as cookware coatings

[30] For more information on the Safer Detergent Stewardship Initiative see http://www.epa.gov/oppt/dfe/pubs/projects/formulat/sdsi.htm

and other miscellaneous coatings including carpets, paper products, and other precursor products (U.S. EPA, 2009a).

There are two subcategories of PFCs: perfluoroalkyl sulfonates (PFAS) and long-chain perfluoroalkyl carboxylates (PFAC). The PFAS subcategory includes perfluorohexane sulfonic acid (PFHxS) and perfluorooctane sulfonic acid (PFOS). The PFAC subcategory includes perfluorooctanoic acid (PFOA).

PFAS manufacturing has dwindled significantly since 2003 when 3M, the principal U.S. producer of PFOS, phased out production. According to OPPT, PFAS are no longer manufactured in the U.S. (U.S. EPA, 2009a).

PFAC on the other hand is still widely produced. The U.S. accounts for more than 50 percent of the world's fluorotelomer production (fluorotelomers are precursors to some long chain PFACs). Half the fluorotelomer production is in textiles and apparel, followed by carpet, carpet care products, and coatings—including coatings for paper products (U.S. EPA, 2009a).

To address concerns surrounding releases of PFOA, OPPT initiated a 2010/2015 Stewardship Program (U.S. EPA, 2012d). Under the program, manufacturing companies voluntarily committed to reducing PFOA emissions and product content by 95 percent by 2010. Additionally companies that chose to participate in the program would work to eliminate PFOA emissions and product content by 2015. In 2006, the eight major PFOA manufacturers joined the PFOA Stewardship Program (see Section 6.2.3 for more details).

***Presence in Industrial Wastewater***

PFCs are manufactured by OCPSF (40 CFR Part 414) facilities and used in products covered by many other industrial categories; however, no ELGs currently regulate the discharge of PFCs. These chemicals can enter the wastewater during manufacture and via washing of manufactured products (U.S. EPA, 2009a). PFOA, in particular, has been detected in industrial wastewater discharges from OCPSF facilities. These discharges in some cases are causing surface water concentrations above a provisional health advisory level for drinking water. In addition, OPPT has suggested that PFOA may be present in industrial wastewater discharges from a variety of other industries that use imported PFOA in the manufacture of products such as clothing and cookware (U.S. EPA, 2009a). Because of the extent of information and available data, OW presents its review of wastewater discharges related to PFCs, and PFOA in particular, below in Section 6.2.3. Section 6.2.3 also briefly discusses PFOA wastewater treatment.

***Toxicity and Exposure Routes***

PFCs have been found worldwide in the environment, wildlife, and in humans. PFCs are persistent in the environment and bioaccumulative in wildlife and humans. Significant adverse effects have been observed in laboratory animals and wildlife, though not in humans (U.S. EPA, 2009a).

PFAS and PFAC contamination and entry points into the environment seem to vary by location and among species, suggesting multiple sources of emissions (U.S. EPA, 2009a). PFAC and PFAS have been found in untreated groundwater, rivers, streams, bays, estuaries, oceans, and even rainwater. OPPT has documented specific releases from manufacturing (see the discussion in Section 6.2.3 for more details on industrial discharges of PFOA). In some cases, PFOA releases near industrial facilities have contaminated drinking water supplies. As of April 2013, citizens in Woods County, West Virginia continue to express concerns related to drinking water supplies contaminated with PFOA from operations at a DuPont-owned plant. The citizens contend that DuPont is not meeting its end of the agreement under the Stewardship Program (Inside EPA, 2013).

Currently PFCs, including PFOA, do not have TWFs. OW may consider developing TWFs for these pollutants, as additional discharge data become available, to more fully characterize and understand the relative toxicity of the discharges.

***OPPT Actions***

OPPT has taken and is planning the following actions related to PFCs:

- On September 30, 2013, EPA issued a rule requiring companies to report all new uses of long-chain perfluoroalkyl carboxylates (LCPFAC) as part of carpets or to treat carpets. Companies now must report to EPA their intent to manufacture (including import) LCPFAC-containing products intended for use as part of carpets or to treat carpets, as well as import carpets already containing these chemical substances (78 FR 62443).
- EPA intends to propose a SNUR under section 5(a)(2) of the Toxic Substances Control Act (TSCA) for long-chain perfluoroalkyl carboxylate (LCPFAC) chemical substances, and for perfluorooctanoic acid (PFOA) or its salts. EPA also intends to propose to make the article exemption inapplicable to the import of certain identified chemical substances.
- Evaluate the potential for disproportionate impact on children and other sub-populations; incorporating this effort as a part of published rules.
- Continue to work with companies to eliminate long-chain PFCs from emissions and products through the 2010/2015 PFOA Stewardship Program (U.S. EPA, 2012d). OPPT will also continue to evaluate alternatives under EPA's New Chemicals Program and collaborate with other countries on managing PFCs.

***OW's Findings***

OW has found that PFCs, specifically PFOA, are present in industrial wastewater discharge from OCPSF facilities (40 CFR Part 414) and that the discharges in some cases are resulting in surface water concentrations above a provisional health advisory level for drinking water. OPPT has suggested that PFOA may be present in industrial wastewater discharge from a variety of other industries that use imported PFOA in the manufacture of various products such as clothing and cookware (U.S. EPA, 2009a). However, PFCs are not currently regulated by existing ELGs.

OPPT also investigated potential wastewater treatment options and determined that biological treatment systems are not successful in treating PFOA (U.S. EPA, 2009a). EPA's Office of Ground Water and Drinking Water (OGWDW) drinking water treatment technology data suggest that granular activated carbon (GAC) may be a viable solution for eliminating PFOA in drinking water (U.S. EPA, 2012e), but it is unclear if that technology could be effective in an industrial wastewater matrix.

#### 6.2.2.7 Penta, Octa, and Decabromodiphenyl Ethers

***Chemical Production and Use***

Penta-, octa-, and decabromodiphenyl ethers (PBDEs) are flame retardants. OPPT's CAP reported that the sole domestic manufacturer of commercial mixtures of pentaBDE and octaBDE phased out their production in 2004 (U.S. EPA, 2009b). DecaBDE is still manufactured and used in the U.S. The three major product categories that use decaBDE as an additive flame retardant include textiles, electronics equipment, and building and construction materials, with its primary use being in high impact polystyrene-based products. However, through the U.S. EPA DecaBDE Phase-Out Initiative (U.S. EPA, 2012f), OPPT received commitments from the primary manufacturers and importers of decaBDE to reduce production beginning in 2010.

***Presence in Industrial Wastewater***

The industrial categories that produce or use PBDEs in the processes listed above may include:

- Textiles (40 CFR Part 410);
- OCSPF (40 CFR Part 414);
- Plastic Molding and Forming (40 CFR Part 463); and
- Electrical and Electrical Components (40 CFR Part 469).

PBDEs are not regulated by these ELGs and OW was not able to identify any data regarding their presence in industrial wastewater discharge.

***Toxicity and Exposure Routes***

OPPT is concerned that some of the component congeners of PBDEs are persistent, bioaccumulative, and toxic. The mechanisms by which PBDEs enter the environment are not known, but likely include releases from manufacturing of the chemicals, manufacturing of products such as textiles and plastics that use the chemicals, and from wear and disposal of treated products over time (U.S. EPA, 2009b). Studies indicate that the primary exposure for humans is the use of PBDEs in commercial products that are part of the indoor environment (foam cushions, computer circuitry, fabrics, etc.). PBDEs are not chemically bound to plastics, foam, fabrics, or other products in which they are used, making them more likely to leach out of these products (U.S. EPA, 2009b). Despite phase-out of production in the U.S., some reports indicate that levels of PBDEs in humans and the environment are increasing (U.S. EPA, 2009b). One potential source is imported articles to which these compounds have been added. Another is the possible breakdown of decaBDE into more toxic and bioaccumulative PBDE congeners.

Currently PBDEs do not have TWFs. If OW identifies discharges of PBDEs in industrial wastewater in the future, it may need to consider developing TWFs to more fully characterize and understand the relative toxicity of the discharges.

### *OPPT Actions*

OPPT has taken and is planning the following actions related to PBDEs:

- In April 2012, proposed to amend the PBDE SNUR to add processing of the six PBDE congeners in penta- and octaPBDE as a significant new use; add manufacturing, importing, or processing of decaBDE as a significant new use; and designate the manufacture or processing of any article to which PBDEs have been added as a significant new use (77 FR 19861).
- In April 2012, issued a proposed TSCA Section 4 test rule for penta-, octa-, and decaBDE to require development of information necessary to determine the effects of manufacturing, processing, or other activities on human health and the environment (77 FR 19861).
- Support and encourage the voluntary phase-out of the manufacture and import of decaBDE (U.S. EPA, 2012f).
- In support of the phase-out, on January 29$^{th}$, 2014, EPA published *An Alternatives Assessment for the Flame-Retardant Decabromodiphenyl Ether (DecaBDE)* (U.S. EPA, 2014b). A draft of this assessment was open for public review and comment from July 30, 2012 to September 30, 2012.

### *OW's Findings*

Based on review of the CAP and other readily available information, OW has found that PBDEs in industrial wastewater discharges are not a significant source that needs to be considered in ELG development. According to OPPT, pentaBDE and octaBDE are no longer produced in the U.S., and OPPT is working to phase out decaBDE.

## 6.2.2.8 Phthalates

### *Chemical Production and Use*

Phthalates are used as plasticizers in polyvinyl chloride (PVC) products and to manufacture paints and coatings, cement, carpet and rugs, wood kitchen cabinets and countertops, and explosives. The CAP identifies eight individual phthalate esters, with ten separate CAS numbers, that warrant an assessment and management strategy (see Table 6-32 for the list of phthalates covered in the CAP) (U.S. EPA, 2012g).

### *Presence in Industrial Wastewater*

Two point source categories, OCPSF (40 CFR Part 414) and Centralized Waste Treatment (CWT) (40 CFR Part 437), regulate three of the eight phthalates identified in the CAP. In addition, two of the eight phthalates are TRI-listed chemicals. Table 6-32 presents the phthalates discussed in the CAP and identifies those that are regulated by the existing ELGs and/or are listed under TRI. Table 6-33 presents the phthalate limits from Parts 414[31] and 437, respectively.[32]

**Table 6-32. Phthalates in CAP Regulated by ELGs and/or Listed in TRI**

| Phthalate Ester Identified in CAP | CAS No. | Common Name(s) | Regulated under Part 414 | Regulated under Part 437 | TRI Listed Chemical |
|---|---|---|---|---|---|
| 1,2-Benzenedicarboxylic acid, 1,2-dibutyl ester (DBP) | 84-74-2 | Dibutyl phthalate, Di-n-butyl phthalate | X | | X |
| 1,2-Benzenedicarboxylic acid, 1,2-bis-(2methylpropyl) ester (DIBP) | 84-69-5 | Diisobutyl phthalate | | | |
| 1,2-Benzenedicarboxylic acid, 1-butyl 2(phenylmethyl) ester (BBP) | 85-68-7 | Butylbenzyl phthalate | | X | |
| 1,2-Benzenedicarboxylid acid, 1,2-dipentyl ester (DnPP) | 131-18-0 | Di-n-pentyl phthalate | | | |
| 1,2-Benzenedicarboxylic acid, 1,2-bis(2ethylhexyl) ester (DEHP) | 117-81-7 | Bis(2-ethylhexyl)phthalate, Di(2-ethylhexyl)phthalate | X | X | X |
| 1,2-Benzenedicarboxylic acid, 1,2-dioctyl ester (DnOP) | 117-84-0 | OP Di-n-octyl phthalate | | | |
| 1,2-Benzenedicarboxylic acid, 1,2-diisononyl ester (DINP) | 28553-12-0 | Diisononyl phthalate | | | |
| 1,2-benzenedicarboxylic acid, di-$C_8$-$C_{10}$-branched alkyl esters, $C_9$-rich (Part of DINP) | 68515-48-0 | Di-($C_9$-rich branched $C_8$-$C_{10}$ - alkyl) phthalate | | | |
| 1,2-Benzenedicarboxylic acid, 1,2-diisodecyl ester (DIDP) | 26761-40-0 | Diisodecyl phthalate | | | |
| 1,2-Benzenedicarboxylic acid, di-$C_9$-$C_{11}$-branched alkyl esters, $C_{10}$-rich (Part of DIDP) | 68515-49-1 | Di-($C_{10}$-rich branched $C_9$-$C_{11}$- alkyl) phthalate | | | |

Sources: 40 CFR 414, 40 CFR 437, EPCRA Section 313 Chemical List for Reporting Year 2011.

[31] Part 414 also regulates diethyl and dimethyl phthalate, which are not discussed in the Phthalates CAP.
[32] For a complete listing of the TRI listed chemicals see: http://www2.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals.

**Table 6-33. ELG Limits for Regulated Phthalates**

| Point Source Category | Pollutant Name | Daily Maximum (mg/L) | Monthly Average (mg/L) | Type of Limit |
|---|---|---|---|---|
| OCPSF | Bis(2-ethylhexyl)phthalate (DEHP) | 279 | 103 | BAT and NSPS, Subpart I—Direct Discharge Point Sources That Use End-of-Pipe Biological Treatment |
| | Di-n-butyl phthalate (DBP) | 57 | 27 | |
| | Diethyl phthalate [a] | 203 | 81 | |
| | Dimethyl phthalate[a] | 47 | 19 | |
| | Bis(2-ethylhexyl)phthalate (DEHP) | 258 | 95 | BAT and NSPS, Subpart J—Direct Discharge Point Sources That Do Not Use End-of-Pipe Biological Treatment |
| | Di-n-butyl phthalate (DBP) | 43 | 20 | |
| | Diethyl phthalate [a] | 113 | 46 | |
| | Dimethyl phthalate [a] | 47 | 19 | |
| | Bis(2-ethylhexyl)phthalate (DEHP) | 258 | 95 | PSES and PSNS, Subpart K—Indirect Discharge Point Sources |
| | Di-n-butyl phthalate (DBP) | 43 | 20 | |
| | Diethyl phthalate [a] | 113 | 46 | |
| | Dimethyl phthalate [a] | 47 | 19 | |
| CWT | Bis(2-ethylhexyl)phthalate (DEHP) | 0.215 | 0.101 | BPT, BAT and NSPS, Subpart B—Oils Treatment and Recovery |
| | Butylbenzyl phthalate (BBP) | 0.188 | 0.0887 | |
| | Bis(2-ethylhexyl)phthalate (DEHP) | 0.267 | 0.158 | PSES and PSNS, Subpart B—Oils Treatment and Recovery |

Sources: 40 CFR 414.91, 414.101, 414.111, 437.21, 23-24, 437.25–26.
[a] Diethyl phthalate and dimethyl phthalate are regulated by the ELGs, but are not included in the Phthalates CAP.

In addition to OCPSF, four other regulated point source categories reported di-n-butyl phthalate discharges to DMR or TRI in 2011, shown in Table 6-34. Additionally, nineteen regulated point source categories reported discharges of bis(2-ethylhexyl)phthalate to DMR or TRI in 2011, shown in Table 6-35. Only three facilities reported discharges of butylbenzyl phthalate. Two of these facilities are CWTs and one did not report an SIC code that corresponds to a specific industrial point source category (DMR Loading Tool).

**Table 6-34. Discharge of Di-n-butyl phthalate by Point Source Category as Reported to DMR and TRI (2011)**

| PSC Code | Point Source Category | Di-n-butyl phthalate | | | | |
|---|---|---|---|---|---|---|
| | | Total DMR Pounds (lbs/yr) | Total DMR TWPE (lbs-eq/yr) | Total TRI Pounds (lbs/yr) | Total TRI TWPE (lbs-eq/yr) | Facility Counts (DMR/TRI) |
| 415 | Inorganic Chemicals Manufacturing | 71.1 | 0.88 | 2,460 | 24.6 | 1/1 |
| 414 | OCPSF | 558 | 5.54 | 132 | 1.31 | 17/4 |
| 428 | Rubber Manufacturing | NR | NR | 7.84 | 0.078 | 0/2 |
| 417 | Soap and Detergent Manufacturing | 21.5 | 0.21 | 0.8 | 0.008 | 1/1 |
| 438 | Metal Products and Machinery | 0.14 | 0.0014 | NR | NR | 1/0 |
| Total | | 651 | 6.63 | 2,605 | 26.0 | 20/8 |

Source: DMR Loading Tool
NR: Not reported

**Table 6-35. Discharge of Bis(2-ethylhexyl)phthalate by Point Source Category as Reported to DMR and TRI (2011)**

| PSC Code | Point Source Category | Bis(2-ethylhexyl)phthalate | | | | |
|---|---|---|---|---|---|---|
| | | Total DMR Pounds (lbs/yr) | Total DMR TWPE (lbs-eq/yr) | Total TRI Pounds (lbs/yr) | Total TWPE (lbs-eq/yr) | Facility Counts (DMR/ TRI) |
| 415 | Inorganic Chemicals Manufacturing | 190 | 48.3 | NR | NR | 3/0 |
| 414 | Organic Chemicals, Plastics And Synthetic Fibers (OCPSF) | 3,450 | 862 | 2,090 | 523 | 33/3 |
| 428 | Rubber Manufacturing | NR | NR | 379 | 94.7 | 0/14 |
| 463 | Plastics Molding and Casting (Foundries) | 10,600 | 2,650 | 151 | 37.8 | 1/8 |
| 455 | Pesticide Chemicals | NR | NR | 2.05 | 0.513 | 0/1 |
| 439 | Pharmaceutical Manufacturing | 0.14 | 0.037 | 2.1 | 0.525 | 1/1 |
| 417 | Soap and Detergent Manufacturing | 21.5 | 5.38 | NR | NR | 1/0 |
| 419 | Petroleum Refining | 669 | 167 | NR | NR | 1/0 |
| 420 | Iron and Steel Manufacturing | 311 | 77.6 | NR | NR | 3/0 |
| 421 | Nonferrous Metals Manufacturing | 10.7 | 2.68 | NR | NR | 1/0 |
| 423 | Steam Electric Power Generating | 0.409 | 0.102 | NR | NR | 3/0 |
| 438 | Metal Products and Machinery | 3.75 | 0.937 | 9.36 | 2.34 | 6/4 |
| 430 | Pulp, Paper and Paperboard | 49.4 | 12.3 | NR | NR | 2/0 |
| 432 | Meat and Poultry Products | 32.2 | 8.06 | NR | NR | 1/0 |
| 435 | Oil & Gas Extraction | 56.6 | 14.1 | NR | NR | 1/0 |
| 437 | Centralized Waste Treatment | 6.98 | 1.73 | NR | NR | 2/0 |
| 445 | Landfills | 50.7 | 12.7 | NR | NR | 3/0 |
| 460 | Hospital | 0.45 | 0.11 | NR | NR | 1/0 |
| 410 | Textile Mills | NR | NR | 353 | 88.2 | 0/1 |
| Total | | 15,500 | 3,870 | 2,980 | 747 | 63/32 |

Source: DMR Loading Tool.
NR: Not reported.
Note: Sums of individual values may not equal the total presented, due to rounding.

Table 6-36 shows that the discharges of the three phthalates reported in DMR are generally at concentrations significantly below the most stringent limits established by the existing ELGs. OW was not able to identify any data regarding the source, presence, or quantity of the other five unregulated phthalates in industrial wastewater discharge.

**Table 6-36. Range of Average Phthalate Discharges Reported to DMR (2011)[a]**

| Pollutant Name | Monthly Average Concentrations (mg/L)[a] | Facility Count[b] | Most Stringent ELG Limits (mg/L)[c] |
|---|---|---|---|
| Butylbenzyl phthalate | 0.005-0.006 | 2 | 0.0887 (40 CFR 437 BPT, BAT, NSPS Subpart B) |
| Di-n-butyl phthalate | 0.0002-0.019 | 20 | 20 (40 CFR 414 BAT and NSPS, Subpart J and PSES and PSNS, Subpart K) |
| Bis(2-ethylhexyl)phthalate | 0.0003- 7[d] | 64 | 0.101 (40 CFR 437 BPT, BAT, NSPS Subpart B) |

Source: DMR Loading Tool.
[a] Monthly average represents the range of concentrations for all point source categories reporting discharges.
[b] Facility counts only include those facilities with reported loads greater than zero.
[c] Most stringent ELG limits taken from Table 6-33. This information is provided for comparison purposes only. Not all facilities are subject to the ELG limits for these pollutants.
[d] There are only three facilities that reported discharges greater than the most stringent ELG limit.

### *Toxicity and Exposure Routes*

Studies indicate that exposure to some phthalates may cause reproductive issues in the human population and in studied animal groups. Effects in the environment have been observed at measured environmental concentrations. Di-n-butyl phthalate, bis(2-ethylhexyl)phthalate, and butylbenzyl phthalate were included in the first group of 67 chemicals to be screened as part of the Endocrine Disruptor Screening Program (EDSP) (U.S. EPA, 2009b).

Phthalates have been observed in most environmental media and may be released to the environment from multiple sources including industrial releases, disposal of industrial waste, municipal solid waste, land application of sewage sludge, and release from products containing phthalates. Based on 2007 TRI data, for two regulated phthalates (di-n-butyl phthalate and bis(2-ethylhexyl)phthalate), releases to water are less significant than releases to land and air.

OW has established TWFs for three regulated phthalates; butylbenzyl phthalate, di-n-butyl phthalate, and bis(2-ethylhexyl)phthalate as well as one of the unregulated phthalates, OP di-n-octyl phthalate (U.S. EPA, 2007). OW has not established TWFs for the remaining phthalates. If OW identifies discharges of these phthalates in industrial wastewater in the future, it may need to consider developing TWFs to more fully characterize and understand the relative toxicity of the discharge.

### *OPPT Actions*

OPPT has taken and is planning the following actions related to phthalates:

- Coordinate with Consumer Product Safety Commission and Food and Drug Administration to more fully assess use, exposure, and substitutes for phthalates.
- In March 2012, proposed a SNUR covering most uses of di-n-pentyl phthalate (77 FR 18752).

- In August 2011, began coordinating with DfE on the Alternatives to Certain Phthalates Partnership.[33] The alternatives assessment would build upon existing knowledge and would consider exposures to all human subpopulations, including children, as well as environmental exposure.

***OW's Findings***

Three of the eight phthalates identified in the CAP are regulated by existing ELGs (OCPSF and CWTs) and two are TRI-listed chemicals. Available data suggests that these regulated phthalates are present in industrial wastewater discharge from several point source categories (beyond OCPSF and CWT), though the concentrations and TWPE are low. OW was not able to readily identify data to characterize the presence of the remaining five unregulated phthalates in industrial wastewater discharge.

