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EPCRA Section 313 Reporting Guidance for Food Processors

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ACKNOWLEDGMENT

The U.S. EPA wishes to acknowledge the valuable contributions made by the staff and members of the National Food Processors Association (NFPA) and the Food Industry Environmental Council (FIEC). Without the insight provided by those in the industry with actual experience in the fulfilling of the EPCRA Section 313 reporting requirements we would not have been able to produce a document that we believe will be of great assistance to those who must prepare future EPCRA Section 313 reports. Special thanks go to Mr. Rick Jarman, Senior Director of Environmental Affairs, NFPA, and Mr. Bob Garfield, Chairman of the Regulatory Working Group of FIEC, for their hard work.

OVERVIEW

This document supersedes the booklet entitled *Section 313 Emergency Planning and Community Right-to-Know Act, Guidance for Food Processors,* dated June 1990. It is intended to assist establishments and facilities designated by Standard Industrial Classification (SIC) Major Group 20 in complying with the Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313 reporting requirements, the preparation of Form R or Form A. The EPCRA Section 313 program is commonly referred to as the Toxic Chemical Release Inventory (TRI).

The principal differences in the new document include:

- More detailed examples;
- New EPCRA Section 313 regulations developed since 1990;
- U.S. Environmental Protection Agency's (EPA's) interpretive guidance on various issues specific to the Food Processing industry;
- TRI issues regarding processes not discussed in the earlier document; and
- Input from the National Food Processors Association and the Food Industry Environmental Council.

This document is designed to be a supplement to the annual issue of the *Toxic Chemical Release Inventory Reporting Forms and Instructions,* (*TRI Forms and Instructions).* It is organized to provide a step-by-step guide to compliance with EPCRA Section 313, starting with how you determine if your facility must report and ending with guidance for estimating releases and other waste management quantities.

Chapter 1 introduces TRI reporting and provides a brief background on the Emergency Planning and Community Right-to-Know Act.

Chapter 2 begins with how to determine if your facility must report. This determination is based on your answers to a series of four questions:

- Is your facility's primary SIC Code or corresponding North American Industry Classification System (NAICS) Code on the EPCRA Section 313 list?
- Does your facility employ ten or more full time equivalent employees?
- Does your facility Manufacture, Process or Otherwise Use any EPCRA Section 313 chemicals?
- Does your facility exceed any of the activity thresholds for an EPCRA Section 313 chemical?

If the answer to ANY ONE of the first three questions is "No" you are not required to submit an EPCRA Section 313 report. If you answer "Yes" to ALL four questions, the next step is to determine what kind of report you must prepare, a Form R or a Form A. Chapter 2 provides detailed information on the requirements for each kind of report.

Chapter 2 concludes with a discussion on how you address trade secrets in your reporting and the kinds of records you should be keeping to support your reporting.

Chapter 3 discusses how you calculate the activity (manufacture, process, and otherwise use) thresholds for the EPCRA Section 313 chemicals. Information is provided on how you determine which EPCRA Section 313 chemicals your facility manufactures, processes, or otherwise uses and how you calculate the quantities of each. Detailed information is also provided on the various exemptions:

- *De Minimis* Exemption;
- Article Exemption;
- Facility-Related Exemption; and
- Activity-Related Exemptions.

Chapter 3 concludes with a discussion of how to determine which EPCRA Section 313 chemicals exceed a reporting threshold.

Chapter 4 discusses how you calculate the release and/or other waste management amounts for those TRI chemicals for which you must prepare a report. This chapter provides a step-by-step approach designed to minimize the risk of overlooking an activity involving an

EPCRA Section 313 chemical and any potential sources or types of releases and/or other waste management activities. This procedure consists of:

- Preparation of a detailed **process flow diagram**;
- Identification of potential **sources** of toxic chemicals released and/or otherwise waste managed;
- Identification of the potential **types** of releases and/or other waste management activities from each source; and
- Determination of the most appropriate methods for **estimating the quantities** of listed toxic chemical releases and/or other waste management activities.

The main part of Chapter 4 is organized around twelve common activities in the food processing industry where EPCRA Section 313 chemicals are used. The commonly used EPCRA Section 313 chemicals, process descriptions, reporting thresholds, release and other waste management estimates, and common problems are presented for each of the twelve activities.

This document includes examples and common errors applicable to the Food Processing industry. These are based on information received from representatives of the National Food Processors Association and the Food Industry Environmental Council, and on the questions received by the EPCRA Hotline and identified during voluntary site surveys of facilities that have filed EPCRA Section 313 reports in the past.