#### 6.2.2.9 Short-Chain Chlorinated Paraffins

***Chemical Production and Use***

Short-chain chlorinated paraffins (SCCPs) are used in the formulation of metalworking fluids (as a component of lubricants and coolants in metal cutting and forming operations), plastics compounding (as a secondary plasticizer and flame retardant in PVC), rubber compounding, paint and coating formulation, petroleum lubricating oil and grease manufacturing, and adhesive and sealant formulation. In the U.S., SCCPs are most frequently used as components of lubricants and coolants in metal cutting and metal forming operations. The second largest use is as a secondary plasticizer and flame retardant in plastics, particularly PVC (U.S. EPA, 2009c).

In 2012, EPA initiated enforcement action against Dover Chemical, requiring the facility to cease manufacturing SCCPs. Dover was the last U.S. manufacturer of SCCPs (U.S. EPA, 2009c). Several companies import SCCPs (U.S. EPA, 2006).

***Presence in Industrial Wastewater***

The industrial categories that produce or use SCCPs in the processes listed above may include:

- OCPSF (40 CFR Part 414);
- Petroleum Refining (40 CFR Part 419);
- Iron and Steel Manufacturing (40 CFR Part 426);
- Pulp, Paper and Paperboard (40 CFR Part 430);
- Metal Finishing (40 CFR Part 433);
- Paint Formulating (40 CFR Part 446);
- Plastics Molding and Forming (40 CFR Part 463);
- Aluminum Forming (40 CFR Part 467);

[33] For more information on the Alternatives to Certain Phthalates Partnership see http://www.epa.gov/dfe/pubs/projects/phthalates/index.html.

- Copper Forming (40 CFR Part 468);
- Nonferrous Metals Forming and Metals Powders (40 CFR Part 471); and
- Miscellaneous Foods and Beverages (40 CFR Part 503).

During manufacture, SCCPs are most likely to enter wastewater through container cleaning, dragout, and disposal of filter media and spent metal working fluid. Using generic scenario methodology, OPPT estimated total releases to wastewater from these activities to be approximately 2,400 kg per site per year (U.S. EPA, 2009c). The ELGs for the categories listed above do not regulate SCCPs.

According to the CAP, releases from industrial sources often end up in sewage treatment plants. Concentrations of SCCPs in sewage sludge are much higher than in river and lake sediments, especially from wastewater treatment plants serving industrial areas (U.S. EPA, 2009c).

SCCPs were added to TRI in 1995 as polychlorinated alkanes. The 2005 through 2007 TRI databases included reported releases of SCCPs to air from only one company manufacturing SCCPs, Dover Chemical in Hammond, Indiana. The facility reported no water releases in 2009 (U.S. EPA, 2009c). Further, in 2011, one metal finishing manufacturer reported discharges of polychlorinated alkanes to TRI, totaling 5.62 pounds per year (DMR Loading Tool). OW did not identify any additional wastewater generation information for SCCPs.

***Toxicity and Exposure Routes***

OPPT has identified manufacturing and lubricant applications as the likely sources of environmental release and exposure. SCCPs have been found worldwide, in the environment, wildlife, and humans. SCCPs are bioaccumulative in humans and wildlife, are persistent in the environment, and are toxic to aquatic organisms at low concentrations (U.S. EPA, 2009c).

Currently SCCPs do not have TWFs. If OW identifies discharges of SCCPs in industrial wastewater in the future, it may need to consider developing TWFs to more fully characterize and understand the relative toxicity of the discharges.

***OPPT Actions***

OPPT has taken and is planning the following actions related to SCCP:

- In February 2012, announced enforcement action against Dover Chemical, requiring them to pay $1.4 million and cease manufacturing of SCCPs.[34] Dover is the last remaining chlorinated paraffin manufacturer in the U.S.
- In March 2012, proposed a SNUR for certain SCCPs (77 FR 18752). The proposal would require companies to notify EPA of plans to manufacture, import or process these chemicals, and would provide EPA an opportunity to review new uses and take any action needed to protect human health or the environment.

[34] For more information on the enforcement action against Dover Chemical, see http://www.epa.gov/compliance/resources/cases/civil/tsca/doverchemical.html.

- In August 2012, announced a settlement with INEOS Chlor Americas, Inc, requiring them to end the importation of SCCPs into the U.S.[35]
- Further evaluate action under TSCA Section 5 and Section 6(a) for medium and long chain chlorinated paraffins.

***OW's Findings***

SCCPs are no longer manufactured in the U.S., and only a single manufacturer reported a very small discharge of polychlorinated alkanes (which may include SCCP) to TRI in 2011. In addition, EPA has taken action against some companies importing SCCPs into the U.S. However, SCCPs have been used in metal working industries and have the potential to be released into wastewater.

### *6.2.3 Additional Review of Long-Chain PFCs*

Two PFCs have gained recent attention due to their persistence in the environment and their ability to bioaccumulate in the food chain: perfluorooctyl sulfonate (PFOS) and perfluorooctanoic acid (PFOA). This section focuses on PFOA discharges, because PFOS is no longer manufactured in the U.S.; industries have nearly completely replaced it with shorter-chain substitutes, such as perfluorobutane sulfonate (PFBS), except in some niche markets (U.S. EPA, 2009a, 2012d). For additional background on PFCs, see Section 6.2.2.6.

PFOA continues to be synthetically manufactured, imported, and used in the U.S. (U.S. EPA, 2009a). In addition to the data provided in the PFCs CAP, OW also reviewed data supporting OPPT's 2010/2015 PFOA Stewardship Program (Stewardship Program). The Stewardship Program was developed to help minimize the potential impact of PFOA in the environment by asking manufacturing companies to voluntarily commit to reducing PFOA emissions and product content by 95 percent by 2010. Additionally, companies that chose to participate in the program would work to eliminate PFOA emissions and product content by 2015 (U.S. EPA, 2012d).

The following sections present OW's findings on PFOA, including an overview of manufacturing and use, a summary of the OPPT 2010/2015 PFOA Stewardship Program, and a review of available discharge data and wastewater treatment options for PFOA.

#### 6.2.3.1 Overview of Manufacture and Use of PFOA

PFOA is a long-chain perfluoroalkyl carboxylate (PFAC). PFACs are synthetic chemicals that do not occur naturally in the environment. PFACs also include higher homologues, salts, and PFOA precursors. PFOA is an eight-carbon chain length chemical. Higher homologues are chemicals with similar structure to PFOA but with nine or more carbons in the chain (U.S. EPA, 2012d). PFOA chemical precursors are chemicals that can break down to form PFOA (U.S. EPA, 2012d).

[35] For more information on the settlement with INEOS Chlor Americas, Inc., see http://www.epa.gov/compliance/resources/cases/civil/tsca/ineoschlor.html.

The recent focus of industry and environmental groups has been on PFOAs and their fluorochemical precursors, which can degrade or metabolize to form perfluorocarboxylic acids (PFCAs). Fluoropolymers, fluorotelomers, and fluorotelomer-based compounds are precursors to PFOA and the main source of PFOA in the environment.[36] PFOA (see chemical structure in Figure 6-9) has a molecular formula of $C_7F_{15}COOH$.

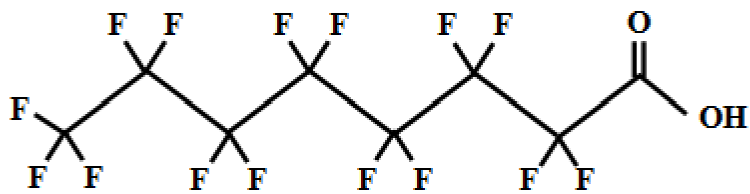

**Figure 6-9. Perfluorooctanoic Acid (CAS Number: 335-67-1)**

Plants primarily manufacture PFOA as an aqueous dispersion agent subsequently used for the manufacture of fluoropolymers. OW reviewed the PFCs CAP to determine the industrial categories manufacturing and using PFOA and its precursors (U.S. EPA, 2009a). PFOA and its fluorotelomer precursors are manufactured at facilities regulated by 40 CFR Part 414 (OCPSF).

In addition to manufacturing, the degradation of fluorotelomers can also unintentionally result in the production of PFOA. For example, some residual monomer chemicals from the telomer manufacturing process such as telomer alcohols and telomer iodides may remain in the final product and break down into PFOA (U.S. EPA, 2012d). These fluorotelomer products are likely used in products that require even flow, which may include paints, coatings, cleaning products, and fire-fighting foams. Both manufacturers and consumers apply (spray) these products in after-market uses such as carpet treatments and water repellent sprays (U.S. EPA, 2009a). Examples of industrial categories that use PFOA and its precursors include:

- Automotive;
- Defense/aerospace;
- Power generation;
- Pollution control;
- Electronics/telecommunications;
- Chemical/petrochemicals;
- Consumer products such as cookware;
- Building/construction;
- Semiconductors;
- Textiles; and
- Paper products.

[36] Fluoropolymers have thousands of important manufacturing and industrial applications such as plastic gears, gaskets and sealants, and pipes and tubing. Fluorotelomers are used to make polymers that impart resistance to soil, stain, grease, and water to coated articles. Consumers and commercial applicators in after-market uses such as carpet treatment and water repellent sprays use fluorotelomer-based compounds (U.S. EPA, 2009a).

#### 6.2.3.2 Industry Trends Observed in the OPPT 2010/15 PFOA Stewardship Program

In 2006, eight major PFOA manufacturers joined the OPPT Stewardship Program. They committed to reducing facility emissions (including water discharges) and product content of PFOA, precursors, and higher homologues by 95 percent by 2010, and to work toward eliminating emissions and product content of these chemicals by 2015. The PFOA Stewardship Program also developed a non-exhaustive list of PFOA precursors, PFOA salts, and higher homologues. The companies that participate in the PFOA Stewardship Program are (U.S. EPA, 2012d):

- 3M/Dyneon;
- Arkema, Inc.;
- Asahi Glass Company;
- BASF Corporation;
- Clariant Corporation;
- Daikin America, Inc.;
- E.I. DuPont de Nemours and Company; and
- Solvay Solexis.

These companies submit annual progress reports on their reductions of PFOA, PFOA precursors, and higher homologues in facility emissions and product content.

OW contacted OPPT personnel to obtain additional information on the discharge data collected as part of the program. The OPPT contact stated that the eight companies participating in the program likely supply 80 percent of the market with PFOA and PFOS. Because the Stewardship Program aims to decrease the manufacture and discharge of these chemicals, the manufacturers are transitioning to using C4 and C6 length chemicals. However, OPPT determined that C8 chemicals are still imported and used in the U.S. Therefore, the OPPT contact stated, manufacturing of these chemicals in the U.S. has decreased, but the discharges have not. C8 chemicals are manufactured in Italy, India, Russia, and China. Companies in the U.S. continue using C8 chemicals because they are more effective and cost half as much as the C4 and C6 chemicals produced in the U.S. (Libelo, 2012).

OPPT confirmed that all of the large manufacturing facilities are participating in the Stewardship Program and monitoring for PFOA and other C8 chemicals. However, hundreds of users continue to apply PFOA to products such as cookware and clothes. The users have not all been identified and are not monitoring wastewater discharges for PFOA or PFOS (Libelo, 2012).

Additionally, OPPT determined that larger facilities manufacturing PFOA and other PFCs likely have onsite wastewater treatment systems. Medium or smaller facilities send wastewater to publicly owned treatment works (POTW) or collect it in drums and send it offsite in batches for treatment (Libelo, 2012). The concentration of PFCs in wastewater discharged from medium and smaller facilities to surface water and POTWs has not been measured, based on available data from OPPT and the DMR Loading Tool.

OPPT confirmed that there are 12 facilities monitoring discharges for PFOA and PFOS. Additionally, some states include PFCs monitoring requirements in NPDES discharge permits, namely West Virginia, Ohio, New Jersey, Alabama, and Minnesota (Libelo, 2012).

#### 6.2.3.3 Available Data on PFCs in Industrial Wastewater Discharges

OW collected publicly available data characterizing PFCs in industrial discharges. Specifically, OW reviewed the docket supporting the PFOA enforceable consent agreement (ECA) process. OPPT used the ECA process to identify and generate information to strengthen its PFOA draft risk assessment. Materials used and generated by the PFOA ECA are available in docket EPA-HQ-OPPT-2003-0012. The docket contains reports provided by DuPont Chambers Works to document its progress in meeting its commitments to the EPA 2010/15 PFOA Stewardship Program. In 2005, Chambers Works implemented a sampling program, focused on wastewater discharges, to measure the effectiveness of the reduction efforts. OW reviewed these monthly discharge data.

Additionally, OW searched the Envirofacts website and DMR Loading Tool to identify publicly available PFOA discharge data and found data for four facilities:

- DuPont Chambers Works in Deepwater, New Jersey;
- 3M Decatur Plant in Decatur, Alabama;
- Daikin America, Inc. in Decatur, Alabama; and
- E.I. DuPont de Nemours and Company in Chesterfield County, Virginia.

The following subsections present the PFC discharge data that OW identified for these four facilities. To put these concentrations into context (because PFCs do not have ELGs or safe drinking water standards), OW compared concentrations of PFOA in wastewater discharges to the Provisional Health Advisory (PHA) PFOA drinking water concentration of 0.4 µg/L (U.S. EPA, 2011c), as shown in Table 6-37 through Table 6-41. EPA has also established a PHA of 0.2 ug/L for one additional PFC, perfluorooctanesulfonate (U.S. EPA, 2011c). PHAs are not legally enforceable by federal standards; however, OW recommends taking action to reduce PFOA concentrations in drinking water at levels above the PHA concentration.

***DuPont Chambers Works Facility—Deepwater, New Jersey (NJ0005100)***

The OPPT ECA docket includes DuPont's *Status Report on PFOA Emissions Reductions and Data Summary for 2009* for the Chambers Works Manufacturing Facility (URS Corporation, 2010). The facility has been working to reduce PFOA emissions through process improvements and source elimination. In 2006, DuPont committed to participate in the EPA 2010/2015 PFOA Stewardship Program. From 2000 to 2008, Chambers Works reduced PFOA emissions by 95 percent.

As described in DuPont's 2009 status report, site process areas at DuPont Chambers Works associated with PFOA include (URS Corporation, 2010):

- Fluoroeslastomers (DPE): PFOA is a polymerization aid in the manufacture of specialty fluoroelastomers and perfluoroelastomers. In 2001, the site discontinued PFOA used in the standard fluoroelastomers, and in 2004 it installed a carbon treatment system to treat washwaters and process cleanouts for the specialty fluoroelastomer and perfluoroelastomer manufacturing process.

- Fluorotelomers: PFOA is present in trace quantities as an unintended byproduct in portions of the fluorotelomer manufacturing process. The amounts of PFOA in fluorotelomer intermediates, while low, vary from levels below detection to concentrations in the parts per million.
- Chambers Works Wastewater Treatment Plant (WWTP): PFOA is present in trace quantities in some commercial wastewater streams that this central waste treatment facility accepts. PFOA continues to be used as a processing aid by industry and can be present as an unintended by-product in other wastestreams. In addition, PFOA is present in wastewaters from the Chambers Works onsite landfill leachate and groundwater treatment system. (Since 2003, many PFOA-containing wastewater streams to the WWTP have been eliminated through treatment at the generation site or finding an alternative treatment).

DuPont Regional Analytical Services analyzed wastewater PFOA concentrations according to a laboratory standard operating procedure. The analytical method uses liquid chromatography/tandem mass spectrometry (LC/MS/MS). The sampling program focuses on measuring wastewater discharges from the Chambers Works Complex, specifically outfall DSN662 (662), the treated effluent from the WWTP.

Table 6-37 shows the average monthly concentrations of PFOA for 2006 through 2009 for outfall 662. Table 6-37 also includes the average concentration for each year. It is clear that the concentrations are decreasing, but all monthly average concentrations exceed the 0.4 µg/L drinking water PHA. Table 6-38 shows some detailed weekly discharge data for 2010 and for one month in2011 for outfall 662, which continue to exceed the PHA. On three occasions in 2010–2011, the PFOA concentration spiked to concentrations higher than the 2009 concentrations.

**Table 6-37. Mean DuPont Chambers Works Monthly PFOA Concentrations and Mass Loadings at Outfall 662, 2006–2009**

| Year | Month | Concentration (µg/L) | Estimated Mass (lb/day) | Average Concentration for the Reporting Year (µg/L) |
|---|---|---|---|---|
| 2006 | January | 26 | 3.74 | 50.6 |
| | February | 27.7 | 3.15 | |
| | March | 36.2 | 3.54 | |
| | April | 51 | 5.51 | |
| | May | 39 | 3.29 | |
| | June | 55.8 | 4.17 | |
| | July | 40 | 4.43 | |
| | August | 70 | 5.62 | |
| | September | 66 | 7.57 | |
| | October | 58 | 5.28 | |
| | November | 98 | 6.76 | |
| | December | 39 | 4.1 | |

**Table 6-37. Mean DuPont Chambers Works Monthly PFOA Concentrations and Mass Loadings at Outfall 662, 2006–2009**

| Year | Month | Concentration (μg/L) | Estimated Mass (lb/day) | Average Concentration for the Reporting Year (μg/L) |
|---|---|---|---|---|
| 2007 | January | 66.3 | 6.48 | 41.9 |
| | February | 56.8 | 5.39 | |
| | March | 65.3 | 6.26 | |
| | April | 44.6 | 4.47 | |
| | May | 30.9 | 2.74 | |
| | June | 41.2 | 3.59 | |
| | July | 24.3 | 2.35 | |
| | August | 31.1 | 3.01 | |
| | September | 58.1 | 4.48 | |
| | October | 40.6 | 3.71 | |
| | November | 20.3 | 1.9 | |
| | December | 23.5 | 2.33 | |
| 2008 | January | 30.3 | 3.01 | 23.2 |
| | February | 41.8 | 4.2 | |
| | March | 43.1 | 4.12 | |
| | April | 18.6 | 1.72 | |
| | May | 18.1 | 1.7 | |
| | June | 30.4 | 2.87 | |
| | July | 25.1 | 2.49 | |
| | August | 21.1 | 1.99 | |
| | September | 19.2 | 1.7 | |
| | October | 13.1 | 1.19 | |
| | November | 10.2 | 0.86 | |
| | December | 7.6 | 0.69 | |
| 2009 | January | 3.5 | 0.3 | 11.4 |
| | February | 4.1 | 0.36 | |
| | March | 4.4 | 0.36 | |
| | April | 5.7 | 0.45 | |
| | May | 8.2 | 0.69 | |
| | June | 13.4 | 1.1 | |
| | July | 10.8 | 0.8 | |
| | August | 10.7 | 0.89 | |
| | September | 12.5 | 0.97 | |
| | October | 14.4 | 1.25 | |
| | November | 21.2 | 1.69 | |
| | December | 28.4 | 2.39 | |

Source: EPA-HQ-OPPT-2003-0012-1315.

**Table 6-38. Detailed DuPont Chambers Works Monthly PFOA Concentrations and Mass Loadings at Outfall 662, 2010–2011**

| Date | Concentration of PFOA (Total, µg/L) |
|---|---|
| 1/11/2010 | 14.6 |
| 1/18/2010 | 9.87 |
| 1/25/2010 | 8.7 |
| 2/1/2010 | 7.83 |
| 2/8/2010 | 7.67 |
| 2/15/2010 | 10.6 |
| 2/22/2010 | 19.7 |
| 4/5/2010 | 10.3 |
| 4/12/2010 | 11.2 |
| 4/19/2010 | 10.5 |
| 4/26/2010 | 7.7 |
| 6/1/2010 | 10 |
| 6/7/2010 | 21.7 |
| 6/14/2010 | 20.4 |
| 6/21/2010 | 9.85 |
| 6/28/2010 | 14 |
| 7/6/2010 | 13.8 |
| 7/12/2010 | 10.7 |
| 7/19/2010 | 41.5[a] |
| 7/26/2010 | 24.4 |
| 9/7/2010 | 13 |
| 9/13/2010 | 12.9 |
| 9/20/2010 | 8.28 |
| 9/27/2010 | 12.4 |
| 10/4/2010 | 15.6 |
| 10/11/2010 | 35.4[a] |
| 10/18/2010 | 16.4 |
| 10/25/2010 | 8.46 |
| 12/6/2010 | 5.32 |
| 12/13/2010 | 5.19 |
| 12/20/2010 | 19.5 |
| 12/27/2010 | 42.4[a] |
| 4/4/2011 | 7.49 |
| 4/11/2011 | 7.25 |
| 4/18/2011 | 5.61 |
| 4/25/2011 | 7.24 |

Sources: EPA-HQ-OPPT-2003-0012-1307, 1313, 1317, 1318, 1319, 1321.
[a] DuPont 2010–2011 PFOA concentrations greater than the highest 2009 PFOA concentrations (28.4 µg/L) reported in Table 6-37.

### *3M Decatur Plant (AL0000205)*

EPA's Envirofacts website contains 2011 discharge data for the 3M Decatur plant. The 3M Decatur plant is a major discharger that monitors for six PFCs from outfall 001, the discharge of process wastewater. Table 6-39 summarizes the 2011 minimum, maximum, and mean concentrations for the six PFCs monitored. As shown in Table 6-39, the 2011 PFOA concentrations exceed the 0.4 µg/L drinking water PHA, and the perfluorooctanesulfonate concentrations exceed the 0.2 ug/L drinking water PHA.

**Table 6-39. Summary of the 2011 Maximum Concentration Data for 3M Decatur Plant, Outfall 001 (Process Wastewater Discharge)**

| Pollutant | Outfall | Minimum Concentration (µg/L) | Maximum Concentration (µg/L) | Mean Concentration (µg/L) |
|---|---|---|---|---|
| Perfluorobutanesulfonamide | 001 | 23.4 | 51.9 | 33.3 |
| Perfluorobutanoic acid | 001 | 1.54 | 3.05 | 1.94 |
| Perfluorobutanoicsulfonate | 001 | 17.7 | 74.1 | 46.3 |
| Perfluorooctanesulfonamide | 001 | 0.816 | 1.58 | 1.08 |
| Perfluorooctanesulfonate | 001 | 10.7[a] | 11.5[a] | 11.1[a] |
| Perfluorooctanoic acid (PFOA) | 001 | 1.76[b] | 4.17[b] | 3.24[b] |

Source: Envirofacts.
[a] Concentrations greater than the 0.2 µg/L PHA.
[b] Concentrations greater than the 0.4 µg/L PHA.

***Daikin America, Inc. (AL0064351)***

EPA's Envirofacts website contains 2011 discharge data for the Daikin America, Inc., plant. The Daikin plant is a major discharger that monitors for PFOA from outfalls 001, 002, and 003. Table 6-40 summarizes the 2011 minimum, maximum, and mean PFOA concentrations. All 2011 PFOA concentrations exceed the 0.4 µg/L PHA.

**Table 6-40. Summary of the 2011 Maximum PFOA Concentration Data for Daikin America, Inc.**

| Outfall | Minimum Concentration (µg/L) | Maximum Concentration (µg/L) | Mean Concentration (µg/L) |
|---|---|---|---|
| 001 | 1.3 | 7.59 | 5.09 |
| 002 | 5.39 | 25 | 15.2 |
| 003 | 4.54 | 96.9 | 50.8 |

Source: Envirofacts.

***E.I. DuPont de Nemours (VA0004669)***

EPA's DMR Loading Tool contains 2011 discharge data for the E.I. DuPont de Nemours plant. The DuPont plant is a major discharger that monitors for PFOA from two outfalls, 001O and 101O. Table 6-41 presents the minimum, maximum, and mean of the 2011 monthly average PFOA concentrations reported in the DMR Loading Tool. For this particular facility, only one monitoring period from outfall 101O exceeded the 0.4 µg/L PHA.

**Table 6-41. Summary of the 2010 Average PFOA Concentration and Data for EI DuPont de Nemours**

| Outfall | Minimum Concentration (μg/L)[a] | Maximum Concentration (μg/L)[a] | Mean Concentration (μg/L)[a] |
|---|---|---|---|
| 001O | 0.03 | 0.1 | 0.05 |
| 101O | 0.04 | 0.67[b] | 0.14 |

Source: DMR Loading Tool.
[a] Minimum and maximum concentrations represent an individual monthly monitoring period. Mean concentration is an annual mean calculated by the DMR Loading Tool across all monitoring periods.
[b] Concentrations greater than the 0.4 μg/L PHA. Only one month in 2011 exceeded the PHA.

#### 6.2.3.4 PFOA Wastewater Treatment

OPPT has investigated the fate of PFCs in wastewater and found that discharges of PFCs from POTWs have increased with the increase in products manufactured with or containing PFCs. Larger facilities manufacturing or using PFCs likely have onsite wastewater treatment, while medium sized facilities likely send wastewater to a POTW. Smaller facilities may collect wastewater in drums in a batch process. CWT and on-site treatment typically include biological treatment and incineration. However, OPPT determined that biological treatment systems are not successful in treating these chemicals. Because the wastewater likely contains precursors to PFOA and PFOS, which then degrade in the biological treatment plant, the effluent PFOA and PFOS concentrations are higher than the influent concentrations. Additionally, PFCs with more than eight carbons are more likely to stay in treatment sludge and be land-applied. OPPT identified incineration as an effective but energy-intensive treatment option for wastewater containing PFOA and other C8 chemicals (Libelo, 2012).

OGWDW's Drinking Water Treatability Database (TDB) collected information on technologies that treat PFOA in drinking water. Although the data evaluated how effective technologies were at removing PFOA from a cleaner matrix (drinking water compared to wastewater), the technologies might apply to wastewater as a polishing step following pre-treatment.

The TDB found that granular activated carbon (GAC) and ultraviolet irradiation, at wavelengths in the 185–200 nm range, remove PFOA from drinking water. OGWDW estimated that GAC could remove up to 100 percent of PFOA from drinking water. However, GAC treatment performance can vary based on water quality and treatment characteristics. According to the TDB, the bench-scale removal studies of ultraviolet irradiation using wavelengths in the range of 185–220 nm reported PFOA removals ranging from 62 to 90 percent (U.S. EPA, 2012e).

### *6.2.4 Summary of OW's Findings from Chemical Action Plans Review*

In reviewing OPPT's 10 CAPs, OW identified that one chemical category is being phased out of U.S. commerce. EPA does not intend to pursue further review for this class of chemicals: Penta, Octa, and Decabromodiphenyl Ethers (PBDEs).

OW found that the following chemicals or classes of chemicals have continued production and/or known or potential wastewater discharges:

- **Benzidine Dyes**. Dye production has been declining over the past decade due to an increase in imported finished textiles and, as a result, OPPT is focused on consumer exposure to finished products. However, based on the available information, OW has found that benzidine dyes may still be present in industrial wastewater discharge from several regulated industrial categories including OCPSF, textiles, leather tanning and finishing, pulp, paper, and paperboard, and ink formulating.
- **BPA.** BPA is not currently regulated by existing ELGs, but is a TRI-listed chemical. OW reviewed BPA discharge data reported to TRI in 2011 and identified several industrial categories with discharges. The quantity and total TWPE of reported BPA discharges is low (less than 15 lb-eq/yr total); however, the current TWF for BPA is over 10 years old, and therefore does not take into consideration new studies showing that endocrine-related effects may occur at much lower doses.
- **HBCD.** HBCDs are used in the manufacture of products covered by several point source categories, but are not currently regulated by any of the existing ELGs. OW was not able to identify specific wastewater generation information from the CAP or other readily available data sources, but did identify, based on studies in Europe, that there could be significant discharges of HBCD to wastewater.
- **Toluene Diamine and Methyl Diphenyl Diamine.** During its review of the Methylene Diphenyl Diisocyanate (MDI) and Toluene Diphenyl Diisocyanate (TDI) CAPs, OW determined that, in the presence of water, TDI hydrolyzes to toluene diamine and MDI hydrolyzes to methyl diphenyl diamine, suggesting that these hydrolysis byproducts may be present in industrial wastewater. OW reviewed TRI data and identified one facility that discharged toluene diamine in 2011, but at low levels. OW was not able to identify any readily available discharge data for methyl diphenyl diamine.
- **NP/NPEs.** NPs and NPEs are used in the manufacture of products covered by several industrial point source categories, but are not currently regulated by existing ELGs. Though OPPT has initiated a voluntary phase out of their use in industrial laundry detergent by 2014 and is considering similar initiatives for other NPE-containing products, OW has identified that NP and NPEs are still likely present in industrial wastewater discharge. OW was not able to find any readily available wastewater generation or discharge data in the U.S., however, data from the European Union and Canada indicate environmental releases to water during the manufacture and use of NP and NPEs.
- **PFCs.** OPPT identified several manufacturers that are discharging PFCs, to surface waters at levels above a provisional health advisory level for drinking water. ELGs do not currently regulate PFCs. OPPT also investigated potential wastewater treatment options and determined that biological treatment systems are not successful in treating PFOA, a PFC of interest due to its persistence in the environment and ability to bioaccumulate in the food chain. OGWDW drinking water treatment technology data suggest that GAC and UV irradiation may be a viable solution for eliminating PFOA in drinking water, but it is unclear if that technology would effectively translate to an industrial wastewater matrix.

- **Phthalates.** OW found that 40 CFR Parts 414 (OCPSF) and 437(CWTs) currently regulate three of the eight phthalates listed in the CAP. Further, two of the regulated phthalates are also TRI listed chemicals. Review of DMR and TRI data show that there are several other point source categories besides OCPSF and centralized waste treatment that discharge phthalates, though at concentrations orders of magnitude lower than the existing ELGs' limits.

  OW was not able to determine if the remaining five unregulated phthalates are present in industrial wastewater discharge. As indicated in the CAP, OPPT intends to add the other six phthalates to TRI, which may provide OW with data on the sources and quantity of their discharge.

- **SCCPs.** SCCPs are no longer manufactured in the U.S. and EPA has taken action against some companies importing SCCPs into the U.S. Although OW was not able to readily identify data to characterize the presence of SCCPs in industrial wastewater discharge, SCCPs have been used in metal working industries and may have the potential to be released into wastewater.

### *6.2.5 References for Review of Chemical Action Plans*

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## 6.3 Identification of Wastewater Discharges Related to Air Pollution Control Not Currently Covered by ELGs

EPA is reviewing federal air pollution control regulations as a new source of data that EPA will use to augment its traditional toxicity rankings analysis (TRA) conducted in the odd-year reviews. Specifically, EPA is examining air pollution control regulations to determine if they result in the generation of unregulated wastewater discharges or changes to currently regulated wastewater streams (containing new pollutants of concern). For example, the wet scrubbers for flue-gas desulfurization at steam electric generating plants generate a wastewater discharge that is regulated by 40 CFR Part 423 (Steam Electric Power Generation) effluent limitations guidelines and standards (ELGs); however, the only pollutants regulated by the current ELGs are total suspended solids, oil and grease, and pH. Discharges of flue-gas desulfurization (FGD) wet scrubber blowdown contain toxic metal pollutants, which are now the focus of the proposed Steam Electric Rulemaking (78 FR 34432).

EPA's review revealed that industry compliance with air regulations potentially result in the generation of metal-containing wastewater discharges not included in the scope of the existing petroleum refinery ELGs (40 CFR Part 419).

### *6.3.1 Air Pollution Control Regulations Background*

Under the Clean Air Act (CAA), EPA controls emissions of air pollutants through several programs, including New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP).

EPA reviewed NSPS and NESHAP requirements to identify industries that may generate wastewater discharges due to complying with the regulations. EPA conducted this review by evaluating rules promulgated or revised after 1990, as well as supporting documentation published in the *Federal Register* (FR). In some cases, the rules supplemented older rules from the 1970s or 1980s, and EPA reviewed the older documentation as well. EPA prioritized the review of rules enacted or revised after 1990 because many ELGs were established before that year. EPA reviewed the air regulation documentation to determine if affected facilities were likely to use wet air pollution control devices to meet the requirements of the rule.

For many rules, the NSPS and NESHAP language specifically prescribes wet air pollution control devices, such as wet scrubbers. However, the rules do not always specify a means of compliance, or may specify more than one acceptable type of control device. Through evaluation of the rules and supporting documentation, EPA identified which rules may result in wastewater discharges (e.g., an air regulation that specifically prescribes wet air pollution control) from industries without existing ELGs or from industries whose wastewater discharges are not in the scope of the existing ELGs.

#### 6.3.1.1 NSPS

Section 111 of the CAA requires EPA to develop "standards of performance" for *new* stationary sources of air pollutant emissions—i.e., NSPS. These regulations apply to specific emission units such as boilers, storage tanks, and landfills. NSPS apply to newly built emission units, but because the definition of "new source" also includes modifications to existing sources, some existing units may also be subject to NSPS. NSPS primarily control emissions of criteria pollutants such as sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), volatile organic compounds (VOCs), particulate matter (PM), lead, and carbon monoxide (CO).

#### 6.3.1.2 NESHAP

Section 112 of the CAA requires EPA to control emissions of hazardous air pollutants from a published list of industrial sources (i.e., source categories) through NESHAP regulations. EPA maintains a list of 187 specific hazardous air pollutants currently regulated under the NESHAP program.[37] CAA Section 112(d) states that EPA must promulgate regulations establishing emission standards (NESHAPs) for each category or subcategory of major sources and area sources of hazardous air pollutants (HAPs) listed pursuant to CAA Section 112(c). The standards must use Maximum Achievable Control Technology (MACT) and require the maximum degree of emission reduction that the EPA determines to be achievable by each particular source category. The definition of MACT differs for new and existing sources.

### *6.3.2 Review of NSPS and NESHAPs*

EPA reviewed NSPS and NESHAPs to identify those regulations that could result in wastewater discharges. EPA next determined whether the industries to which the NSPS and NESHAP applied were covered by existing ELGs. For industries covered by an existing ELG, EPA explored if the ELG applied to the wastewater discharge from air pollution control. Table 6-44 through Table 6-47, presented at the end of this section, list the results of EPA's review. EPA examined language in the regulations and supporting documentation and noted which rules specified air pollution control that would potentially generate wastewater (e.g., use of a wet scrubber). If the air regulation included language that mentioned wet air pollution control as an option, EPA designated the affected industries as "potentially resulting in a wastewater impact from the air regulation" (see Table 6-44 through Table 6-46 for a list of these air regulations and affected industries). If the air regulation specifically prescribed dry air pollution control, EPA designated the affected industries as "less likely to have wastewater impacts" (see Table 6-47 for a list of these air regulations and affected industries).

***Air Regulations Potentially Resulting in Wastewater Discharges in Industries with No Existing ELGs***

Of the 38 NESHAP rules and 46 NSPS rules reviewed, EPA found that six rules affected the following four industries not currently regulated by ELGs:

- Brick and structural clay products manufacturing;
- Perchloroethylene (PCE)-based and petroleum-based dry cleaning;
- Industrial, commercial, and institutional boilers; and
- Industrial, commercial, and institutional steam generating units.

Table 6-44 at the end of this section details how these air regulations relate to these industries. EPA reviewed available industry and discharge data for these industries and discusses the results in Sections 6.3.2.1 through 6.3.2.4.

[37] The list of 187 regulated pollutants can be found at: http://www.epa.gov/ttn/atw/orig189.html

***Air Regulations Potentially Resulting in Wastewater Discharges Not Included in the Scope of Existing ELGs.***

In addition to the industries not currently regulated by ELGs, EPA found that six NESHAP and NSPS rules affected two industries currently regulated by ELGs, but for which wet air pollution control discharges were not included in the scope of the existing ELGs:

- Steam electric power generating industry
- Petroleum refineries

Table 6-45 at the end of this section presents air regulations as they relate to these industries. EPA reviewed available industry and discharge data for these industries and discusses the results in Sections 6.3.2.5 and 6.3.2.6.

EPA also reviewed 38 other air regulations that it identified as potentially generating wastewater discharges, presented in Table 6-46 at the end of this section. These regulations may affect 13 additional industries with existing ELGs. However, EPA has not yet completed thorough reviews of these air rules as they may affect the related industries. EPA prioritized the review of air rules for industries without ELGs and for petroleum refining and steam electric because these industries continually rank high, in terms of TWPE, in EPA's TRA.

***Air Regulations with Less Likely Wastewater Impacts***

Table 6-47 at the end of this section presents the 34 rules and 23 affected industries EPA identified as less likely to generate a wastewater stream resulting from their air pollution controls, based on the air regulations prescription of dry air pollution controls.

#### 6.3.2.1 Brick and Structural Clay Products Manufacturing (Not Currently Regulated by ELGs)

EPA promulgated the NESHAP for Brick and Structural Clay Products Manufacturing on May 16, 2003 (68 FR 26689). The HAPs emitted in the brick and structural clay products manufacturing process and covered by the NESHAP are hydrogen fluoride, hydrogen chloride, and certain metals, which can be controlled with wet or dry air pollution control. Based on the brick manufacturing process, the likely pollutants in brick and structural clay manufacturing wastewater discharges include suspended solids and metals.

EPA searched for data on wastewater discharges from brick manufacturers. Table 6-42 presents the counts of brick and structural clay products manufacturing facilities in the U.S. as of 2012, by SIC code. It also presents the number of brick and structural clay products manufacturing facilities in the DMR database with discharge data as of 2009. There are 93 facilities in the DMR database; none of them has an individual NPDES permit, and all of them have general stormwater permits.

**Table 6-42. Counts of Brick and Structural Clay Products Manufacturing Facilities in the U.S.**

| SIC Code | SIC Code Description | Number of Facilities in the U.S. (2012) | Number of Facilities in the DMR Database with Discharge Data Greater than Zero (2009) |
|---|---|---|---|
| 1455 | Kaolin & Ball Clay | 283 | 5 |
| 1459 | Clay, Ceramic & Refractory Minerals | 887 | 14 |
| 3251 | Brick & Structural Clay Tile | 399 | 10 |
| 3255 | Clay Refractories | 270 | 4 |
| 3259 | Structural Clay Products | 65 | 0 |
| 3271 | Concrete Block & Brick | 1,037 | 3 |
| 5032 | Brick, Stone & Related Materials | 720 | 1 |
| **Total Brick and Clay Manufacturing Facilities** | | **3,671** | **37** |

Sources: Envirofacts and *DMRLoads2009_v2*.

The fact that the only NPDES permits identified in the above analysis are stormwater permits suggests that brick manufacturers have no wastewater discharges and use dry air pollution control or fully recycle any water from wet air pollution control. To confirm that brick and structural clay products manufacturers do not discharge wastewater other than stormwater, EPA contacted permit writers of brick and clay manufacturers in Alabama, who confirmed they had not identified any industrial wastewater discharges at brick and structural clay products manufacturers (Warren, 2012).

#### 6.3.2.2 Perchloroethylene (PCE)-Based and Petroleum-Based Dry Cleaning (Not Currently Regulated by ELGs)

EPA promulgated NESHAP for PCE Dry Cleaners on September 22, 1993. On July 27, 2006, EPA revised these standards to account for new developments in production practices, processes, and control technologies and to reduce PCE emissions beyond the 1993 NESHAP. From the 1993 and 2006 NESHAP rule documentation, carbon adsorbers and/or refrigerated condensers control PCE emissions from process vents at dry cleaners and generate wastewater.

A carbon adsorber is a bed of activated carbon that adsorbs PCE from the PCE-containing vapor stream routed through it. When the carbon adsorber is saturated with PCE, it is "desorbed" by passing steam through the carbon adsorber. PCE is collected in the steam condensate from desorption. A typical machine with an existing carbon adsorber is estimated to generate 1.9 pounds of PCE in wastewater per year. A refrigerated condenser is a vapor recovery system that cools vapor streams containing PCE. After cooling, the PCE and water are separated, the PCE is returned to the process, and the condensed water is discharged. A typical dry cleaning machine controlled with a refrigerated condenser can generate 0.07 pounds of PCE in wastewater each year (58 FR 49354). As of 1996, the NESHAP required that 3,200 of the 17,400 existing industrial and commercial facilities subject to the standards must install process vent control devices (i.e., a refrigerator condenser and/or carbon adsorber) to be in compliance (58 FR 49354). The documentation for the revised 2006 NESHAP did not specifically state any changes to the estimation of wastewater impacts from wet air pollution control or the number of affected facilities.

EPA promulgated NSPS for VOC emissions from dry cleaners using petroleum-based solvents in 1984. The rule documentation does not clearly identify if wet air pollution control is a method for controlling VOC emissions and, therefore, does not indicate if this air regulation results in wastewater discharges. Because EPA is investigating wastewater discharges generated from air pollution control for PCE-based dry cleaners, EPA included petroleum-based dry cleaners this review (49 FR 37331).

The TRI and DMR databases do not include wastewater discharge data for dry cleaning facilities. EPA's Office of Pollution Prevention and Toxic Substances (OPPT) is collecting data from dry cleaners as part of its TRI expansion sector initiative (U.S. EPA, 2012, see Section 6.4). If this industry is required to report to TRI, EPA will be able to evaluate the impact of the discharges of dry cleaners as part of the TRA.

As explained in Section 6.4, EPA proposed pretreatment standards for pollutant discharges from industrial laundries in 1997. During its study of industrial laundries, EPA reviewed discharges of some large dry cleaners. EPA found that the dry cleaning process generates minimal amounts of wastewater, ranging from zero to 0.25 gallons of water per pound of laundry processed. Further, EPA determined that many facilities are moving away from dry cleaning because of the hazardous nature of the dry cleaning solvents and the expense of their disposal. EPA also determined that facilities that do operate dry cleaning units are moving away from the use of PCE as a solvent in favor of petroleum-based solvents (U.S. EPA, 2000). Because EPA investigated this industry in 1997, after the air regulations were in effect (1984 and 1993), EPA expects that the review captured discharges from air pollution controls. EPA does not expect the 2006 revision to the 1993 NESHAP for PCE-based dry cleaners to affect the wastewater discharges because the air pollution controls for the emissions (carbon adsorbers and refrigerated condensers) did not change.

#### 6.3.2.3 Industrial, Commercial, and Institutional Boilers (Not Directly Regulated by ELGs)

EPA promulgated NESHAP for industrial, commercial, and institutional boilers on January 31, 2013. The regulation potentially regulates emissions of over ten industrial categories (78 FR 7138). Table 6-43 lists the potentially affected industries and the corresponding point source category for each. The regulation requires control of carbon monoxide, hydrogen chloride, mercury, particulate matter, and total selected metals (i.e., arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, and selenium). It allows the use of a variety of control technologies, including wet scrubbers, fabric filters, electrostatic precipitators, or any other controls. In the text of the rule, EPA estimated that the rule would affect 14,136 boilers and process heaters at 1,700 facilities (78 FR 7138).

**Table 6-43. Existing ELGs for Industries Affected by the NESHAP for Industrial, Commercial, or Institutional Boilers**

| Industry | Applicable Point Source Category |
|---|---|
| Petroleum refineries | 40 CFR Part 419 (Petroleum Refining) |
| Lumber and wood products | 40 CFR Part 429 (Timber Products Processing) |
| Pulp and paper | 40 CFR Part 430 (Pulp, Paper, and Paperboard) |

**Table 6-43. Existing ELGs for Industries Affected by the NESHAP for Industrial, Commercial, or Institutional Boilers**

| Industry | Applicable Point Source Category |
|---|---|
| Chemical manufacturers | 40 CFR Part 414 (OCPSF);<br>40 CFR Part 415 (Inorganic Chemicals Manufacturers);<br>40 CFR Part 454 (Gum and Wood Chemicals Manufacturing) |
| Rubber manufacturers | 40 CFR Part 414 (OCPSF);<br>40 CFR Part 428 (Rubber Manufacturers) |
| Plastics manufacturers | 40 CFR Part 414 (OCPSF);<br>40 CFR Part 463 (Plastics Molding and Forming) |
| Steel works | 40 CFR Part 420 (Iron and Steel Manufacturing) |
| Electroplating | 40 CFR Part 413 (Electroplating);<br>40 CFR Part 433 (Metal Finishing) |
| Motor vehicle parts manufacturers | 40 CFR Part 433 (Metal Finishing);<br>40 CFR Part 438 (Metal Products and Machinery) |
| Electric services | 40 CFR Part 423 (Steam Electric) |
| Gas services | NA |
| Sanitary services | 40 CFR Part 403 (General Pretreatment Regulations for Existing and New Sources of Pollution) |
| Health services | 40 CFR Part 460 (Hospitals) |
| Educational services | NA |

NA – Not applicable. Industry does not have a corresponding point source category.

EPA expects that wastewater discharges from boiler air pollution control devices are commingled and discharged with wastewater from other plant processes. However, EPA has not evaluated the pollutants in the boiler air pollution control wastewater for these industries.

#### 6.3.2.4 Industrial, Commercial, and Institutional Steam Generating Units (Not Directly Regulated by ELGs)

EPA promulgated NSPS for large and small industrial, commercial, and institutional steam generating units on June 19, 1984 (40 CFR 60 Subpart Db) and June 9, 1989 (40 CFR 60 Subpart Dc), respectively. The regulations require control of PM, $NO_x$, and $SO_2$, regardless of the fuel source, for more than 30 industries. Discharges from these steam generating units are not regulated by 40 CFR Part 423 (Steam Electric Power Generation) because they do not produce electric power for distribution and/or sale as their primary purpose (U.S. EPA, 2009). During EPA's detailed study of the steam electric industry, EPA reviewed discharges from these units (including cogenerators[38]). EPA found that, with the exception of certain instances (e.g., certain subcategories of the Pulp, Paper, and Paperboard ELGs—see 40 CFR Part 430.01 (m)), wastewaters from these steam units are not specifically regulated by ELGs (i.e., there are no regulations specifically for discharges from wet air pollution control on steam generating units). Additionally, EPA discovered that most industrial plants commingle the wastewaters associated with the air pollution control devices from these steam generating units with wastewater from other plant processes, which may be treated in the plant's wastewater treatment system. EPA

[38] A cogenerator is defined as "a generating plant that produces electricity and another form of useful thermal energy (such as heat or steam), used for industrial commercial, heating, or cooling purposes" (U.S. DOE, 2006).

determined that the Steam Electric ELGs are not typically used to set BPJ-based limits for these discharges; instead, permit writers typically develop discharge limits based on the industry-specific ELGs (U.S. EPA, 2009).