Chapter 1 - Introduction

1.0 PURPOSE

The purpose of this guidance manual is to assist Food Processing facilities, Standard Industrial Classification (SIC) Code 20, in complying with the reporting requirements of EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and of Section 6607 of the Pollution Prevention Act of 1990 (PPA). This industry group includes facilities that produce meat products, dairy products, preserved fruits and vegetables, grain mill products, bakery products, sugar and confectionery products, fats and oils, beverages, and other miscellaneous food products. This manual explains the EPCRA Section 313 reporting requirements and discusses specific release and other waste management activities encountered at many facilities in this industry. Since each plant is unique, the recommendations presented may have to be modified for your particular facility.

This document supersedes the document entitled *Section 313 Emergency Planning and Community Right-to-Know Act, Guidance for Food Processors*, dated June 1990. This new document includes:

- More detailed examples;
- New EPCRA Section 313 regulations developed since 1990;
- U.S. Environmental Protection Agency's (EPA's) interpretive guidance on various issues specific to the Food Processing industry;
- TRI issues regarding processes not discussed in the earlier document; and
- Input from the National Food Processors Association and the Food Industry Environmental Council.

It is intended to supplement the *Toxic Chemical Release Inventory Reporting Forms and Instructions (TRI Forms and Instructions)* document that is updated and published annually by the U.S. Environmental Protection Agency (U.S. EPA). It is essential that you use the current version of the *TRI Forms and Instructions* to determine if (and how) you should report. Changes or modifications to Toxic Chemical Release Inventory (TRI) reporting requirements are reflected

in the annual *TRI Forms and Instructions* and should be reviewed before compiling information for the report.

The objectives of this manual are to:

- Reduce the level of effort expended by those facilities that prepare an EPCRA Section 313 report; and
- Increase the accuracy and completeness of the data being reported by the food processing industry.

U.S. EPA cannot anticipate every potential issue or question that may apply to your facility. Therefore, this manual attempts to address those issues most prevalent or common for the food processing industry. Used in conjunction with the most current *TRI Forms and Instructions* and the *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form (1998 version),* facilities should be able to provide complete and accurate information for EPCRA Section 313 reporting. Additional discussions on specific issues can be found in U.S. EPA's current version of *EPCRA Section 313, Questions and Answers,* which is available on the U.S. EPA's TRI website (**http://www.epa.gov/opptintr/tri**) or by contacting the **EPCRA Hotline at 1-800-424-9346**. In the Washington DC metropolitan area, call 703-412-9810.

1.1 Background on EPCRA

The following overview of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA Public Law 99-499, Title III of the Superfund Amendments and Reauthorization Act), specifically Section 313 of EPCRA, and Section 6607 of the Pollution Prevention Act (PPA), will provide you with a basic understanding of the objectives and requirements of this program, and will help you in completing your reports.

One of the primary goals of EPCRA is to increase the public's knowledge of, and access to, information on both the presence of toxic chemicals in their communities and on

releases into the environment and other waste management activities of those chemicals. EPCRA Section 313 requires certain designated businesses (see SIC Code discussion, Chapter 2, Section 2.2) to submit annual reports (commonly referred to as Form Rs and Form As) on the amounts of over 600 EPCRA Section 313 chemicals and chemical categories released and otherwise managed. The chemicals on the EPCRA Section 313 list are selected based on the potential for acute health effects, chronic health effects, and environmental effects. Chemicals may be added or deleted from the list. Therefore, before completing your annual report, be sure to check the most current list included with the *TRI Forms and Instructions* when evaluating the chemicals in use at your facility. Copies of the reporting package can be requested from the EPCRA Hotline, 1-800-424-9346.

All facilities meeting the EPCRA Section 313 reporting criteria must report the annual releases and/or other waste management activities (routine and accidental) of EPCRA Section 313 chemicals to all environmental media. A separate report is required for each listed chemical that is manufactured (including imported), processed, or otherwise used above the reporting threshold. The reports are submitted to U.S. EPA and State or Tribal governments, on or before July 1, for activities in the previous calendar year. The owner/operator of the facility on July 1 is primarily responsible for the report, even if the owner/operator did not own the facility during the reporting year. However, property owners with no business interest in the operation of the facility (for example, owners of an industrial park) are exempt from reporting requirements.

EPCRA also mandates that the U.S. EPA establish and maintain a publicly available database system consisting of the information reported under EPCRA Section 313, and applicable Pollution Prevention Act information. This database, known as the Toxic Chemical Release Inventory System (TRIS), can be accessed through the following sources:

- National Library of Medicine (NLM) TOXNET on-line system;
- U.S. EPA Internet site, http://www.epa.gov/opptintr/tri ;
- Envirofacts Warehouse Internet site, http://www.epa.gov/enviro/html/tris ;
- CD-ROM from the Government Printing Office;

- Microfiche in public libraries; and
- Magnetic tape and diskettes from the National Technical Information Service.