Generally, the industry-specific ELGs do not explicitly address the wastewater discharges from the steam generating units, though discharge permits for some of these facilities may include limits for pollutants in wastewater discharges from the air pollution control devices on the steam generating units. These discharges are likely captured in the TRA databases in the plant's specific point source category. However, some discharge permits may not include limits for these pollutants, in which case these discharges are not captured in the TRA databases.

#### 6.3.2.5 Steam Electric Power Generating Units (Currently Regulated Under 40 CFR Part 423)

EPA promulgated NSPS for steam generating units in August 1971 (40 CFR 60 Subpart D) and September 1978 (40 CFR 60 Subpart Da). The rules required control of particulate matter, nitrogen oxides, and sulfur dioxides from fossil fuel-fired steam generators and electric utility steam generating units. Additionally, EPA promulgated NESHAP in February 2012 to control particulate matter, antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel, selenium, hydrogen chloride, sulfur dioxide, and mercury from coal- and oil-fired steam generating units. Wastewater discharges from these steam generating units are regulated by 40 CFR Part 423 (Steam Electric Power Generation) because they produce electric power for distribution and/or sale (U.S. EPA, 2009).

EPA completed a detailed study of the steam electric power generating industry in 2009, which resulted in a rulemaking to revise the 1982 Steam Electric ELGs. The proposed revisions to the ELGs include limitations for metals in wastewater discharges from FGD air pollution control systems (e.g., wet FGD scrubbers). FGD scrubber wastewater is regulated by the 1982 ELGs for total suspended solids, oil and grease, and pH only. However, these discharges also contain toxic metal pollutants not previously captured in EPA's review of this industrial category. EPA proposed the revised ELGs, including metals in wastewater discharges from FGD scrubbers, for Part 423 in April 2013 (78 FR 34432).

#### 6.3.2.6 Petroleum Refineries (Currently Regulated Under 40 CFR Part 419)

EPA promulgated NSPS (40 CFR 60 Subparts J and Ja) for petroleum refineries March 8, 1974 (revised and amended many times since, most recently in 2012). These rules require control of particulate matter, nitrogen oxides, and sulfur dioxides. The 2012 revised NSPS (77 FR 56463) reflect demonstrated improvements in emissions control technologies and work practices. Specifically, EPA estimated that refineries would use wet scrubbers to control emissions from fluid catalytic cracking units and fluid coking units. EPA estimated that the rule would generate 1.6 billion gallons of water per year for the 5 years following the proposal for new sources (73 FR 56463).

EPA promulgated NESHAP in 1995 to control organic compounds, reduced sulfur compounds, inorganics, and particulate metals from process units at petroleum refineries. In addition, EPA promulgated NESHAP in 2002 (amended in February 2005) to control organic compounds, reduced sulfur compounds, inorganics, and particulate metals emissions from catalytic cracking, catalytic reforming, and sulfur units at petroleum refineries. EPA expected a small increase in water usage from the increased use of wet scrubbers because of the NESHAP (67 FR 17761). EPA also sent a comprehensive industry-wide information collection request to all petroleum refineries in the U.S. in April 2011. EPA conducted the ICR to collect information needed to reevaluate air emission standards. In the ICR, EPA requested processing characteristics at the refineries (including wastewater collection and treatment).

In 1982 (before EPA promulgated the NESHAPs for petroleum refineries) EPA promulgated an ELG for wastewater discharges (Part 419 Petroleum Refining). EPA conducted a detailed study of petroleum refinery wastewaters in 2004, specifically looking at concentrations of dioxins, polycyclic aromatic compounds, and metals discharged in 2000. In 2004, EPA determined that revisions to the ELGs were not warranted for controlling wastewater discharges from refineries.

During its 2011 and 2012 Annual Reviews, EPA began a review of the petroleum refining point source category because it ranked high in terms of TWPE. The annual reviews show a recent increase in metals discharges in the DMR database (see Section 5.2). Currently, except for chromium, the petroleum refineries ELG does not regulate the discharge of metals. The reviews of petroleum refineries in 1982 and 2004 did not capture changes in the industry resulting from the 2002 NESHAP and the 2008 revisions to NSPS, which identified wet scrubbers as a method for controlling particulate metal emissions and other HAPs.

### *6.3.3 Summary of Findings from EPA's Review of Air Pollution Control Regulations*

EPA evaluated whether air pollution control regulations might result in the generation of wastewater discharges not included in the scope of existing ELGs and identified the following:

- Of the 38 NESHAP rules and 46 NSPS rules reviewed, EPA found that six of these rules affected four industries not currently regulated by ELGs. Findings for these industries are summarized below:
  - *Brick and Structural Clay Products Manufacturing*: Currently brick and structural clay product manufacturers only have stormwater NPDES permits. Further, permit writers that EPA contacted explained that they have not identified industrial wastewater discharges at brick and clay products manufacturers.
  - *PCE-Based and Petroleum-Based Dry Cleaning*: EPA's review of the industrial laundries industry in 1997 found that many facilities are moving away from dry cleaning because of the hazardous nature of the solvents and the expense of their disposal. Because EPA investigated wastewater discharges from this industry after promulgation of air regulations, EPA does not expect the revised 2006 NESHAP to affect wastewater discharges.
  - *Industrial, Commercial, and Institutional Boilers*: EPA expects that wastewater discharges from boiler air pollution control devices are commingled and discharged with other industrial plant process

wastewaters, and are not specifically addressed in ELGs. EPA has not evaluated the pollutants in the boiler air pollution control at this time.

— *Industrial, Commercial, and Institutional Steam Generating Units*: Discharges from steam generating units are not regulated by 40 CFR Part 423 (Steam Electric Power Generating ELGs) because they do not produce electric power for distribution and/or sale. However, in its 2009 detailed study of the steam industry, EPA found that industry-specific ELGs do not specifically address wastewater discharges from these units either. EPA expects that some discharge permits, but not all, may include permit limitations for pollutants in wastewater from air pollution controls on steam generating units based on the facility-specific ELGs. EPA has not evaluated pollutants in these wastewater discharges at this time.

- Additionally, EPA found that for two industries with existing ELGs, five air rules might result in wastewater discharges not included in the scope of existing ELGs. Findings for these industries are summarized below:

  — *Steam Electric Generating Units*: EPA promulgated NSPS for steam generating units in 1971 and 1978 (40 CFR 60 Subparts D and Da). These air regulations address electric generating units that are covered under 40 CFR Part 423 (Steam Electric Power Generating ELGs) because they produce electric power for distribution and/or sale. EPA is currently proposing to revise the 1982 Steam Electric Power Generation ELGs to include limitations for toxic metal pollutants in FGD scrubber wastewater.

  — *Petroleum Refining*: EPA revised NSPS for petroleum refineries in 2012 to control particulate matter, nitrogen oxides, and sulfur dioxides. Additionally, EPA promulgated the 2002 NESHAP (amended in September 2009) to control organic compounds, reduced sulfur compounds, inorganics, and particulate metals emissions from catalytic cracking, catalytic reforming, and sulfur plant units at petroleum refineries. EPA began a category review of the petroleum refining point source category in the 2011 and 2012 Annual Reviews, which show a recent increase in metals discharges in the DMR database.

### *6.3.4 References for Air Pollution Control Regulations*

1. U.S. DOE. 2006. U.S. Department of Energy. Glossary. Energy Information Administration (EIA). Available online at: http://www.eia.doe.gov/glossary/index.html. Date accessed: June 2006. EPA-HQ-OW--2004-0032-2005. DCN 03359.

2. U.S. EPA. 2000. *Technical Development Document for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category*. Washington, D.C. (March). EPA-821-R-00-006. EPA-HQ-OW-2010-0824. DCN 07763.

3. U.S. EPA. 2009. *Steam Electric Power Generating Point Source Category: Final Detailed Study Report.* Washington, D.C. (October). EPA-821-R-09-008. EPA-HQ-OW-2008-0517-0413.

4. U.S. EPA. 2012. Expansion of Industry Sectors Covered by the Toxics Release Inventory (TRI), EPCRA section 313. (May 16). Available online at: http://yosemite.epa.gov/opei/rulegate.nsf/byRIN/2025-AA33#1. EPA-HQ-OW-2010-0824. DCN 07735.

5. Warren, Lee. 2012. Telephone Communication Between Lee Warren, Alabama Department of Environmental Management, and Kimberly Landick, Eastern Research Group, Inc., Re: Brick Manufacturing Process. (March 21). EPA-HQ-OW-2010-0824. DCN 07737.

**Table 6-44. Air Regulations Potentially Resulting in Wastewater Discharges in Industries with No Existing Effluent Limitations Guidelines**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | Further Review? |
|---|---|---|---|---|---|
| Brick and Structural Clay | NESHAP for Brick and Structural Clay Products Manufacturing | Hydrogen fluoride, Hydrogen chloride, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Mercury, Manganese, Nickel, Lead and Selenium | 2006 | 40 CFR 63 Subpart JJJJJ<br>Final Rule: May 16, 2003<br>(68 FR 26689) | Wet scrubbers are listed as an optional air pollution control device in the final rule. EPA's initial review of brick and structural clay industrial wastewater discharges suggests that most of the NPDES permits are stormwater permits for the 93 permits in the 2009 DMR database. Therefore, EPA expects that discharges in the TRA databases are from stormwater, not air pollution control, at this time. |
| Dry Cleaning | NESHAP for Perchloroethylene (PCE) Dry Cleaners | Perchloroethylene (PCE) | 2009[a] | 40 CFR 63 Subpart M<br>• Final Rule: July 27, 2006<br>• (71 FR 42724) | Yes. The NESHAP prescribes refrigerator condensers (wet air pollution control) for all PCE dry cleaning facilities (major sources, large area sources, and small area sources). Additionally, the NESHAP prescribes carbon adsorbers in addition to refrigerator condensers (wet air pollution controls) for major sources. The NSPS applies to facilities located at a petroleum dry cleaning plant with a total manufacturers' rated dryer capacity equal to or greater than 38 kilograms. Dry cleaners are not required to report to TRI and only 16 laundries reported DMR discharges (in 2009). Top pollutants reported in discharges include fluoride and chlorine. Therefore, EPA concludes that the TRA database to not capture discharges from PCE or petroleum-based dry cleaning facilities. |
| Dry Cleaning | NSPS for Petroleum Dry Cleaners. | VOC emissions | 1984 | 40 CFR 60 Subpart JJJ<br>Final Rule: September 1984<br>(49 FR 37331) | |

**Table 6-44. Air Regulations Potentially Resulting in Wastewater Discharges in Industries with No Existing Effluent Limitations Guidelines**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | Further Review? |
|---|---|---|---|---|---|
| Printing and Publishing [b] | NSPS Publication Rotogravure Printing | $SO_2$, $NO_x$, VOCs, PM, or CO | 1980 | 40 CFR 63 Subpart QQ<br><br>Final Rule: November 1982<br><br>(47 FR 50649) | No. Final Rule lists the following wet air pollution control devices: carbon adsorption, condensation/solvent recovery, biological treatment, stream stripping, and liquid- phase carbon adsorption.<br><br>However, based on the date of the NSPS publication (1980), EPA expects that the 2006 Preliminary Study of the Printing and Publishing industry reviewed the discharges from this air regulation. |
| Industrial, Commercial, and Institutional Boilers and Process Heaters—Major Sources | NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters | CO, HCl, Hg, and PM or TSM | 2016 | 40 CFR 63 Subpart DDDDD<br><br>Final Rule: January 31, 2013<br><br>(78 FR 7138) | Yes. The NESHAP potentially affects over ten industrial categories. Wastewater discharges from boiler air pollution control devices (e.g., wet scrubbers) are likely commingled with plant wastewater and therefore categorized as part of a plant's point source category in the TRA databases.<br><br>Therefore, the TRA databases likely capture these discharges for some point source categories, but not all. |

**Table 6-44. Air Regulations Potentially Resulting in Wastewater Discharges in Industries with No Existing Effluent Limitations Guidelines**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | Further Review? |
|---|---|---|---|---|---|
| Industrial-Commercial-Institutional Steam Generating Units | NSPS for Industrial-Commercial-Institutional Steam Generating Units/NSPS for Small Industrial- Commercial-Institutional Steam Generating Units | PM, $SO_2$, $NO_x$ | 1984 and 1989 | 40 CFR 60 Subpart Db and Dc<br><br>Final Rule: June 1984 and 1989 | Yes. 40 CR Subparts Db and Dc potentially affect over 30 industrial categories. Wastewater discharges from steam generating unit air pollution control devices (e.g., wet scrubbers) are likely commingled with plant wastewater and therefore categorized as part of a plant's point source category in the TRA databases.<br><br>Therefore, the TRA databases likely capture these discharges for some point source categories, but not all. |

Note: EPA examined language in the regulations and supporting documentation and noted which rules specified air pollution control that would potentially generate wastewater (e.g., use of a wet scrubber). If the air regulation included language that mentioned wet air pollution control as an option, EPA designated the affected industries as potentially having a wastewater impact from the air regulation.

[a] On September 22, 1993, EPA promulgated technology-based emission standards to control emissions of PCE from dry cleaning facilities. On July 27, 2006, EPA promulgated revised standards to take into account new developments in production practices, processes, and control technology. The 2006 standards are expected to provide further reductions of PCE beyond the 1993 NESHAP. On July 11, 2008, EPA published revisions to the 2006 regulations based on adverse comments. The latest date of compliance for these regulations is July 27, 2009.

[b] EPA reviewed the MACT standards for the Printing and Publishing industry in April 2011 (76 FR 22566). EPA did not identify any advances in practices, processes, and control technologies applicable to the emission sources in the Printing and Publishing Industry source category in the technology review (75 FR 65067). EPA determined that the current MACT standards for Printing and Publishing facilities reduce risk to an acceptable level, provide an ample margin of safety to protect public health, and prevent adverse environmental effects. Therefore, EPA re-adopted the existing MACT standards.

**Table 6-45. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Prioritized for Further Review During EPA's 2012 Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Steam Generating Units | NSPS for Fossil-Fuel-Fired Steam Generators | $SO_2$, $NO_x$, VOCs, PM, or CO | 1976 (Amendment: 2007) | 40 CFR 60 Subpart D<br><br>Final Rule:<br>August 17, 1971 | ELG currently under review; Part 423 Steam Electric ELGs (1982) | Yes. Likely not captured in TRA databases because potentially contains pollutants without ELGs, such as selenium and arsenic.<br><br>Ongoing EPA rulemaking is addressing wastewaters discharges from air pollution controls. |
| | NSPS for Electric Utility Steam Generating Units | $SO_2$, $NO_x$, VOCs, PM, or CO | 1978 (Amendment: 2007) | 40 CFR 60 Subpart Da<br><br>Final Rule:<br>September 18, 1978 | | |
| | NESHAP for Coal- and Oil-Fired Electric Utility Steam Generating Units | PM, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Manganese, Nickel, Selenium, Hydrogen Chloride, Sulfur Dioxide, Mercury | 2015 | 40 CFR 63 Subpart UUUUU<br><br>Final Rule:<br>February 16, 2012<br>(77 FR 9303) | | |

**Table 6-45. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Prioritized for Further Review During EPA's 2012 Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Petroleum Refineries | NSPS for Refineries | $SO_2$, $NO_x$, VOCs, PM, or CO. | 1977 (Updated: 2012) | 40 CFR 60 Subparts J and Ja<br><br>Final Rule for NSPS J: March 8, 1974 (39 FR 9315)<br><br>Final Rule for NSPS Ja: June 24, 2008 (73 FR 35837); Updated September 12, 2012 (77 FR 56422) | Petroleum Refining – 40 CFR Part 419 (1982) | Yes. EPA suspects that the 2012 NSPS Ja and the 2002 (amended in 2005) NESHAP may result in wastewater discharges from wet scrubbers. The NESHAP expects a small increase in annual water usage would result from the increased use of wet scrubbers.<br><br>EPA conducted a Preliminary Study of this category in 2004; however, this review did not capture any changes in the industry potentially resulting from the 2012 NSPS amendment and the 2005 NESHAP. |
| | NESHAP for Petroleum Refineries | Organic compounds, Reduced sulfur compounds, Inorganics, and Particulate metals | 1998 | 40 CFR 63 Subpart CC<br><br>Final Rule: August 18, 1995 (60 FR 43244) | | |
| | NESHAP for Petroleum Refineries (Catalytic Cracking, Catalytic Reforming, Sulfur Plant Units). | Organic compounds, Reduced sulfur compounds, Inorganics, and Particulate metals | 2005 | 40 CFR 60 Subpart UUU<br><br>Final Rule: April 11, 2002 (67 FR 17761); Amendment: February 5, 2005 (70 FR 6929) | | |

Note: EPA examined language in the regulations and supporting documentation and noted which rules specified air pollution control that would potentially generate wastewater (e.g., use of a wet scrubber). If the air regulation included language that mentioned wet air pollution control as an option, EPA designated the affected industries as potentially having a wastewater impact from the air regulation.

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Battery Manufacturing | NSPS for Lead Acid Battery Manufacturing Plants | Lead | 1980 | 40 CFR 60 Subpart KK<br><br>Final Rule: April 1982<br><br>(47 FR 16573) | Part 461 Battery Manufacturing ELGs (1984) | No. Wastewater discharges from manufacture of lead acid batteries are regulated under Subpart C (Lead Subcategory) of 40 CFR Part 461. EPA reviewed lead acid battery manufacturing (specifically including wastewater streams from wet scrubbers) during the development of the ELG (promulgated in 1984). |
| | NESHAP for Lead Acid Battery Manufacturing\ | Lead | 2008 | 40 CFR 63 Subpart PPPPPP<br><br>Final Rule: July 16, 2007<br><br>(72 FR 16636) | | No. The NESHAP for Lead Acid Battery Manufacturing adopts the numerical emissions limits in 40 CFR 60 Subpart KK (NSPS for Lead Acid Batteries). EPA does not expect the NESHAP to change wastewater discharges. |
| OCPSF | NSPS for Pressure Sensitive Tape and Label Surface Coding Operations | $SO_2$, $NO_x$, VOCs, PM, or CO | 1983 | 40 CFR 60 Subpart RR<br><br>Final Rule: October 18, 1983<br>(48 FR 48375) | Part 414 OCSPF ELGs (1987) | Not yet determined. EPA will determine if the regulated pollutants are accurately represented in the TRA databases in future annual reviews. |
| | NSPS for Flexible Vinyl/Urethane Coating and Printing | $SO_2$, $NO_x$, VOCs, PM, or CO | 1984 | 40 CFR 60 Subpart FFF<br><br>Final Rule: June 29, 1984<br>(49 FR 26892) | | |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| | NESHAP for Acrylic/Modacrylic Fiber | Acrylonitrile | 2008 | 40 CFR 63 Subpart LLLLLL<br><br>Final Rule: July 16, 2007 (72 FR 38864) | | |
| | NESHAP for Cellulose Products Manufacturing | Carbon Disulfide, Carbonyl Sulfide, Ethylene Oxide, Methanol, Methyl Chloride, Propylene Oxide, Toluene | 2005 | 40 CFR 63 Subpart UUUU<br><br>Final Rule: June 11, 2002 (67 FR 40043) | | Not yet determined. EPA will determine if all cellulose products manufacturing facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Flexible Polyurethane Foam Fabrication Operation | Hydrochloric Acid, 2,4–Toluene Diisocyanate, Hydrogen Cyanide, Methylene Chloride | 2003 | 40 CFR 63 Subpart MMMMM<br><br>Final Rule: April 14, 2003 (68 FR 18061) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Generic MACT I-Acetal Resins | | 2002 | 40 CFR 63 Subpart YY & UU<br><br>Final Rule: June 29, 1999 (64 FR 34853) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Generic MACT I-Polycarbonates Production | | 2002 | 40 CFR 63 Subpart YY & UU<br><br>Final Rule: June 29, 1999 (64 FR 34853) | | |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| | NESHAP for Generic MACT I-Acrylic/Modacrylic Fibers | | 2002 | 40 CFR 63 Subpart YY & UU<br><br>Final Rule: June 29, 1999 (64 FR 34853) | | |
| | NESHAP for Miscellaneous. Organic Chemical Production and Processes | Toluene, Methanol, Xylene, Hydrogen Chloride, Methylene Chloride | 2008 | 40 CFR 63 Subpart FFFF<br><br>Final Rule: November 10, 2003 (68 FR 63851) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Polyether Polyols Production | Ethylene Oxide, Propylene Oxide, Hexane, Toluene | 2002 | 40 CFR 63 Subpart PPP<br><br>Final Rule: June 1, 1999 (64 FR 29419) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Polymers and Resins I | Organic hazardous air pollutants including Styrene, n-Hexane, 1,3-Butadiene, Acrylonitrile, Methyl Chloride, Hydrogen Chloride, Carbon Tetrachloride, Chloroprene, Toluene | 2001 | 40 CFR 63 Subpart U<br><br>Final Rule: September 5, 1996 (61 FR 46906) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| | NESHAP for Polymers & Resins II | | 1998 | 40 CFR 63 Subpart W<br><br>Final Rule: March 8, 1995 (60 FR 12670) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Polymers & Resins III | Organic hazardous air pollutants including Formaldehyde, Methanol, Phenol, Xylene, Toluene | 2003 | 40 CFR 63 Subpart OOO<br><br>Final Rule: January 20, 2000 (65 FR 3275) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Polymers & Resins IV | Organic hazardous air pollutants including Acrylonitrile, Butadiene, Styrene Resin, Styrene Acrylonitrile Resin, Methyl Methacrylate Polystyrene Resin, Poly Resin, and Nitrile Resin. | 2001 | 40 CFR 63 Subpart JJJ<br><br>Final Rule: September 12, 1996 (61 FR 48208) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| | NESHAP for Polyvinyl Chloride and Copolymers Production | | 2002 | 40 CFR 63 Subpart J<br><br>Final Rule: July 10, 2002 (67 FR 45885) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| Paving and Roofing Materials | NSPS for Asphalt Processing and Asphalt Roofing Manufacture for either $SO_2$, $NO_x$, VOCs, PM, or CO. | $SO_2$, $NO_x$, VOCs, PM, or CO | 1982 | 40 CFR 60 Subpart UU<br><br>Final Rule: August 6, 1982 (47 FR 34143) | Part 443 Paving and Roofing Materials ELGs (1975) | Not yet determined. EPA will determine if the regulated pollutants are accurately represented in the TRA databases in future annual reviews. |
| Glass Manufacturing | NSPS for Wool Fiberglass Insulation Manufacturing | $SO_2$, $NO_x$, VOCs, PM, or CO. | 1985 | 40 CFR 60 Subpart PPP<br><br>Final Rule: February 1985 (50 FR 7699) | Part 426 Glass Manufacturing ELGs (1974) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| Textiles | NESHAP for Fabric Printing, Coating and Dyeing | Toluene, Methyl Ethyl Ketone (MEK), Methanol, Xylenes, Methyl Isobutyl Ketone (MIBK), Methylene Chloride, Trichloroethylene, N-Hexane, Glycol Ethers, Formaldehyde. | 2006 | 40 CFR 63 Subpart OOOO<br><br>Final Rule: May 29, 2003 (68 FR 32171) | Part 410 Textiles ELGs (1982) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Waste Combustors | NSPS for New or Modified Construction of Commercial and Industrial Solid Waste Incineration Units for Which Construction Is Commenced | $SO_2$, $NO_x$, VOCs, PM, or CO | 2013 | 40 CFR 60 Subpart CCCC<br><br>Final Rule: December 1, 2000 (65 FR 75350) | Part 444 Waste Combustors ELGs (2000) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NSPS for Existing Commercial and Industrial Solid Waste Incineration Units | $SO_2$, $NO_x$, VOCs, PM, or CO | 2011 | 40 CFR 60 Subpart DDDD<br><br>Final Rule: December 2000 (65 FR 75362) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Hazardous Waste Combustion | Chlorinated Dioxins and Furans, Other toxic organic compounds, Toxic metals, Hydrochloric Acid, Chlorine Gas, PM. | 2003 | 40 CFR 63 Subpart EEE<br><br>Final Rule: September 30, 1999 (64 FR 52827) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Off-Site Waste Recovery Operations | | 2000 | 40 CFR 63 Subpart DD<br><br>Final Rule: July 1, 1996 (61 FR 34140) | | |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Benzene Waste Operations | NESHAP for Such Operations | | 2006 | 40 CFR 61 Subpart FF<br><br>Final Rule: December 4, 2003 (68 FR 67931) | Many – Not yet determined. | Not yet determined. This NESHAP affects many industries. EPA will review additional air regulation documentation and ELGs of affected industries to determine if ELGs accurately regulate discharges in future annual reviews. |
| Inorganic Chemicals Manufacturing | NESHAP for the Chemical Manufacturing Industry | | 2012 | 40 CFR 63 Subpart VVVVVV<br><br>Final Rule: October 29, 2009 (74 FR 56008) | Part 415 Inorganic Chemicals Manufacturing ELGs (1982) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Hydrochloric Acid Production | Hydrochloric Acid | 2006 | 40 CFR 63 NNNNN<br><br>Final Rule: April 17, 2003 (68 FR 19075) | | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| | NESHAP for Lime Manufacturing | Hydrogen Chloride, Antimony, arsenic, Beryllium, Cadmium, Chromium, Lead, Manganese, Mercury, Nickel, Selenium | 2007 | 40 CFR 63 AAAAA<br><br>Final Rule: January 5, 2004 (69 FR 393) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| | NESHAP for Mercury Cell Chlor-Alkali Plants | | 2006 | 40 CFR 63 Subpart IIIII<br><br>Final Rule: December 19, 2003 (68 FR 70903) | | NA. These facilities are being phased out. |
| Metal Finishing | NESHAP for Magnetic Tape (surface coating) | | 1996 | 40 CFR 63 Subpart EE<br><br>Final Rule: December 15, 1994 (59 FR 64580) | Part 433 Metal Finishing ELGs (1983) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| Iron and Steel Manufacturing | NESHAP for Integrated Iron and Steel | Metals, Trace amounts of organics | 2006 | 40 CFR 63 Subpart FFFFF<br><br>Final Rule: May 20, 2003 (68 FR 27645) | Part 420 Iron and Steel Manufacturing ELGs (2002) | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| | NESHAP for Steel Pickling-HCL Process | Hydrochloric Acid and Chlorine | 2001 | 40 CFR 63 Subpart CCC<br><br>Final Rule: June 22, 1999 (64 FR 33202) | | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| Coil Coating | NESHAP for Metal Coil (surface coating) | Methyl Ethyl Ketone, Glycol Ethers, Xylenes, Toluene, and Isophorone | 2005 | 40 CFR 63 Subpart SSSS<br><br>Final Rule: June 10, 2002 (67 FR 39793) | Part 465 Coil Coating ELGs (1983) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Pulp, Paper, and Paperboard | NESHAP for Paper and Other Web (surface coating) | Organics including Toluene, Methanol, Methyl Ethyl Ketone, Xylenes, Phenols | 2005 | 40 CFR 63 Subpart JJJJ<br><br>Final Rule: December 4, 2002 (67 FR 72329) | Part 430 Pulp, Paper, and Paperboard ELGs (1998) | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| Pesticides Chemicals | NESHAP for Pesticide Active Ingredient Production | Toluene, Methanol, Methyl Chloride, Hydrogen Chloride | 2003 | 40 CFR 63 Subpart MMM<br><br>Final Rule: June 23, 1999 (64 FR 33549) | Part 455 Pesticides Chemicals ELGs (1978) | Not yet determined. EPA will determine if all applicable facilities are reporting these pollutants in the TRA databases in future annual reviews. |
| Pharmaceuticals Production | NESHAP for Pharmaceuticals Production | | 2001 | 40 CFR 63 Subpart GGG<br><br>Final Rule: September 21, 1998 (63 FR 50280) | Part 439 Pharmaceutical Manufacturing ELGs (1998) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |
| Gum and Wood Chemicals | NESHAP for Plywood and Composite Wood Products | Acetaldehyde, Acrolein, Formaldehyde, Methanol, Phenol, Propionaldehyde | 2007 | 40 CFR 63 Subpart DDDD<br><br>Final Rule: July 30, 2004 (69 FR 45943) | Part 454 Gum and Wood Chemicals Manufacturing ELGs (1976) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |

**Table 6-46. Air Regulations Potentially Resulting in Wastewater Discharges not Included in the Scope of Existing ELGs Requiring Further Investigation in Future Annual Reviews**

| Industry | NSPS/NESHAP | Regulated Pollutants | Latest Date of Required Compliance | Citation | ELG (Date of Promulgation or Last Revision) | Further Review? |
|---|---|---|---|---|---|---|
| Ore Mining | NESHAP for Taconite Iron Ore Processing | Metal compounds including Manganese, Arsenic, Lead, Nickel, Chromium, Mercury; Products of incomplete combustion including Formaldehyde; Hydrogen Chloride and Hydrogen Fluoride. | 2006 | 40 CFR Part 63 Subpart RRRRR<br><br>Final Rule: October 30, 2003 (68 FR 61867) | Part 440 Ore Mining ELGs (1982; Detailed Study completed in 2011) | Not yet determined. EPA will review additional air regulation documentation to determine the affects of wet air pollution control on industrial discharges in future annual reviews. |

Note: EPA examined language in the regulations and supporting documentation and noted which rules specified air pollution control that would potentially generate wastewater (e.g., use of a wet scrubber). If the air regulation included language that mentioned wet air pollution control as an option, EPA designated the affected industries as potentially having a wastewater impact from the air regulation.

### Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| Fertilizer Manufacturing, Inorganic Chemicals Manufacturing | NSPS for sulfuric acid production units for sulfuric acid mist and $SO_2$. | 1995 | 40 CFR Part 60 Subpart Cd<br><br>Final Rule: December 19, 1995 (60 FR 65414) | Undetermined. Possibly Part 418 Fertilizer Manufacturing ELGs (1974) or Part 415 Inorganic Chemicals Manufacturing (1982) |
| Fertilizer Manufacturing, Inorganic Chemicals Manufacturing | NSPS for nitric acid plants for NOx and opacity. | 1977 | 40 CFR Part 60 Subpart G<br><br>Final Rule: July 25, 1977 (42 FR 37936) | Undetermined. Possibly Part 418 Fertilizer Manufacturing ELGs (1974) or Part 415 Inorganic Chemicals Manufacturing (1982) |
| Fertilizer Manufacturing | NSPS for phosphate fertilizer industry: wet process phosphoric acid plants. This rule requires control of fluoride emissions. | 1977 | 40 CFR Part 60 Subpart T<br><br>Final Rule: July 25, 1977 (42 FR 37937) | Part 418 Fertilizer Manufacturing ELGs (1974) |
| Fertilizer Manufacturing | NSPS for phosphate fertilizer industry: superphosphoric acid plants. This rule requires control of fluoride emissions. | 1977 | 40 CFR Part 60 Subpart U<br><br>Final Rule: July 25, 1977 (42 FR 37937) | Part 418 Fertilizer Manufacturing ELGs (1974) |
| Paving and Roofing Materials | NSPS for hot mix asphalt facilities. This rule requires control of PM emissions and opacity. | 1977 | 40 CFR Part 60 Subpart I<br><br>Final Rule: July 25, 1977 (42 FR 37937) | Part 443Paving and Roofing Materials (Tars and Asphalt) ELGs (1975) |
| Nonferrous Metals Manufacturing | NSPS for Secondary Lead Smelters. This rule requires control of particulate emissions and opacity. | 1977 | 40 CFR Part 60 Subpart L<br><br>Final Rule: July 25, 1977 (42 FR 37937) | Part 421 Nonferrous Metals Manufacturing ELGs (1984) |
| | NSPS for Secondary Brass and Bronze Production Plants. This rule requires control of particulate emissions and opacity. | 1977 | 40 CFR Part 60 Subpart M<br><br>Final Rule: July 25, 1977 (42 FR 37937) | |

**Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG**

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| | NSPS for primary copper smelters. This rule requires control of particulate, $SO_2$ emissions, and opacity. | 1976 | 40 CFR Part 60 Subpart P<br><br>Final Rule: January 15, 1976 (41 FR 2338) | |
| | NSPS for primary zinc smelters. This rule requires control of particulate, $SO_2$ emissions, and opacity. | 1976 | 40 CFR Part 60 Subpart Q<br><br>Final Rule: January 15, 1976 (41 FR 2340) | |
| | NSPS for primary lead smelters. This rule requires control of particulate, $SO_2$ emissions, and opacity. | 1976 | 40 CFR Part 60 Subpart R<br><br>Final Rule: January 15, 1976 (41 FR 2340) | |
| | NSPS for primary aluminum reduction plants. This rule requires control of fluoride emissions and opacity. | 1980 | 40 CFR Part 60 Subpart S<br><br>Final Rule: June 30, 1980 (45 FR 44207) | |
| Iron and Steel Manufacturing | NSPS for primary emissions for Basic Oxygen Process Furnaces. This rule requires control of particulate emissions and opacity. | 1977 | 40 CFR Part 60 Subpart N<br><br>Final Rule: July 25, 1977 (42 FR 37937) | Part 420 Iron and Steel Manufacturing ELGs (2002) |
| Ferroalloy Manufacturing | NSPS for ferroalloy production facilities. This rule requires control of particulate emissions and carbon monoxide. | 1976 | 40 CFR Part 60 Subpart Z<br><br>Final Rule: May 4, 1976 (41 FR 18501) | Part 424 Ferroalloy Manufacturing ELGs (1974) |
| Coil Coating and Metal Finishing | NSPS for surface coating of metal furniture. This rule requires control of VOC emissions. | 1982 | 40 CFR Part 60 Subpart EE<br><br>Final Rule: October 29, 1982 (47 FR 49287) | Part 465 Coil Coating ELGs (1983) and Metal Finishing ELGs (1986) |

**Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG**

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| Inorganic Chemicals Manufacturing | NSPS for lime manufacturing plants. This rule requires control of particulate emissions. | 1984 | 40 CFR Part 60 Subpart HH<br><br>Final Rule: April 26, 1984 (49 FR 18080) | Part 415 Inorganic Chemicals Manufacturing ELGs (1982) |
| Mineral Mining and Processing | NSPS for metallic mineral processing plants. This rule requires control of particulate emissions. | 1984 | 40 CFR Part 60 Subpart LL<br><br>Final Rule: February 21, 1984 (49 FR 6464) | Part 436 Mineral Mining and Processing ELGs (1975) |
| Metal Products and Machinery | NSPS for automobile and light duty trucks surface coating operations. This rule requires control of VOC emissions. | 1980 | 40 CFR Part 60 Subpart MM<br><br>Final Rule: December 24, 1980 (45 FR 85415) | Part 438 Metal Products and Machinery ELGs (2003) |
| Phosphate Manufacturing | NSPS for phosphate rock plants. This rule requires control of particulate emissions. | 1982 | 40 CFR Part 60 Subpart NN<br><br>Final Rule: April 16, 1982 (47 FR 16589) | Part 422 Phosphate Manufacturing ELGs (1974) |
| Coil Coating | NSPS for metal coil surface coating. This rule requires control of VOC emissions. | 1982 | 40 CFR Part 60 Subpart TT<br><br>Final Rule: November 1, 1982 (47 FR 49612) | Part 465 Coil Coating ELGs (1983) |
| Rubber Manufacturing | NSPS for rubber tire manufacturing industry. This rule requires control of VOC emissions. | 1987 | 40 CFR Part 60 Subpart BBB<br><br>Final Rule: September 15, 1987 (52 FR 34874) | Part 428 Rubber Manufacturing ELGs (1974) |

## Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| OCPSF | NSPS for synthetic organic chemical manufacturing industry (SOCMI) distillation and reactor process. This rule requires control of VOC emissions. | 1990 | 40 CFR Part 60 Subpart NNN<br><br>Final Rule: June 29, 1990 (55 FR 26942) | Part 414 OCPSF ELGs (1987) |
| Mineral Mining and Processing | NSPS for nonmetallic mineral processing plants. | 2009 | 40 CFR Part 60 Subpart OOO<br><br>Final Rule: April 28, 2009 (74 FR 19309) | Part 436 Mineral Mining and Processing ELGs (1975) |
| Waste Combustors | NSPS for Large Municipal Waste Combustors. This rule requires control of MWC metals (cadmium, lead, mercury, PM), organics (dioxin/furan), acid gases (HCl, $SO_2$, $NO_x$, and opacity). | 1996 | 40 CFR Part 60 Subpart Cb<br><br>Final Rule: December 19, 1995 (60 FR 65415) | Part 444 Waste Combustors ELGs (2000) |
| | NSPS for Municipal Waste Combustors. This rule requires control of MWC metals (cadmium, lead, mercury, PM), organics (dioxin/furan), acid gases (HCl, $SO_2$, $NO_x$, and opacity). | 1991/1995 | 40 CFR Part 60 Subpart Ea and Eb<br><br>Final Rule: February 11, 1991 (56 FR 5507) and December 19, 1995 (60 FR 65419) | |
| Waste Combustors | NSPS for incinerators for particulate matter. | 1977 | 40 CFR Part 60 Subpart E<br><br>Final Rule: July 25, 1977 (42 FR 37936) | Part 444 Waste Combustors ELGs (2000) |

**Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG**

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| Iron and Steel | NSPS for steel plants, electric arc furnaces, and argon-oxygen decarburization vessels. This rule requires control of particulate emissions and opacity. | 1984 | 40 CFR Part 60 Subpart AA and AAa<br><br>Final Rule: October 31, 1984 (49 FR 43843 and 49 FR 43845) | Part 420 Iron and Steel ELGs (2002) |
| Pulp and Paper | NSPS for kraft pulp mills. This rule requires control of particulate emissions and total reduced sulfur. | 1986 | 40 CFR Part 60 Subpart BB<br><br>Final Rule: May 20, 1986 (51 FR 18544) | Part 430 Pulp and Paper (1998) |
| Glass Manufacturing | NSPS for glass manufacturing plants. This rule requires control of particulate emissions. | 1980 | 40 CFR Part 60 Subpart CC<br><br>Final Rule: October 7, 1980 (45 FR 66751) | Part 426 Glass Manufacturing ELGs (1974) |
| Steam Generating Units | NSPS for coal-fired electric steam generating units. This rule limits nationwide emissions of mercury by setting a cap on emissions and allowing trading. | 2005 | 40 CFR Part 60 Subpart HHHH<br><br>Final Rule: May 2005 (70 FR 28657) | Part 423Steam Electric ELGs (ELG currently under review) |
| Ore Mining | NESHAP for Gold Mine Ore Processing and Production. | 2014 | 40 CFR Part 60 Subpart EEEEEEE<br><br>Final Rule: February 17, 2011 (76 FR 9450) | Part 440 Ore Mining ELGs (1982; Detailed Study completed in 2011) |
| Sewage Treatment Plants | NSPS for sewage treatment plants. This rule requires control of particulate emissions and opacity. | 1977 | 40 CFR Part 60 Subpart O<br><br>Final Rule: November 10, 1977 (42 FR 58521) | Sewage treatment plants are outside the scope of ELGs |

**Table 6-47. Air Regulations with Less Likely Wastewater Impacts – Scope of Air Regulation and Applicable ELG**

| Industry | Scope | Latest Date of Required Compliance | Citation | Existing ELG? (Date of Promulgation or Revision) |
|---|---|---|---|---|
| Sewage Sludge Incineration | NSPS for performance standards for New Sewage Sludge Incineration units for either $SO_2$, $NO_x$, VOCs, PM, or CO. | 2011 | 40 CFR Part 60 Subpart LLLL<br><br>Final Rule: March 31, 2011 (76 FR 15372) | Sewage sludge incineration is covered under Part 503 |
| Sewage Sludge Incineration | NSPS for emission guidelines and compliance times for Existing Sewage Sludge Incineration units for either $SO_2$, $NO_x$, VOCs, PM, or CO. | 2011 | 40 CFR Part 60 Subpart MMMM<br><br>Final Rule: March 31, 2011 (76 FR 15372) | Sewage sludge incineration is covered under Part 503 |

Note: EPA examined language in the regulations and supporting documentation and noted which rules specified air pollution control that would potentially generate wastewater (e.g., use of a wet scrubber). If the air regulation specifically prescribed dry air pollution control, EPA designated the affected industries as less likely to have wastewater impacts.

## 6.4 Review of TRI Industry Sectors Expansion

The Toxics Release Inventory (TRI) is an integral part of EPA's annual review of effluent discharges. Each year, under TRI, facilities that meet certain thresholds must report their releases and other waste management activities for listed toxic chemicals. For facilities discharging toxic chemicals directly to receiving streams and indirectly to publicly owned treatment works (POTWs), EPA uses the annual load data reported to TRI to estimate the toxic-weighted pound equivalents (TWPE) released and assesses the potential hazard of discharges from specific industrial categories. Currently, more than 20,000 U.S. industrial facilities are required to report information to TRI on disposal and other releases of over 650 toxic chemicals (U.S. EPA, 2011a).

In June 2011, EPA's Office of Environmental Information (OEI) initiated a rulemaking to add or expand the coverage of TRI for six industries, including phosphate mining, iron ore mining, solid waste combustors and incinerators, large dry cleaning facilities, bulk petroleum storage, and steam generating facilities. EPA reviewed the proposed expansion of TRI to evaluate whether new hazard data were used as a basis for the expansion proposal for the identified sectors, or if the identified sectors represent new or unregulated wastewater discharges that are not adequately regulated by effluent limitations guidelines and standards (ELGs). EPA examined the TRI sector expansion as a new source of hazard data to augment its traditional toxicity rankings analysis (TRA) conducted in the odd-year review.

The TRI sector expansion rulemaking is still under development, with an expected proposal date of December 2014. Though the available information for the planned expansion is limited, EPA's initial review suggests that selenium discharges from phosphate mines (regulated under 40 CFR Part 136) may be a new pollutant of concern.

### *6.4.1 TRI Industry Sectors Expansion Background*

As discussed above, OEI is considering expanding the facilities required to report to TRI. Currently, facilities with more than 10 employees in certain industrial point source categories are required to report their toxic chemical releases under the Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and the Pollution Prevention Act of 1990. As originally enacted, EPCRA only applied to manufacturing industry sectors. However, Section 313 allows EPA to add industrial sectors to the scope of TRI. TRI currently covers the following industries:[39]

- Mining: coal, metal, and nonmetallic mineral mining and quarrying.
- Utilities: electric, water, sewage, and other systems.
- Manufacturing: food, beverage and tobacco, textile mills and products, apparel, leather and allied products, wood products, paper, printing and publishing, petroleum and coal products, chemicals, plastics and rubber products, nonmetallic mineral products, primary metals, fabricated metals, machinery, computer and

[39] See the list of TRI-covered industries available online at http://www2.epa.gov/toxics-release-inventory-tri-program/my-facilitys-six-digit-naics-code-tri-covered-industry.

electronic products, electrical equipment, transportation equipment and allied services, furniture, miscellaneous manufacturing.

- Merchant wholesalers, non-durable goods: chemical and allied products merchant wholesalers, petroleum and petroleum products merchant wholesalers.
- Wholesale electronic markets and agents brokers.
- Publishing.
- Hazardous waste: waste collection, waste treatment and disposal, remediation and other waste management services.
- Federal facilities.

In June 2011, OEI initiated a rulemaking to add or expand coverage of TRI to the following industry sectors. This rule is still under development, with an anticipated proposal date in December 2014; therefore, the supporting docket is not yet available.

- Iron Ore Mining;
- Phosphate Mining;
- Steam Generation from Coal and/or Oil;
- Petroleum Bulk Storage;
- Solid Waste Combustors and Incinerators; and
- Large Dry Cleaning.

EPA reviewed the scope of the planned TRI sector expansion and information available on the TRI exchange to identify potential toxic chemical releases not adequately regulated by ELGs. For each industrial sector considered under the TRI sector expansion, EPA reviewed available information on the scope of the expansion, any targeted pollutants specific to the industry sector, and any public comments on the TRI exchange website to date. After determining the scope of the TRI expansion for each industry sector, EPA compared the information to the applicable point source categories to determine each sector's regulatory status (i.e., covered by existing ELGs or not regulated). For regulated point source categories, EPA summarized the findings from the most recent annual reviews. For unregulated industries, EPA reviewed any prior industrial category reviews or publicly available information as part of the TRI sector expansion. EPA will continue to review TRI sector expansion data in future annual reviews and as supporting data become available through the public docket.

The following sections present EPA's initial findings and potential next steps related to the six industry sectors proposed for inclusion in the TRI sector expansion.

### *6.4.2 Iron Ore Mining (40 CFR Part 440)*

The TRI sector expansion may add facilities classified under North American Industrial Classification System (NAICS) code 212210 (Iron Ore Mining) to the list of facilities subject to EPCRA Section 313. This expansion would potentially require these facilities to report chemical constituents from iron ore, waste rock, and other mining operations. OEI added metal mining to TRI as part of the 1997 Industry Expansion Rule, but at the time deferred action on iron ore mining facilities, citing that listed toxic chemicals did not appear to be "processed" or "otherwise used" above *de minimis* concentrations. Further, it did not appear that listed toxic chemicals were coincidentally manufactured above the "manufacturing" threshold during the extraction or beneficiation of iron ores (62 FR 23859). However, OEI left open the possibility to reconsider iron ore mining as new information became available and has since indicated that the rationale for deferring action may no longer be applicable. The TRI exchange website did not list specific pollutants targeted as part of the TRI sector expansion for iron ore mining.

ELGs for the Ore Mining and Dressing Point Source Category (40 CFR Part 440), Subpart A (Iron Ore) limit pollutant discharges from iron ore mines. The original ELGs were established in 1982 (47 FR 54609). In each of its annual reviews, EPA has identified the Ore Mining Point Source Category as one of the top ranking industries, in terms of TWPE discharged annually. As a result, each year EPA has performed a preliminary review of ore mining discharges, including iron ore mines. EPA also recently conducted a preliminary study of the Ore Mining and Dressing Point Source Category as a whole, and performed a separate preliminary review for the Iron Ore subcategory, as part of the 2009 Annual Reviews and Preliminary 2010 Plan (U.S. EPA, 2009b; U.S. EPA, 2011b).

EPA's reviews have consistently found that much of the pollutant loads from iron ore mines result from stormwater discharges that are regulated by stormwater general permits and are not subject to Part 440. EPA and state stormwater Multi-Sector General Permits (MSGPs) regulate discharges from waste rock and overburden piles (see 65 FR 64746, October 30, 2000, and 70 FR 72116, December 1, 2005). Because the majority of loads result from stormwater covered by a general permit, they fall outside the current applicability of the national ELGs (U.S. EPA, 2011b).

The U.S. has only 13 active iron ore mines (U.S. Geological Survey, 2011). In 2009, EPA found that one facility, North Shore Mining in Minnesota, reported the majority of the toxic weighted discharges in EPA's toxicity ranking analysis (U.S. EPA, 2009b). After following up with the Minnesota permit writer for North Shore, EPA corrected database errors in the screening level database, and the facility no longer ranked high in terms of TWPE.

Part 440 Subpart A regulates iron, pH, and total suspended solids (TSS) in ore mine drainage. However, EPA regulated TSS as an indicator of metals in mine discharges. EPA describes all the chemicals considered during the 1982 rulemaking in the *Proposed Development Document for Effluent Limitations Guidelines and Standards for the Ore Mining and Dressing Point Source Category* (Ore Mining TDD). In 1982, EPA concluded that the wastewater concentrations of the chemicals reviewed corresponded directly to the TSS concentrations. At the time of the regulation, EPA found that if TSS in the wastewater discharge from the mining operation were reduced, the specific metal concentrations would also decrease (U.S. EPA, 1982).

Based on EPA's previous years of review, the coverage of the existing Part 440 Subpart A, and the regulation of some mine drainage by MSGPs, EPA previously concluded that no additional review of discharges from iron ore mines is warranted. EPA's review of available TRI sector expansion data did not provide any further information regarding the discharge of specific pollutants from the iron ore mining category.

### *6.4.3 Phosphate Mining (40 CFR Part 436)*

The TRI sector expansion may add facilities classified under NAICS 212392 (Phosphate Rock Mining) to the list of facilities subject to EPCRA Section 313, which would potentially require these facilities to report chemical constituents from phosphate ore, waste rock, and other mining operations. According to the 2007 U.S. Economic Census, NAICS 212392 includes seven mines (U.S. Census, 2007). The TRI exchange website did not list specific pollutants targeted as part of the TRI sector expansion for phosphate mining.

OEI has received two petitions, in 2006 and 2009, from the Greater Yellowstone Coalition requesting the addition of phosphate mining as part of the TRI sector expansion. Through the petitions, public commenters raised concerns about selenium discharges from phosphate mines in Idaho (Hoyt, 2006; Hoyt, 2009). Further, in public comments submitted to the TRI exchange, Earthworks also urged EPA to add phosphate mining to TRI due to significant releases of selenium from mines in Idaho (U.S. EPA, 2011c).

ELGs for the Mineral Mining Point Source Category (40 CFR Part 436), Subpart R (Phosphate Mining) limit pollutant discharges from phosphate mines. The original ELGs were established in 1978 (43 FR 9809). EPA recently reviewed the Mineral Mining Point Source Category as part of its 2010 and 2011 Annual Reviews (U.S. EPA, 2011d; U.S. EPA, 2012). Currently, Part 436 only regulates TSS and pH; it does not regulate selenium or discharges of other metals.

EPA's 2010 and 2011 Annual Review identified 14 phosphate mines with discharge data in the 2009 DMR database, all of which are in Florida (U.S. EPA, 2012). Discharges of fluoride account for a large percentage of the TWPE from these mines. Though fluoride is not regulated by Part 436 ELGs, it is controlled in Florida by permit limitations in accordance with the State's water quality standards (10.0 mg/L). EPA did not identify in the TRA databases any phosphate mines in Idaho reporting discharges, nor did it identify any mines reporting discharges of selenium because 40 CFR Part 436 does not regulate selenium (or any other metals). In 2011, EPA contacted the Florida Department of Environmental Protection (FL DEP) Phosphate Management Permit Manager and Program Administrator. The contact stated that the usual fluoride concentration from the phosphate mines in Florida is approximately 3 mg/L; therefore, there has been no action to revise the state's fluoride water quality criteria or research new treatment technologies for fluoride discharges (Champion, 2011). In addition, FL DEP identified no additional chemicals of concern or treatment technologies for phosphate mines in the area, and concluded that phosphate mine discharges were not degrading receiving stream quality (Champion, 2011).

Based on the data collected for EPA's 2010 and 2011 Annual Reviews, EPA previously concluded that no additional review of discharges from phosphate mines was warranted. Because data to support TRI's sector expansion to cover phosphate mining are not yet available, and because phosphate mines are not currently reporting selenium discharges to DMR, EPA is unable to complete its review of phosphate mining, or determine the impact of selenium discharges.

### *6.4.4 Steam Generation from Coal and/or Oil (Not Currently Regulated)*

The TRI sector expansion may add facilities classified under NAICS 221330 (Steam and Air-Conditioning Supply) to the list of facilities subject to EPCRA Section 313. Currently, coverage of NAICS 221330 is limited to facilities that generate a combination of electric, gas, and other services (e.g., facilities that cogenerate steam and electricity). The expansion may include facilities that combust coal and/or oil to generate steam for distribution in commerce, regardless of whether they cogenerate electricity. According to the 2007 U.S. Economic Census, NAICS 221330 includes 69 facilities (U.S. Census, 2007). The TRI exchange website did not list specific pollutants targeted as part of the TRI sector expansion for steam generation from coal and/or oil.

Wastewater discharges from steam electric generation from coal and/or oil are regulated by 40 CFR Part 423 (Steam Electric Power Generating Point Source Category). The Steam Electric Power Generating ELGs cover plants primarily engaged in the generation of electricity for distribution and sale, which results primarily from a process utilizing fossil-type fuel or nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium. The ELGs do not cover the proposed TRI sector expansion for facilities that combust coal and/or oil to generate steam for distribution into commerce because these facilities may not be engaged in the generation of electricity. However, EPA collected information regarding steam and air conditioning supply plants (that use a variety of fuels including natural gas, oil, and coal) as part of its 2009 Steam Electric Power Generating Detailed Study (U.S. EPA, 2009a).

From the detailed study, EPA determined that steam and air-conditioning supply plants generate similar types of wastewaters as steam electric plants regulated under the Steam Electric Power Generating ELGs. However, most of the plants combust natural gas or oil and, therefore, do not generate the quantity of flue gas desulfurization (FGD) and/or ash transport wastewaters that are generated by coal-fired power plants. EPA identified that some of the wastewater discharges contain similar pollutants to those discharged by steam electric plants. Additionally, some of the wastewaters from these plants are regulated using the Steam Electric Power Generating ELGs as the basis for best professional judgment (BPJ)-derived limits. EPA also identified that there are relatively few of these plants in operation and most of them discharge a small amount of wastewater compared to the steam electric plants regulated under the Steam Electric Power Generating ELGs. (U.S. EPA, 2009a). EPA's review of available TRI sector expansion data did not provide any further information regarding the discharge of specific pollutants from steam generation from coal and/or oil.

### *6.4.5 Petroleum Bulk Storage (Not Currently Regulated)*

The TRI sector expansion may add facilities classified under NAICS 493190 (Other Warehousing and Storage) to the list of facilities subject to EPCRA Section 313. In the 1997 Industry Expansion Rule, OEI added to TRI bulk petroleum facilities classified under NAICS 424710 (Petroleum Bulk Stations and Terminals). The TRI rulemaking may expand coverage to include bulk petroleum storage facilities and bulk petroleum stations and terminals for hire. EPA plans to clarify the specific scope and industries covered under this TRI sector expansion once

TRI publishes additional information and data. The TRI exchange website did not list specific pollutants targeted as part of the TRI sector expansion for petroleum bulk storage.

Discharges from petroleum bulk storage facilities are not currently regulated by ELGs. However, EPA conducted a detailed study of Petroleum Bulk Storage Terminals (PBSTs) in 2003 and 2004 (U.S. EPA, 2004). For this study, EPA visited PBSTs and collected data on the chemicals of concern: total petroleum hydrocarbons, phenols, naphthenic acids, aromatic hydrocarbons, and surfactants.

EPA found that PBST wastewaters were limited to stormwater discharges. The detailed study data indicated these stormwater discharges contained low concentrations of toxic chemicals. In addition, general or individual stormwater permits regulated the majority of the chemicals. EPA found that permit writers were issuing stormwater permits to control discharges from PBSTs. As a result, EPA concluded that the discharges were adequately regulated and did not warrant national ELGs (U.S. EPA, 2004). EPA's review of available TRI sector expansion data did not provide any further information regarding the discharge of specific pollutants from petroleum bulk storage facilities.

### *6.4.6 Solid Waste Combustors and Incinerators (40 CFR Parts 437 and 444)*

The TRI sector expansion may add facilities classified under NAICS 562213 (Solid Waste Combustors and Incinerators) to the list of facilities subject to EPCRA Section 313. According to the 2007 U.S. Economic Census, NAICS 562213 includes 117 facilities (U.S. Census, 2007).[40] EPA previously added combustors and incinerators regulated under subtitle C of the Resource Conservation and Recovery Act (RCRA). These facilities collect, transport, treat, stabilize, or dispose of RCRA subtitle C hazardous waste. The TRI sector expansion rulemaking considers the addition of all facilities classified under NAICS 562213, whether or not facilities have subtitle C permits. The TRI exchange website did not list specific pollutants targeted as part of the TRI sector expansion for solid waste combustors and incinerators.

ELGs for the Centralized Waste Treatment (CWT) and Waste Combustor Point Source Categories (40 CFR Part 437 and 40 CFR Part 444, respectively) limit pollutant discharges from incinerators and hazardous waste combustors, as well as from other types of non-hazardous centralized waste treatment. These regulations may not address all potential solid waste combustors and incinerators that are being considered under the TRI sector expansion. EPA originally promulgated the ELGs in 2000 for CWTs and waste combustors (65 FR 81300 and 65 FR 4381, respectively). In addition, in 2009 and 2011, EPA performed preliminary category reviews of both of these point source categories (U.S. EPA, 2009b; U.S. EPA, 2012). EPA found that the majority of the pollutant load associated with these categories resulted from an individual facility and/or from estimations of pollutant discharge loads using values measured below the detection limit. EPA concluded that these categories did not warrant further revision, but that individual facilities would benefit from permitting and compliance support (U.S. EPA, 2009b; U.S. EPA, 2012). EPA has not evaluated discharge data associated with other types of

[40] The U.S. Economic Census includes more facilities than EPA's toxicity rankings databases. Many factors might contribute to this discrepancy, including: facilities may not meet TRI-reporting thresholds; facilities discharging to POTWs are not required to report to ICIS-NPDES; and some facilities in the U.S. Economic Census are distributors or sales facilities, not manufacturers.

solid waste combustors that may be included under the TRI sector expansion. In addition, EPA's review of available TRI sector expansion data did not provide any further information regarding the discharge of specific pollutants from solid waste combustors and incinerators.

### *6.4.7 Large Dry Cleaning (Not Currently Regulated)*

The TRI sector expansion may add large dry cleaning facilities to the list of facilities subject to EPCRA Section 313. This includes multiple sectors classified under NAICS 8123 (Drycleaning and Laundry Services). Large dry cleaning facilities have not previously been required to report to TRI. Particularly, the TRI sector expansion is targeting this industry to report the TRI-listed chemical perchloroethylene (PCE), a non-aqueous solvent used to wash garments. The TRI exchange website did not list any other specific pollutants targeted as part of the TRI sector expansion for large dry cleaning facilities.

On December 17, 1997 (62 FR 66183), EPA published proposed pretreatment standards for pollutant discharges from industrial laundries. At the time, EPA determined that a majority of industrial laundries did not discharge directly to surface water, but rather to POTWs. The proposed pretreatment standards included limits for 11 pollutants including:

- Bis (2-Ethylhexyl) Phthalate;
- Ethylbenzene;
- Naphthalene;
- Tetrachloroethene (also known as PCE);
- Toluene;
- m-Xylene;
- o&p-Xylene;
- Copper;
- LEPA;
- Zinc; and
- TPH (as measured by SGT–HEM).

During a review and detailed study of industrial laundries, EPA reviewed discharges of some large dry cleaners. EPA found that the dry cleaning process generates minimal amounts of wastewater, ranging from zero to 0.25 gallons of water per pound of laundry processed. Further, EPA determined that many facilities were moving away from dry cleaning because of the hazardous nature of dry cleaning solvents and the expense of their disposal. EPA also determined that facilities operating dry cleaning units were moving away from the use of PCE as a solvent in favor of petroleum-based solvents (U.S. EPA, 2000). The proposed pretreatment standards for industrial laundries considered dry cleaning only within the context of facilities that include water washing following dry cleaning.

In 1999, EPA ultimately decided not to promulgate national pretreatment standards for industrial laundries (64 FR 45071). EPA determined that the discharges to POTWs did not represent a problem warranting national regulation because the pretreatment options determined to be economically achievable would remove only a small amount of pollutants. In addition, EPA believed that POTWs were generally not experiencing problems from industrial laundry discharges, or that the discharges would be adequately controlled by the existing pretreatment program. EPA's review of available TRI sector expansion data did not provide any further information regarding the discharge of specific pollutants from large dry cleaning facilities.

### *6.4.8 Summary of Findings from EPA's Review of TRI Industry Sectors Expansion*

The TRI industry sectors expansion rule is still under development and is expected to be proposed by December 2014. From the available information, EPA has conducted a limited review of the six industries proposed to be included in the TRI and has preliminary found:

- The iron ore mining industry sector is regulated by 40 CFR Part 440 (Ore Mining and Dressing), Subpart A (Iron Ore). EPA previously reviewed discharges from iron ore mines in 2009 and 2010, as part of a preliminary study of the point source category. EPA then concluded that no additional review of discharges from iron ore mines was warranted. EPA's review of the TRI sector expansion proposal added no new data or information to alter this prior finding.
- The phosphate mining industry sector is regulated by 40 CFR Part 436 (Mineral Mining), Subpart R (Phosphate Mining). As part of the TRI sector expansion, public commenters have urged EPA to consider including selenium discharges from phosphate mines, specifically citing concerns over phosphate mine discharges in Idaho.
- The steam generation from coal and/or oil industry sector is not currently regulated by ELGs. EPA investigated this sector as part of its 2009 Steam Electric Power Generation Detailed Study and determined that some of the discharges contain similar pollutants to those discharged by steam electric plants; however, there are relatively few of these plants in operation (and even fewer that use coal, which would result in flue gas desulfurization (FGD) and/or ash transport wastewaters). In addition, most of the plants discharge a relatively small amount of wastewater compared to the steam electric plants. The review of the TRI sector expansion proposal information published to date added no new data or information for EPA to consider.
- The petroleum bulk storage industry sector is not currently regulated by ELGs. In 2003 and 2004, EPA performed a detailed study of the industrial category and found that PBST wastewaters are limited to stormwater discharges. As a result, EPA concluded that the discharges were adequately regulated and did not warrant national ELGs. EPA's review of the TRI sector expansion proposal information published to date found no new data or information to alter this prior finding.
- TRI is proposing to expand coverage to all solid waste combustor facilities classified under NAICS 562213, regardless of whether the facility is a hazardous waste combustor. ELGs for the CWT and Waste Combustor Point Source Categories (40 CFR Part 437 and 40 CFR Part 444, respectively) limit pollutant discharges from incinerators and hazardous waste combustors, as well as from other types of centralized waste treatment. This may not include all solid waste combustors that would be included in the TRI sector expansion. EPA previously

reviewed discharges from hazardous waste combustors and CWTs as part of EPA's 2009 and 2010 Annual Reviews. EPA concluded that these categories did not warrant further revision, but that individual facilities would benefit from permitting and compliance support. EPA's review of the TRI sector expansion proposal information published to date found no new data or information to alter this prior finding.

- The large dry cleaning industry category is not regulated by ELGs. In 1999, EPA reviewed the industrial laundries point source category (which includes some dry cleaning operations) as part of a proposed rule to establish industrial laundry pretreatment standards. At the time, EPA considered dry cleaning operations, and determined that they are not a significant source of wastewater discharge, unless coupled with a water washing process. EPA also determined that the discharges from industrial laundries to POTWs in general did not represent a problem warranting national regulation. Therefore, EPA did not promulgate national pretreatment standards for this industry. As part of the TRI sector expansion, OEI is considering adding PCE; however, EPA's prior review of industrial laundries indicated that many dry cleaning facilities were moving away from PCE toward less hazardous alternatives. EPA's review of the TRI sector expansion proposal information published to date added no new data or information to alter this prior finding not to regulate discharges from industrial laundries, or dry cleaning operations in particular.

### *6.4.9 References for Review of TRI Industry Sectors Expansion*

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## 6.5 Review of Analytical Methods

As part of this 2012 Annual Review, EPA reviewed analytical methods recently developed or revised by the Agency to facilitate its identification of unregulated pollutants in industrial wastewater discharges. The Agency periodically develops new analytical methods, or updates existing ones, in response to developments such as the identification of a new class of pollutants, or if impairments to water bodies indicate the need for altered or new methods.

In some instances, EPA is limited in its ability to regulate pollutants in industrial wastewater based on the availability or sensitivity of analytical methods. This is particularly true for emerging contaminants of concern, which may be present in industrial wastewater, but which EPA cannot definitively detect and/or quantify. In addition, as technology and analytical techniques evolve, the Agency may improve the accuracy and sensitivity of its existing analytical methods. EPA recognizes the need to assess these improvements and their potential impacts on wastewater pollution control. Lower detection limits may reveal the presence of additional pollutants in regulated wastewater streams that EPA had been unable to detect. EPA reviewed recent analytical method development activities for two reasons:

- To identify new analytical methods that might help identify unregulated pollutants in industrial wastewater discharges.
- To identify changes to existing analytical methods that provide for increased sensitivity, which might allow EPA to identify previously undetected pollutants or strengthen existing requirements for regulated pollutants.

EPA's review of the wastewater analytical methods included in the 2012 Method Update Rule identified improved detection limits for some metals and new methods for several other pollutants of concern in industrial wastewater. These included free cyanide, acid mine drainage (as a parameter), nonylphenol (NP), and bisphenol A (BPA). EPA also identified several pesticides, measured by existing analytical methods, that do not currently have effluent limits under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455).

EPA also reviewed drinking water analytical methods to determine if new methods have been developed to detect emerging drinking water contaminants that may be attributed to industrial wastewater sources. EPA's review of drinking water analytical methods revealed relatively new methods developed by EPA's Office of Research and Development (ORD) for perfluorinated chemicals (PFCs) and 1,4-dioxane. EPA's Office of Ground Water and Drinking Water (OGWDW) is using these methods in its Unregulated Contaminant Monitoring Rule (UCMR) to evaluate PFCs and 1,4-dioxane in drinking water. EPA has also identified industrial wastewater discharges for both PFCs and 1,4-dioxane.

The following sections present EPA's 2012 review of analytical methods.

### *6.5.1 Data Sources*

An analytical method is a procedure that determines the concentration of a contaminant in wastewater or drinking water. Though the analytical methods established for drinking water may not be directly applicable to industrial wastewater, EPA included them in this analysis to identify emerging pollutants in drinking water that may be attributed to sources of industrial wastewater.

EPA reviewed available information from the following EPA offices to determine if recently developed analytical methods identify unregulated pollutants in industrial discharges or, if established wastewater methods have significantly improved sensitivity and lower detection limits.

- EPA's Office of Water, Office of Science and Technology, Engineering and Analysis Division (EAD). EAD develops, reviews, and approves analytical methods used for measuring contaminants in wastewater, both domestic and industrial.
- EPA's Office of Ground Water and Drinking Water (OGWDW). OGWDW develops, reviews, and approves analytical methods used for measuring drinking water contaminants.
- EPA's Office of Research and Development (ORD). ORD supports research programs that identify the most pressing environmental health research needs with input from EPA offices, partners, and stakeholders. Currently, ORD is also developing analytical methods for measuring contaminants in drinking water.

The following sections present the findings of the new analytical methods reviews for each of these EPA offices.

### *6.5.2 EAD*

- EAD publishes laboratory methods used by industries and municipalities to analyze the chemical, physical, and biological properties of wastewater and other environmental samples that are required by regulation. EAD publishes these methods under the authority of the Clean Water Act (CWA) at 40 CFR Part 136. EAD develops and updates these analytical methods by working with the EPA Regions, states, and stakeholders to determine current analytical needs (U.S. EPA, 2012a).
- EAD published a Methods Update Rule in May 2012 (2012 Method Update Rule) (77 FR 29758) Table 6-50 at the end of this section lists the actions taken in that rule and their relevance to the 304m annual review process. The updates to the rule include new and revised methods by EAD, commercial entities, and voluntary consensus organizations (e.g., Standards Methods Committee).

From its review of the 2012 Method Update Rule, EPA identified five analytical method updates that may help identify new or unregulated pollutants:

- Metals: EAD added EPA Method 200.5 (Revision 4.2), "Determination of Trace Elements in Drinking Water by Axially Viewed ICP-AES," to Table 1B of Part

136 as an alternative to EPA Method 200.7. EAD also clarified that the axial orientation of the torch is allowed for use with EPA Method 200.7 (Revision 4.4), "Determination of Metals and Trace Elements in Water and Wastes by ICP-AES." Both methods are acceptable under Part 136 and both methods employ ICP-AES technology. The use of the axial orientation under both methods allows for greater sensitivity and lower detection limits for some metals.