Information identified by the submitter as trade secret in accordance with the regulatory requirements is protected from public release. In addition to being a resource for the public, TRIS is also used in the research and development of regulations related to EPCRA Section 313 chemicals.

To reduce the reporting burden for small businesses, the U.S. EPA established an alternate threshold of one million pounds manufactured, processed, or otherwise used for facilities with total annual reportable amounts of 500 pounds or less of the EPCRA Section 313 chemical. Provided the facility does not exceed either the reportable amount or the alternate threshold, the facility may file a certification form (Form A) rather than file a Form R. By filing the Form A the facility certifies that they do not exceed the reportable amount or exceed the alternate threshold.

Note that the annual reportable amount includes the quantity of toxic chemical in all production-related waste management activities, not just releases (see the discussion in Section 2.8 for more detail). Also note that either a Form A or a Form R, but not both, must be submitted for each EPCRA Section 313 chemical above any reporting threshold.

Violation of EPCRA Section 313 reporting provisions may result in federal civil penalties of up to $25,000 per day for each violation through January 30, 1997, and $27,500 per day for violations after January 30, 1997 (61 FR 69360). State enforcement provisions may also be applicable depending on the state's EPCRA Section 313 reporting regulations.

Members of the National Food Processors Association and the Food Industry Environmental Council provided input on the common problems specific to the food processing industry that are encountered by those completing the Form R and Form A reports. U.S. EPA has combined this input with questions forwarded to the EPCRA Hotline and those questions

identified during voluntary site surveys of facilities that have filed EPCRA Section 313 reports in the past. Selected issues and guidance are presented throughout this document as applicable.

The *TRI Forms and Instructions* also contain a discussion of common problems in completing the Form R. You are encouraged to read this section before filling out the Form R (or Form A) for your facility.

If, after reading this manual, you still have questions about EPCRA Section 313 reporting, please contact the EPCRA Hotline at 1-800-424-9346. Assistance is also available from the designated EPCRA Section 313 Coordinator in the U.S. EPA regional office and the EPCRA contact in your state (see the *TRI Forms and Instructions* for a current list of these contacts). Additional guidance is also available in the resources listed in Appendix A.

Chapter 2 - Reporting Requirements

2.0 PURPOSE

The purpose of this chapter is to help you determine if you must prepare an EPCRA Section 313 report(s) and, if so, what kind of a report(s) should be prepared (Form R or Form A). This chapter presents the EPCRA Section 313 reporting requirements to help you determine if these requirements apply to your facility. It also discusses the records that must be kept.

To understand the following discussion you must first understand how EPCRA defines a facility. The term "facility" is defined as "all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person (or by any person which controls, is controlled by, or is under common control with such person). A facility may contain more than one "establishment" (40 CFR 372.3). An "establishment" is defined as "an economic unit, generally at a single physical location, where business is conducted, or services or industrial operations are performed" (40 CFR 372.3).

U.S. EPA recognizes that for business reasons it may be easier and more appropriate for multiple establishments at one facility to report separately. However, the combined quantities of EPCRA Section 313 chemicals manufactured, processed, or otherwise used in all establishments in that facility must be considered for threshold determinations. Also, the combined releases and other waste management activities reported singly for each establishment must equal those for the facility as a whole.

Note that if a facility is comprised of more than one establishment, once an activity threshold is met by the facility, providing the facility meets SIC Code and employee criteria, releases and other waste management activities from <u>all</u> establishments at the facility must be reported.

Example - Multiple Establishments

Your facility has several different establishments, all with SIC Codes covered by EPCRA Section 313. One establishment used 7,000 pounds of an EPCRA Section 313 chemical during the year to clean equipment. Another establishment purchased and used 4,000 pounds of the same chemical during the year as a food processing aid. Both activities constitute "otherwise use" of the listed toxic chemical (as presented in Section 2.5 and described in detail in Chapter 3) and the total for the facility exceeded the 10,000 pound otherwise use threshold for the year. Thus, if your facility meets the employee threshold, you must file one Form R for that chemical from your facility, or two Form Rs, one from each establishment. Please note that you may be eligible to file one Form A for the facility but you cannot file a separate Form A for each establishment.

2.1 Must You Report?

How do you determine if your facility must prepare an EPCRA Section 313 report? Your answers to the following four questions will help you decide (illustrated by Figure 2-1):

1) Is the SIC Code for your facility included in the list covered by EPCRA Section 313 reporting (see Section 2.2)?

2) Does your facility employ 10 or more full time employees or their equivalent (see Section 2.3)?

3) Does your facility manufacture (which includes importation), process, or otherwise use EPCRA Section 313 chemicals (see Section 2.4)?