- Pesticides: As part of the update of pesticide analytical methods, EAD added some of the methods for Pesticide Active Ingredients from Table IG in Part 136 to applicable parameters listed in Table ID for general use. EPA reviewed these methods and identified 30 pesticides that the methods measure, which do not currently have effluent limits under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455) (see Table 6-51 at the end of this section).
- Acid Mine Drainage: EAD added EPA Method 1627, "Kinetic Test Method for the Prediction of Mine Drainage Quality," to Table 1B of Part 136 as a new parameter termed "Acid Mine Drainage." This method may provide additional characterization of coal mine drainage discharges.
- Free Cyanide: EAD added free cyanide as a new parameter to Table IB of Part 136. The addition of this parameter may affect ELGs for industries that discharge cyanide.
- Nonylphenol (NP), Bisphenol A (BPA), p-tert-Octylphenol (OP), Nonylphenol Monoethoxylate (NP1EO), and Nonylphenol Diethoxylate (NP2EO): EAD added ASTM D7065-06 "Standard Test Method for Determination of Bisphenol A, p-tert-Octylphenol, Nonylphenol Monoethoxylate, and Nonylphenol Diethoxylate" to Table IC of Part 136, which covers these five new chemicals. EPA reviewed NP and BPA as part of the review of OPPT's Chemical Action Plans and determined that these pollutants may be present in industrial wastewater discharge (see Section 6.2 for details). EPA does not currently have information or data regarding the presence of OP, NP1EO, or NP2EO in industrial wastewater discharge.

In addition to the 2012 Method Update Rule, EAD is also supporting several initiatives to add or improve methods for additional contaminants through the following actions:

- Developed revised holding times and preservation conditions for pharmaceuticals and personal care products in EPA Method 1694 and steroids and hormones in EPA Method 1698 (U.S. EPA, 2010).
- Developing a draft procedure for measuring perfluorinated carboxylic acids (PFAC) and perfluorinated sulfonic acids (PFAS) in sewage sludge and biosolids; (U.S. EPA, 2011; Gomez-Taylor and Walker, 2012).
- Preparing a protocol with which to validate rapid methods for pathogens using real-time polymerase chain reaction (qPCR).

### *6.5.3 OGWDW*

- OGWDW requires public water systems (PWSs) to demonstrate that their drinking water source, water treatment process, and treated waters meet certain health-based standards, using methods and laboratories approved by EPA or the states. The approved OGWDW analytical methods include methods developed by other EPA offices (including ORD and EAD). However, OGWDW also approves methods developed by consensus method organizations, universities, or commercial vendors. When OGWDW publishes new regulations, it lists at least one analytical method (new or existing) for analyzing the regulated pollutants (U.S. EPA, 2012b).

OGWDW has promulgated drinking water regulations for more than 90 contaminants. Under the Safe Drinking Water Act, OGWDW established a program requiring PWSs to monitor unregulated contaminants. In March 2012, OGWDW issued a final action for its Unregulated Contaminant Monitoring Rule (UCMR) (77 FR 26071). This rule requires PWSs to monitor their influent water supply for the 29 contaminants listed in Table 6-48. Over the next several years, OGWDW will work with PWSs, states, and laboratories to evaluate the results of UCMR testing and determine if further drinking water regulations are warranted.

EPA recognizes that the analytical methods for the pollutants included in the UCMR are applicable to drinking water and may not necessarily be transferrable for detecting and quantifying pollutants in industrial wastewater. EPA reviewed the pollutants included in the UCMR to determine if any are likely attributable to industrial wastewater sources.

**Table 6-48. Analytes in OGWDW's 2012 UCMR**

| **29 Unregulated Analytes and Associated Methods** | |
|---|---|
| **Method** | **Pollutants Measured** |
| **Assessment Monitoring: Targets contaminants that are analyzed with methods that use existing and widely used technology.** | |
| EPA Method 524.3 (GC/MS) | Volatile organic compounds:<br>• 1,2,3-Trichloropropane<br>• 1,3-Butadiene<br>• Chloromethane (methyl chloride)<br>• 1,1-Dichloroethane<br>• Bromomethane (methyl bromide)<br>• Bromochloromethane (Halon 1011)<br>• Chlorodifluoromethane (HCFC-22) |
| EPA Method 522 (GC/MS) | Synthetic organic compounds:<br>• 1,4-Dioxane |
| EPA Method 200.8 (ICP/MS) or alternate SM 3125 or ASTM D5673-10 Methods | Metals:<br>• Cobalt<br>• Molybdenum<br>• Strontium<br>• Vanadium |
| EPA Method 300.1 (IC/Conductivity) or alternate SM 4110D or ASTM D6581-08 Methods | Oxyhalide anion:<br>• Chlorate |

**Table 6-48. Analytes in OGWDW's 2012 UCMR**

| **29 Unregulated Analytes and Associated Methods** | |
|---|---|
| EPA Method 537 (LC/MS/MS) | Perfluorinated chemicals:<br>• Perfluorooctanesulfonic acid (PFOS)<br>• Perfluorooctanoic acid (PFOA)<br>• Perfluorononanoic acid (PFNA)<br>• Perfluorohexanesulfonic acid (PFHxS)<br>• Perfluoroheptanoic acid (PFHpA)<br>• Perfluorobutanesulfonic acid (PFBS) |
| EPA Method 218.7 (IC/UV-VIS): | • Chromium-6 |
| **Screening Survey: Addresses contaminants with analytical methods that rely on sophisticated technology that may not be widely used in drinking water laboratories.** | |
| EPA Method 539 (LC/MS/MS): | Hormones:<br>• 17-β-Estradiol<br>• 17-α-Ethynylestradiol (ethinyl estradiol)<br>• Estriol (16-α-hydroxy-17-β-estradiol)<br>• Equilin<br>• Estrone<br>• Testosterone<br>• 4-Androstene-3,17-dione |
| **Pre-Screen Testing: Addresses contaminants that are analyzed with methods that utilize very new or specialized technology.** | |
| See Section III.D.5 of the FR notice for methods discussion[a]: | Viruses:<br>• Enterovirus<br>• Norovirus |

Source: 77 FR 26072.
[a] Monitoring also includes sampling for pathogen indicators (i.e., total coliforms, *E. coli*, bacteriophage, *Enterococci*, and aerobic spores).

From Table 6-48 EPA identified and further reviewed PFCs and 1,4-dioxane, as these pollutants in drinking water may be attributed to industrial discharges.

EPA did not investigate further the other chemicals listed in Table 6-48. The seven volatile organic compounds (VOCs) included in the UCMR are discharged by industrial facilities, but not at significant concentrations. The sum total of all discharges of these seven VOCs is 1,500 pounds and less than 8 TWPE (DMR Loading Tool). EPA did not identify industrial wastewater discharge data for hormones, viruses, or chlorate, and EPA historically reviews metals discharges as part of its annual review process.

PFCs are manmade and do not occur naturally in the environment (U.S. EPA, 2009). Review of EPA's Office of Pollution Prevention and Toxics (OPPT's) Chemical Action Plan for long-chain PFCs revealed that several chemical manufacturers in the OCPSF point source category are discharging PFCs, and PFOA in particular, at levels above the provisional health advisory level for drinking water (see Section 6.2 for more detail).

- EPA also identified 40 facilities that reported discharges of 1,4-dioxane in 2011 (DMR Loading Tool). EPA's *Toxicological Review of 1,4-Dioxane* (U.S. EPA, 2010) indicates that 1,4-dioxane is a contaminant of some ingredients used in the manufacture of personal care products and cosmetics. 1,4-dioxane is used as a solvent for cellulosics, organic products, lacquers, paints, varnishes, paint and varnish removers, resins, oils, waxes, dyes, cements, fumigants, emulsions, and polishing compositions. It has also been used as a solvent in the formulation of inks, coatings, and adhesives and in the extraction of animal and vegetable oil (U.S. EPA, 2010).

### *6.5.4 ORD*

ORD's water research provides the science and tools necessary to develop sustainable solutions for water resource problems, ensuring water quality and availability to protect human and ecosystem health. This includes development of new methods to measure water contaminants. ORD currently develops methods for:[41]

- Bacteria;
- Biological indicators;
- Coliphages;
- Drinking water;
- Protozoa; and
- Viruses.

EPA is focusing on ORD's methods established for pollutants in drinking water to determine if any are likely attributable to industrial wastewater sources. EPA's Exposure Research Program has actively conducted drinking water methods research and has developed or revised several analytical methods within the last five years, shown in Table 6-49. EPA has identified two of ORD's methods that cover pollutants that OGWDW has included in the UCMR as new pollutants of concern in drinking water: PFCs and 1,4,-dioxane. EPA's review of these pollutants is presented above in Section 6.5.3. EPA did not investigate the remainder of these pollutants or ORD methods further as part of this annual review.

**Table 6-49. ORD Drinking Water Methods Developed Within Last Five Years**

| Method | Pollutants Addressed | Method Description | Latest Revision |
|---|---|---|---|
| 415.3 Rev 1.1, 1.2 | Total Organic Carbon (TOC) | Determination of Total Organic Carbon and Specific UV Absorbance at 254 nm in Source Water and Drinking Water. | September 2009 |
| 522 | 1,4-Dioxane | Determination of 1,4-Dioxane in Drinking Water by Solid Phase Extraction (SPE) and Gas Chromatography/Mass Spectrometry (GC/MS) with Selected Ion Monitoring (SIM). | September 2008 |

[41] For more details see EPA's Water Research webpage at http://www.epa.gov/research/mmtd/water.htm.

**Table 6-49. ORD Drinking Water Methods Developed Within Last Five Years**

| Method | Pollutants Addressed | Method Description | Latest Revision |
|---|---|---|---|
| 525.3 | Semivolatile organics (SVOCs) | Determination of Semivolatile Organic Chemicals in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS). | February 2012 |
| 537 Rev 1.1 | Perfluorinated Alkyl Acids | Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). | September 2009 |
| 538 | Acephate<br>Aldicarb<br>Aldicarb sulfoxide<br>Dicrotophos<br>Diisopropyl methylphosphonate (DIMP)<br>Fenamiphos sulfone<br>Fenamiphos sulfoxide<br>Methamidophos<br>Oxydemeton-methyl<br>Quinoline<br>Thiofanox | Determination of Selected Organic Contaminants in Drinking Water by Direct Aqueous Injection-Liquid Chromatography/Tandem Mass Spectrometry (DAI-LC/MS/MS). | November 2009 |

Source: Drinking Water Methods Developed by EPA's Exposure Research Program. Available online at: http://www.epa.gov/nerlcwww/ordmeth.htm

### *6.5.5 Summary of EPA's Findings from Analytical Methods Review*

Recent EAD analytical method developments as part of the 2012 Method Update Rule have reduced detection limits for some metals and added new methods for detecting other pollutants of concern from industrial wastewater discharge including free cyanide, acid mine drainage, NP, and BPA. The lowered metals detection limits are significant to the annual review process because industries may be discharging metals at levels that were previously undetected. In addition, EPA identified several pesticides measured by some of the approved pesticide analytical methods that do not currently have effluent limits under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455).

In EPA's review of OGWDW and ORD drinking water analytical methods, EPA identified two relatively new analytical methods that ORD has developed to measure concentrations of PFCs and 1,4-dioxane in drinking water. OGWDW is referencing these methods in its UCMR to gather data related to the presence of PFCs and 1,4-dioxane in drinking water. In addition, EPA determined that these pollutants are discharged in industrial wastewater. Though the analytical methods may not be transferrable for detecting PFCs in industrial wastewater, their use through the UCMR will allow EPA to better characterize the impact of PFC and 1,4-dioxane discharges from industrial sources on drinking water supplies.

### *6.5.6 References for Review of Analytical Methods*

1. Gomez-Taylor, Maria and Walker, Lemuel. 2012. Notes from Telephone Communications Between Maria Gomez-Taylor, U.S. EPA, Lemuel Walker, U.S. EPA, William Swietlik, U.S. EPA, Eleanor Codding, Eastern Research Group, Inc., and Elizabeth Sabol, Eastern Research Group, Inc., Re: OW EAD New Analytical Methods. (January 4). EPA-HQ-OW-2010-0824. DCN 07727.

2. U.S. EPA. 2009. *Long-Chain Perfluorinated Chemicals (PFCs) Action Plan.* Washington, D.C. (December 30). Available online at: http://www.epa.gov/opptintr/existingchemicals/pubs/pfcs_action_plan1230_09.pdf. EPA-HQ-OW-2010-0824. DCN 07766.

3. U.S. EPA. 2011. *Draft Procedure for Analysis of Perfluorinated Carboxylic Acids and Sulfonic Acids in Sewage Sludge and Biosolids by HPLC/MS/MS*. Washington, D.C. (December). Available online at: http://water.epa.gov/scitech/methods/cwa/upload/Draft-Procedure-for-Analysis-of-Perfluorinated-Carboxylic-Acids-and-Sulfonic-Acids-in-Sewage-Sludge-and-Biosolids-by-HPLC-MS-MS.pdf. EPA-821-R-11-007. EPA-HQ-OW-2010-0824. DCN 07749.

4. U.S. EPA. 2012a. Clean Water Act Analytical Methods. Available online at: http://water.epa.gov/scitech/methods/cwa/index.cfm. EPA-HQ-OW-2010-0824. DCN 07746.

5. U.S. EPA. 2012b. Safe Drinking Water Act Analytical Methods and Laboratory Certification. Available online at: http://water.epa.gov/scitech/drinkingwater/labcert/methods_index.cfm. EPA-HQ-OW-2010-0824. DCN 07747.

6. U.S. EPA. 2013. *Toxicological Review of 1,4-Dioxane.* Washington, D.C. (September). Available online: http://www.epa.gov/iris/toxreviews/0326tr.pdf. EPA/635/R-09/005-F. EPA-HQ-OW-2010-0824. DCN 07748.

**Table 6-50. 2012 CWA Method Update Rule**

| Changes EPA Made in May 2012 to Part 136 of the CWA Method Update Rule 77 FR 29758 | | |
|---|---|---|
| **Pollutant Affected** | **Summary of Change** | **Relevance to 304m Annual Review** |
| ***New EPA Methods and new versions of previously approved EPA Methods (six categories of pollutants)*** | | |
| Oil and grease | Adds new version of EPA Method 1664, 1664 Revision B: n-Hexane Extractable Material (HEM) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM) by extraction and gravimetry.<br><br>This new version of the method describes modifications that are allowed and modifications that are not allowed when using this method for compliance with Clean Water Act regulations. EPA will continue to allow Method 1664 Revision A for current permits because this method is not significantly different from Revision B. | None currently. |
| Metals | Approval of EPA Method 200.5 (Revision 4.2), "Determination of Trace Elements in Drinking Water by Axially Viewed ICP-AES."<br><br>Method 200.5 includes performance data for the axial configuration that is not in Method 200.7 because the axial technology torch results were not available when Method 200.7 was developed. For some parameters listed in Table IB, the axial orientation using ICP/AES technology results in greater sensitivity and lower detection limits than the radial orientation. Both Methods 200.5 and 200.7 are acceptable methods under Part 136 and both methods employ ICP/AES technology. | Potential lower detection limits for metals. |
| Pesticides | Adds EPA Method 525.2 to Table IG in Part 136 as an additional approved method for all parameters for which EPA previously approved EPA Method 525.1. Adds EPA Methods 525.1 and 525.2 to Table ID in Part 136 for the same parameters for which EPA previously approved EPA Method 525.1 in Table IG. Adds some of the methods for pesticide active ingredients from Table IG to applicable parameters listed in Table 1D for general use. | EPA reviewed the specific pesticides measured by the methods for pesticide active ingredients (referenced in Table IG) and identified several that are not currently regulated by the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELG (40 CFR Part 455). |
| Microbiologicals | Approves new EPA Methods 1622 and 1623 to measure *Cryptosporidium* and *Giardia*. Approves revisions to EPA Methods 1103.1, 1106.1, 1600, 1603, and 1680. | None currently. |
| Non-conventionals | Adds EPA Method 1627, "Kinetic Test Method for the Prediction of Mine Drainage Quality," to Table IB as a new parameter termed "Acid Mine Drainage." | May advise any future reviews of coal mining discharges. |
| Organics | Approves EPA Method 624, "Purgeables," as an alternative to EPA Method 603 for the determination of acrolein and acrylonitrile in wastewater. | None currently. |

## Table 6-50. 2012 CWA Method Update Rule

| Changes EPA Made in May 2012 to Part 136 of the CWA Method Update Rule 77 FR 29758 | | |
|---|---|---|
| **Pollutant Affected** | **Summary of Change** | **Relevance to 304m Annual Review** |
| ***New standard methods and new versions of approved standard methods (23 methods)*** | | |
| Oil and grease | Approves SM 5520 B-2001 and SM 5520 F-2001, which provide alternative gravimetric standard methods for measuring oil and grease. | None currently. |
| Ammonia (as N) and total Kjeldahl nitrogen | Approves SM 4500-$NH_3$ G-1997, which provides an alternative automated phenate standard method for measuring Ammonia and TKN. | None currently. |
| Boron | Approves SM 4500-B B-2000, which provides an alternative colorimetric (curcumin) standard method for measuring total boron. | None currently. |
| Inorganic ions (bromide, chloride, fluoride, orthophosphate, and sulfate) | Approves SM 4140 B-1997, which provides an alternative capillary ion electrophoresis with indirection UV detection standard method for measuring bromide, chloride, fluoride, orthophosphate, and sulfate. | None currently. |
| Arsenic and selenium, | Approves SM 3114 B and 3114C-2009, which provide alternative AA gaseous hydride standard methods for arsenic and selenium. | None currently. |
| Aluminum and beryllium | Approves SM 3111 E-1999, which provides an alternative direct aspiration atomic absorption spectrometry standard method for aluminum and beryllium. | None currently. |
| Chemical oxygen demand | Approves SM 5220 B-1997, which provides an alternative titrimetric standard method for chemical oxygen demand. | None currently. |
| Chromium | Approves SM 3500-CR B-2009, which provides an alternative colorimetric (diphenyl carbazide) standard method for chromium. | None currently. |
| Kjeldahl nitrogen | Approves SM 4500-$N_{org}$ D-1997, which provides an alternative semi-automated block digester colorimetric standard method for Total Kjeldahl Nitrogen. | None currently. |
| Mercury | Approves SM 3112 B-2009, which provides an alternative cold vapor, manual standard method for total mercury. | None currently. |
| Total Phosphorus | Approves SM 4500-P G-1999 and SM 4500-P H-1999, which provide alternative total, automated ascorbic acid reduction standard methods for total phosphorous. | None currently. |
| Total Phosphorus | Approves SM 4500-P E-1999 and SM 4500-P F-1999, which provide alternative manual and automated ascorbic acid reduction standard methods for total phosphorous. | None currently. |
| Oxygen, dissolved | Approves SM 4500-O B, D, E and F-2001, which provide alternative Winkler (azide modification) standard methods for dissolved oxygen. | None currently. |

## Table 6-50. 2012 CWA Method Update Rule

| **Changes EPA Made in May 2012 to Part 136 of the CWA Method Update Rule 77 FR 29758** | | |
|---|---|---|
| **Pollutant Affected** | **Summary of Change** | **Relevance to 304m Annual Review** |
| Oxygen, dissolved | Approves SM 4500-O E-2001, which provides an alternative Winkler alum flocculation modification standard method for dissolved oxygen. | None currently. |
| Phenols | Approves SM 5530 B-2005, which provides an alternative manual distillation standard method for phenols. | None currently. |
| Phenols | Approves SM 5530 D-2005, which provides an alternative colorimetric standard method for phenols. | None currently. |
| Potassium | Approves SM 3500-K C-1997, which provides an option for a selective electrode standard method for total potassium. | None currently. |
| Residues | Approves SM 2540 E-1997, which provides an alternative volatile gravimetric standard method for total residue. | None currently. |
| Silica, dissolved | Approves SM 4500-$SiO_2$ E-1997 and SM 4500-$SiO_2$ F-1997, which provide alternative automated (molybdosilicate) standard methods for dissolved silica. | None currently. |
| Sulfate | Approves SM 4500-$SO_4^{2-}$ C-1997, D-1997, E-1997, F-1997, and G-1997, which provide alternative gravimetric (C-1997 and D-1997), turbidimetric (E-1997), and automated colorimetric (F-1997) standard methods for sulfate. | None currently. |
| Sulfide | Approves SM 4500-$S^2$ B-2000 and C-2000, which provide alternative sample pretreatment standard methods for sulfide. | None currently. |
| ***New ASTM Methods and new versions of previously approved ASTM Methods (eight methods)*** | | |
| Cyanide, available | Approves ASTM D2036-09 (B), which provides an alternative cyanide amenable to chlorination; manual distillation with $MgCl_2$ followed by titrimetric or spectrophotometric ASTM method for available cyanide. | None currently. |
| Cyanide, available | Approval of ASTM D6888-09, which provides an alternative flow injection and ligand exchange followed by gas diffusion amperometry ASTM method for available cyanide. | None currently. |
| Cyanide, total | Approval of ASTM D7284-08, which provides an alternative manual distillation with $MgCl_2$ ASTM method for total cyanide. | None currently. |
| Cyanide, total | Approval of ASTM D7511-09, which provides an option for using segmented flow injection, in-line ultraviolet digestion followed by gas diffusion amperometry for total cyanide. | None currently. |
| Free cyanide | Added free cyanide as a new parameter (24A in Table IB). Added two ASTM methods (D4282-02 and D7237-10) and a new version of OIA1677 (2009) as approved test methods for this parameter. | May affect ELGs for industries that discharge cyanide. |
| Oxygen, dissolved | Approval of ASTM D888-09 (A), which provides an alternative for the Winkler (Azide modification) ASTM method for dissolved oxygen. | None currently. |
| Organic carbon | Approval of ASTM D7573-09, which provides an alternative combustion ASTM method for total organic carbon. | None currently. |

## Table 6-50. 2012 CWA Method Update Rule

| **Changes EPA Made in May 2012 to Part 136 of the CWA Method Update Rule 77 FR 29758** | | |
|---|---|---|
| **Pollutant Affected** | **Summary of Change** | **Relevance to 304m Annual Review** |
| Nonylphenol, bisphenol A, p-tert-octylphenol, nonylphenol monoethoxylate, and nonylphenol diethoxylate | Added nonylphenol, bisphenol A, p-tert-octylphenol, nonylphenol monoethoxylate, and nonylphenol diethoxylate as new parameters (114-118 in Table IC). Added ASTM D7065-06 as an approved test method for these parameters. | Unknown. EPA does not currently have a clear understanding of the sources or presence of these chemicals in industrial wastewater discharge. |
| ***New alternate test procedures at 40 CFR 136.3 (eight methods)*** | | |
| Oxygen, dissolved, BOD5, cBOD5 | Added Hach Company's Method 10360 as an alternative luminescence measurement of dissolved oxygen for determination of dissolved oxygen. | None currently. |
| Oxygen, dissolved | Added In-Situ Incorporated's Method 1002-8-2009 as an alternative luminescence measurement of dissolved oxygen. | None currently. |
| BOD5 | Added In-Situ Incorporated's Method 1003-8-2009 as an alternative method for BOD5. | None currently. |
| CBOD5 | Added In-Situ Incorporated's Method 1004-8-2009 as an alternative method for CBOD5. | None currently. |
| Turbidity | Added Mitchell Method M5271 as an alternative method for turbidity. | None currently. |
| Turbidity | Added Mitchell Method M5331 as an alternative method for turbidity. | None currently. |
| Turbidity | Added Thermo Scientific's Orion Method AQ4500 as an alternative method for turbidity. | None currently. |
| Nitrate, nitrite and combined nitrate/nitrite | Added Easy (1-Reagent) Nitrate Method as an alternative method for nitrate, nitrite, and combined nitrate/nitrite. | None currently. |
| ***Clarifications and corrections to previously approved methods in 40 CFR 136.3*** | | |
| Orthophosphate | Clarifies the purpose of the immediate filtration requirement in orthophosphate measurements, which is to assess the dissolved or bio-available form of orthophosphorous. | None currently. |
| ***Revisions to Table II at 40 CFR 136.3(e) to required containers, preservation techniques, and holding times*** | | |
| Whole Effluent Toxicity (WET) Test | Clarifies sample holding time and handling. | None currently. |
| Cyanide | Revises cyanide sample handling instructions. | None currently. |
| Alkylated phenols, adsorbable organic halides, chlorinated phenolics | Adds containers, preservation, and holding times. | None currently. |

**Table 6-50. 2012 CWA Method Update Rule**

| Changes EPA Made in May 2012 to Part 136 of the CWA Method Update Rule 77 FR 29758 | | |
|---|---|---|
| **Pollutant Affected** | **Summary of Change** | **Relevance to 304m Annual Review** |
| ***Revisions to 40 CFR 136.4 and 136.5*** | | |
| NA | Changes Part 136.4 and 136.5 to clarify the procedures for obtaining review and approval for the use of alternate test procedures for those methods for which EPA has published an ATP protocol. | None currently. |
| ***Revisions to method modification provisions at 40 CFR 136.6*** | | |
| NA | Allows users to make certain modifications to an approved method to address matrix interferences without the extensive review and approval process specified for an alternate test procedure at 136.4 and 136.5. | None currently. |
| ***New quality assurance and quality control language at 40 CFR 136.7*** | | |
| NA | Specifies “essential” quality control elements at 136.7 for use in conducting an analysis for CWA compliance monitoring. | None currently. |
| ***Revisions at 40 CFR Part 423 (Steam)*** | | |
| Total residual chlorine, free available chlorine | Revises the 40 CFR Part 423 definitions for total residual chlorine and free available chlorine at 423.11(a) and 423.11(l) to allow the use of “chlorine—total residual” and “chlorine—free available” methods in 136.3(a), Table IB, or other methods approved by the permitting authority. | None currently. |

NA: Change is general in nature and not applicable to any specific pollutant.

**Table 6-51. Pesticide Chemicals Measured by EPA Approved Methods Without Limits Under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455)**

| EPA Method | Chemical | CAS Number |
|---|---|---|
| 608.1 | Chlorobenzilate | 510156 |
| | Chloropropylate | 5836402 |
| | Dibromochloropropane | 96128 |
| | Etridiazole | 2593159 |
| 614.1 | EPN | 2104645 |
| 615 | Dalapon | 75990 |
| 617 | Carbophenothion | 786196 |
| | Endosulfan sulfate | 1031078 |
| | Endrin aldehyde | 7421934 |
| | Heptachlor epoxide | 1024573 |
| | Isodrin | 465736 |
| | Strobane | 8001501 |
| 619 | Atraton | 1610179 |
| | Secbumeton | 26259450 |
| | Simetryn | 1014706 |
| 622 | Chlorpyrifos methyl | 5598130 |
| | Coumaphos | 56724 |
| | Ethoprop | 13194484 |
| | Ronnel | 299843 |
| | Tokuthion | 34643464 |
| | Trichloronate | 327980 |
| 622.1 | Aspon | 3244904 |
| | Dichlofenthion | 97176 |
| | Famphur | 52857 |
| | Fenitrothion | 122145 |
| | Fonophos | 944229 |
| | Thionazin | 297972 |
| 632 | Fluometuron | 2164172 |
| | Neburon | 555373 |
| | Oxamyl | 23135220 |

## 6.6 Review of Industrial Wastewater Treatment Technologies

The Clean Water Act (CWA) directs EPA to establish Effluent Limitations Guidelines and Standards (ELGs) based on the performance of particular treatment technologies, application of best management practices, or implementation of process changes. As described in the EPA's 2002 Draft National Strategy (67 FR 71165), EPA considers several factors when developing its Effluent Guidelines Program Plans, including the availability of wastewater treatment technologies. EPA may choose to revise existing ELGs for a point source category if it identifies an applicable and demonstrated technology, process change, or pollution prevention approach that would substantially reduce the concentrations of pollutants in the discharged wastewater, and, consequently, reduce the hazard to human health or the environment associated with the pollutant discharges.

Traditionally, EPA has reviewed the use and availability of improved treatment technologies when conducting specific facility-, industry-, and/or pollutant evaluations. However, EPA recognizes the utility in considering advances in treatment technologies in a more coordinated manner across all industries as part of its initial screening process. In this way, EPA will enhance its ability to identify industrial categories or pollutants that warrant further review for new or revised ELGs. EPA believes it is especially important to consider technology advances when evaluating the effectiveness of older ELGs, some of which date back to the late 1970s or early 1980s. In some cases, more advanced treatment may be available that would allow EPA to establish ELGs for new pollutants or to strengthen existing requirements for regulated pollutants. Further, in considering advances in treatment technologies in its initial screening of industrial discharges, EPA is addressing one of the key recommendations from a recent Government Accountability Office (GAO) review of the Effluent Guidelines Program (GAO, 2012).

As a first step in EPA's efforts to consider treatment technology advances in its screening of industrial wastewater discharges, EPA has initiated a review of relevant literature regarding the performance of new and improved industrial wastewater treatment technologies. EPA plans to capture these data in a searchable industrial wastewater treatment technology (IWTT) database. EPA intends to use the IWTT database in its screening process in future annual reviews to quantify the effectiveness of technologies for removing pollutants of concern from specific industrial wastewater discharges. EPA will use the database, in part, to answer the following questions:

- What new technologies or changes to existing technologies are specific industries using to treat their waste streams?
- Are there technologies that can reduce or eliminate wastewater pollutants not currently regulated by ELGs, or remove pollutants to a greater degree than industries are currently achieving?

This section summarizes the information sources EPA is currently reviewing and the treatment technology data EPA is collecting.

### *6.6.1 Industrial Wastewater Treatment Technologies Data Collection*

In 2011, EPA began developing an approach to identify and capture, in a searchable database, performance data for technologies that reduce, remove, or eliminate pollutants from industrial wastewater. EPA first conducted a brief and general literature search for studies that documented pilot- or full-scale performance data for industrial wastewater treatment technologies. This search was not limited to peer-reviewed literature. The purpose of this initial literature search was to assess the availability and quality of treatment technology performance data. In addition, EPA evaluated the feasibility of developing a searchable database that it could use as a tool to screen industrial wastewater discharges based on advances in technologies. EPA included the following sources in its initial literature search:

- Water Environment Federation Technical Exhibition and Conference (WEFTEC) (2011 and 2012);
- International Water Conference (IWC) (2011);
- *Industrial WaterWorld;*
- *Pollution Engineering;*
- *WaterWorld;* and
- *WEF Industrial Wastewater.*

From the initial literature search, EPA identified several articles that were of sufficient quality for use (see Section 6.6.1.3 for more details) and began cataloging the information in a searchable IWTT database (see Section 6.6.2 for more details). EPA is now focusing on collecting a more comprehensive set of data on wastewater treatment performance related to a few key industries of interest, as identified in recent annual reviews or through stakeholder input (see Section 6.6.1.1 for more details).

The subsections below discuss the initial key industries, data sources, and quality assurance and control criteria EPA used to evaluate and document the data included to date in the IWTT database.

#### **6.6.1.1 Initial Key Industries for Treatment Technology Data Collection**

During recent annual reviews, EPA identified new data for the Petroleum Refining (40 CFR Part 419), Metal Finishing (40 CFR Part 433), and Electroplating (40 CFR Part 413) point source categories suggesting that discharges of metals and other emerging and potentially hazardous compounds (for the metal finishing and electroplating industries in particular) are of increasing concern. Further, EPA has identified recent technology advancements that have significantly improved metals removal since promulgation of the ELGs for these industries. As a result, EPA is initially focusing on collecting and reviewing performance data for technologies that remove metals and that treat wastewater discharges from these three industries in particular. The subsections below detail how EPA selected these initial key industries and pollutant category.

### *Petroleum Refining*

EPA finalized the ELGs for Petroleum Refining (40 CFR Part 419) in 1982 and has made no significant revisions since that time. However, EPA has periodically reviewed petroleum refinery discharges as part of the Preliminary and Final Effluent Guidelines Program Plans in 2004–2010 (U.S. EPA, 2004, 2005, 2006, 2007, 2008, 2009, 2011). During its 2004 Final Effluent Guidelines Program Plan reviews, EPA also conducted a detailed study of this industry (U.S. EPA, 2004). These reviews focused on discharges of polycyclic aromatic compounds (PACs), dioxin and dioxin-like compounds, and metals. EPA previously determined that PACs and the most toxic dioxin congeners were likely not present in the discharge at concentrations above detectable levels. In addition, EPA determined the concentration of metal pollutants in refinery wastewaters is at or near treatable levels, leaving little to no opportunity to reduce metals discharges through conventional end-of-pipe treatment.

During the 2011 Annual Review, EPA again identified the Petroleum Refining Category for preliminary review because it ranked high, in terms of toxic-weighted pound equivalents (TWPE), in the 2011 toxicity rankings analysis. EPA conducted a more detailed evaluation of petroleum refineries in this 2012 Annual Review (see Section 5.2 for details on the continued review of petroleum refineries in 2012) and, based on new data and information, determined that changes in the petroleum industry in recent years have led to an increase in the discharge of metal compounds. These changes include the use of different feedstock, such as Canadian crude oil and tar sands (Purdue-Argonne Task Force, 2011), and changes in air pollution controls (see Section 6.3 for additional detail on EPA's review of air pollution controls).

Further, EPA compared 2010 metals concentrations discharge monitoring report (DMR) data to more recent treatability data for chemical precipitation systems. The data suggests that technologies are available that could mitigate recent increases in the concentrations of metals discharged in petroleum refinery wastewater (see Section 5.2). This finding is of particular interest to EPA because the existing ELGs for petroleum refining only include limitations for hexavalent and trivalent chromium and do not address the discharge of other metals.

### *Metal Finishing and Electroplating*

EPA finalized the ELGs for Electroplating (40 CFR Part 413) in 1981 and Metal Finishing (40 CFR Part 433) in 1983. EPA reviewed the ELGs for these industries as part of its development of the ELGs for Metal Products and Machinery (40 CFR Part 438), which were promulgated in 2003 (U.S. EPA, 2003). EPA has also periodically reviewed these industries as part of its annual reviews, including its most recent 2011 Annual Review (U.S. EPA, 2012), but has not made significant revisions to either regulation since the 1980s.

As part of this 2012 Annual Review, EPA identified that metal finishing wastewater transfers to POTW sludge may be contributing to higher POTW sludge concentrations of metals, particularly chromium and nickel (see Section 6.1 for more details). In addition, in a recent letter to EPA and in its public comments on the Preliminary 2012 Plan, the Association of Clean Water Administrators (ACWA) urged EPA to revise the ELGs for metal finishing and electroplating, or prioritize providing additional guidance regarding the pretreatment standards to address recent changes in wastewater chemistry and the use of "green" technologies (ACWA, 2013a, 2013b).

*Metals Removal*

In the late 1970s and early 1980s, EPA compiled metals treatment and removal data for several industries (including aluminum forming, battery manufacturing, coil coating, copper forming, electroplating, and porcelain enameling) into the Combined Metals Database (CMDB). EPA used the CMDB as the basis for developing metals limits for several of these industry categories. Since the promulgation of these ELGs, EPA has identified advances in treatment technologies that may significantly improve metals removals.

#### 6.6.1.2 Data Sources

EPA is collecting and reviewing studies on new or improved IWTT from the following technical literature:

- Conference proceedings. EPA is reviewing references from three key technical conferences in the wastewater field that present information on a broad range of industries: the Water Environment Federation's Technical Exhibit and Conference, the International Water Conference, and the Water Environment Federation's Industrial Wastewater Seminar.
- Water-related journals. EPA is reviewing peer-reviewed journal articles from water-related societies that may provide information on new, more effective industrial wastewater treatment technologies.
- Industry-specific organizations. EPA is reviewing industry trade organization publications, such as treatment publications from the American Petroleum Institute and the American Chemical Society.

EPA is preferentially reviewing literature published since 2000 that documents wastewater treatment technologies for the metal finishing, electroplating, and petroleum refining industries, or metals removal in general. EPA selected this date to capture advances in technologies that have become available since its last in-depth review of metals removals as part of the development of the Metal Products and Machinery ELGs. To search for relevant literature, EPA entered various combinations of general and specific keyword search terms related to these industries and metals removal in online search engines and water industry websites.

EPA has ensured that all data sources entered into the database meet the data quality criteria described in Section 6.6.1.3.

#### 6.6.1.3 Data Quality Assurance and Control Criteria

EPA is ensuring the quality of the treatment technology data by evaluating the data sources for accuracy, reliability, representativeness, and reasonableness. The *Environmental Engineering Support for Clean Water Regulations Programmatic Quality Assurance Project Plan (PQAPP)* generally describes the quality objectives in more detail (ERG, 2013a). However, EPA has established the following criteria specific to its efforts to document and evaluate treatment technology performance data and sources:

- Accuracy. EPA is evaluating the accuracy of the treatment technology performance data based on whether the documented data are consistent with the body of information collected as part of the literature search. For the purposes of this analysis, EPA assumes that the underlying data and information contained in state and federal reports, selected conference proceedings and peer-reviewed journal articles are accurate. Although industry publications and conference proceedings are not peer-reviewed, these resources may provide useful information for capturing the full range of processes and/or wastes generated by a specified industry point source or a range of information on specified treatment technologies.
- Reliability. EPA is evaluating the reliability of the treatment technology performance data based on whether the data source incorporates the following attributes:
  - — Scientific work is clearly written, so that all assumptions and methodologies can be identified.
  - — Assumptions and methodologies are consistently applied throughout the analysis, as reported in the source (when appropriate).
- Representativeness. EPA is evaluating whether the data are representative of a modern treatment technology applied to industrial wastewater. Therefore, EPA is collecting industrial wastewater treatment technology information and performance data published since 2000 so that the data are representative of current industrial processes and treatment challenges.
- Reasonableness. EPA is evaluating the reasonableness of the treatment technology performance data based on historical knowledge of each industry's wastewater characteristics, such as:
  - — Range of concentrations expected in the untreated waste stream.
  - — Types of pollutants expected in the untreated waste stream.
  - — Wastewater generation rates and the expected capacities of the evaluated treatment technologies.

For more information on EPA's efforts to ensure that the data sources meet the data quality criteria, see the methodology documented in the *Supplemental Quality Assurance and Control Plan for the Development and Population of the Industrial Wastewater Treatment Database* (ERG, 2013b).

### *6.6.2 Industrial Wastewater Treatment Technologies Data Storage*

As discussed above, EPA is developing a database to capture the wastewater treatment technology data identified from the reviewed data sources. EPA is structuring the IWTT database in Microsoft Access$^{TM}$ to collect data on the following:

- Treatment systems (i.e., treatment units included in the system, unit order, chemical additions, system operating conditions and costs, and process diagrams).
- Industries implementing the technologies or industries for which the technology has been tested.
- Pollutants removed, including influent and effluent quality and pollutant removals achieved.
- Specific industry motivations for evaluating and employing new technologies.

In addition, EPA is conducting specific quality assurance and control measures to validate the quality of the data as they are entered into the IWTT database. For more information on the quality assurance and control measures, see the methodology documented in the *Supplemental Quality Assurance and Control Plan for the Development and Population of the Industrial Wastewater Treatment Database* (ERG, 2013b).

### *6.6.3 References for Review of Industrial Wastewater Treatment Technologies*

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# PART III: RESULTS OF EPA'S 2012 ANNUAL REVIEW

# 7. Results of the 2012 Annual Review

For the 2012 Annual Review, EPA evaluated public comments and stakeholder input received on the Preliminary 2012 Plan and continued its review of the industrial categories identified as warranting further investigation during the 2011 toxicity rankings analysis (TRA). Additionally, EPA reviewed the six new industrial wastewater hazard data sources described in Section 6. This section presents a summary of the findings and results of the 2012 Annual Review.

## 7.1 Continued Review of Select Point Source Categories

During the 2011 TRA, EPA identified three point source categories warranting further review: meat and poultry products (40 CFR Part 432); petroleum refining (40 CFR Part 419); and pulp, paper, and paperboard (40 CFR Part 430). EPA continued review of these categories as part of the 2012 Annual Review. Below are the findings from the 2012 continued category reviews.

- **Meat and Poultry Products (40 CFR Part 432).** EPA completed further review of Toxic Releases Inventory (TRI) reported nitrate discharges and found that the majority of the top nitrate compound dischargers in the 2009 TRI database are in compliance with the Part 432 total nitrogen limitations, based on a comparison of their discharge monitoring report (DMR) discharges to the ELGs. EPA contacted the permit writers of the remaining top nitrate compound dischargers and determined that the majority are receiving new permits and meeting Part 432 total nitrogen limitations. Therefore, EPA concludes that nitrate discharges from meat and poultry products facilities are decreasing due to the 2004 Part 432 effluent guidelines revisions, and no further review is warranted at this time.

- **Petroleum Refining (40 CFR Part 419).** EPA further reviewed discharges of dioxin and dioxin-like compounds and metals, identified as pollutants of concern in the TRA for the petroleum refining category during the 2011 Annual Review. For dioxins, EPA found that one facility's reported discharges contributed to the majority (65 percent) of the dioxin and dioxin-like compound TRI TWPE, however this facility's reported dioxin discharges are estimated (based on the number of reformer catalyst regenerations) and not directly measured. EPA also reviewed 2010 DMR data for dioxin. EPA only identified one refinery reporting discharging detectable concentrations of dioxin and furan (above the Method 1613B Minimum Level (ML)), though available data indicates this facility's discharges result largely from stormwater (from aerial deposition), not the discharge of treated process wastewater (U.S. EPA, 2004). For metals discharges, EPA reviewed DMR data from 76 refineries from across the country and identified metals present in most petroleum refineries' effluent discharges that exceeded comparable treatability data for metals removals achieved by more recent technologies.

- **Pulp, Paper, and Paperboard (40 CFR Part 430).** EPA further reviewed discharges of dioxin and dioxin-like compounds and found that the majority of estimated releases reported to TRI were based on pollutant concentrations below the Method 1613B minimum level. EPA concluded that dioxin and dioxin-like compounds from pulp and paper facilities are not a hazard priority at this time.

## 7.2 New Data Sources and Hazard Analyses Results

EPA identified six data new industrial wastewater discharge hazard data sources to review as part of the 2012 Annual Review. Below are the findings from EPA's review of these data sources.

- **Identification of Industrial Pollutants in Sewage Sludge.** EPA's review of the Targeted National Sewage Sludge Survey (TNSSS) data, combined with available indirect discharge data from the 2009 TRI database identified the metal finishing point source category (40 CFR Part 433) as potentially discharging high concentrations of metals, particularly chromium, nickel, and zinc, to publically owned treatment works (POTWs). These metals could transfer to sewage sludge and impact its beneficial use. Based on the TNSSS and 2009 TRI datasets, EPA did not identify for further review any new pollutants of concern or wastewater discharges from industrial categories not currently regulated by ELGs. EPA focused its review on the pollutants in the TNSSS with discharge information available in TRI since TRI provided a means to link industrial wastewater sources to the pollutants found in POTW sludge.

- **Review of Chemical Action Plans.** EPA's review of the Office of Pollution Prevention and Toxics (OPPT) Chemical Action Plans (CAPs) identified one chemical category that is being phased out of U.S. commerce; EPA does not intend to pursue further review for Penta, Octa, and Decabromodiphenyl Ethers (PBDEs). Two additional chemicals, Methylene Diphenyl Diisocyanate (MDI) and Toluene Diisocyanate (TDI) do not have significant wastewater discharges. However, EPA identified that the hydrolysis byproducts of TDI and MDI, toluene diamine and methyl diphenyl diamine, may be present in industrial wastewater.

  EPA found that six of the chemical categories have continued production or known or potential wastewater discharges (Benzidine dyes, Bisphenol A (BPA), Hexabromocyclododecane (HBCD), Nonylphenol and Nonylphenol Ethoxylates, Perfluorinated Chemicals (PFCs), and Phthalates). In addition, EPA found that short-chain chlorinated paraffins (SCCPs) are used in metal working and have the potential to be discharged in wastewater even though they are no longer manufactured in the U.S.

- **Identification of Wastewater Discharges Related to Air Pollution Control Not Currently Covered by ELGs.** EPA identified new and revised air regulations that likely result in the generation of new wastestreams at petroleum refineries that contain metals. EPA also identified three industries that have air regulations that may result in an unregulated wastewater discharge; brick and structural clay product manufacturing, industrial, commercial, and institutional boilers, and industrial, commercial, and institutional steam generating units. In addition, EPA identified 13 industries with existing ELGs, for which new air regulations may result in the discharge of new or additional pollutants.

- **Review of TRI Industry Sectors Expansion.** The TRI sector expansion rulemaking is still under development, with an expected proposal date of December 2014. Available TRI sector expansion information suggests that selenium discharges from phosphate mines (regulated under 40 CFR Part 136) may be a new pollutant of concern.

- **Review of Analytical Methods.** EPA reviewed recent analytical method developments as part of the 2012 Method Update Rule and determined that there are reduced detection limits for some metals and additions of new methods for detecting other pollutants of concern from industrial wastewater discharges (e.g., free cyanide, acid mine drainage, nonyphenol, and bisphenol A).

  In addition, EPA identified several pesticides measured by some of the approved pesticide analytical methods (listed in 40 CFR Part 136) that do not currently have effluent limits under the Pesticide Chemicals Manufacturing, Formulating, and Packaging ELGs (40 CFR Part 455).

  EPA also reviewed Office of Ground Water and Drinking Water (OGWDW) and Office of Research and Development (ORD) drinking water analytical methods and identified two relatively new methods developed by ORD to measure concentrations of PFCs and 1,4-dioxane. OGWDW is using these methods in its Unregulated Contaminant Monitoring Rule (UCMR) to evaluate PFCs and 1,4-dioxane in drinking water. EPA has identified industrial wastewater discharges for both PFCs and 1,4-dioxane.

- **Review of Industrial Wastewater Treatment Technologies.** EPA is identifying and reviewing wastewater treatment technology performance data related to petroleum refining, metal finishing, and electroplating industries (and metals removal in general) and is working to capture this data in a searchable industrial wastewater treatment technology database.

## 7.3 References for Results of the 2012 Annual Review

1. U.S. EPA. 2004. *Technical Support Document for the 2004 Effluent Guidelines Program Plan*. Washington, D.C. (August). EPA-821-R-04-014. EPA-HQ-OW-2003-0074-1346 through 1352.