4) Does your facility exceed any applicable thresholds of EPCRA Section 313 chemicals (25,000 pounds per year for manufacturing; 25,000 pounds per year for processing; or 10,000 pounds per year for otherwise use - see Section 2.5)?

If you answered "No" to any of the first three questions, you are not required to prepare any Form R or Form A reports. If you answered "Yes" to ALL of the first three questions, you must complete a threshold calculation for each EPCRA Section 313 chemical at the facility, and submit a Form R **OR** Form A report for each chemical exceeding a threshold.

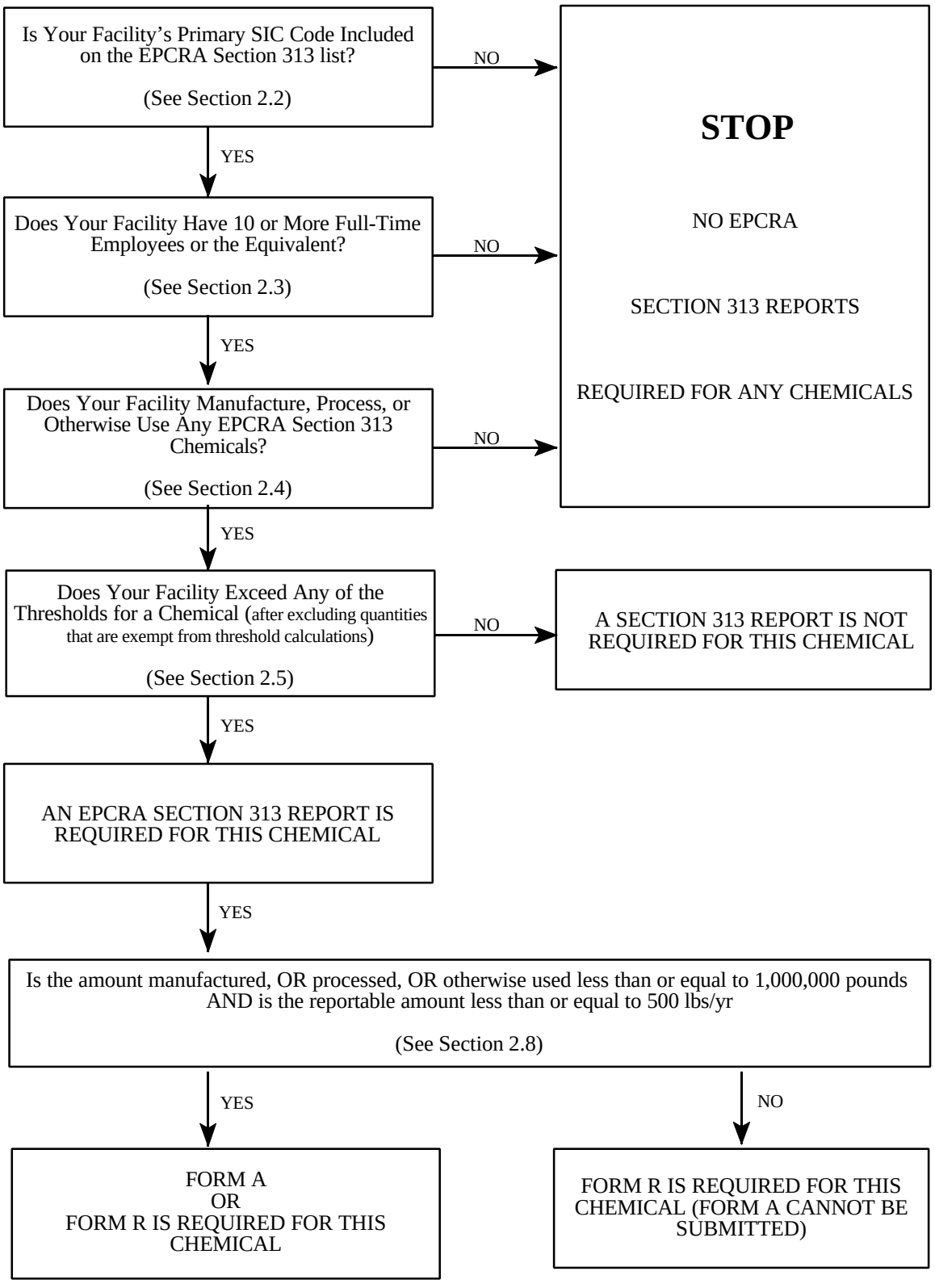

Figure 2-1 EPCRA Section 313 Reporting Decision Diagram

2.2 SIC Code Determination

Facilities with the SIC Codes presented in Table 2-1 are covered by the EPCRA Section 313 reporting requirements.

Table 2-1
SIC Codes Covered by EPCRA Section 313 Reporting

SIC Code Major Groups		
SIC Codes	**Industry**	**Qualifiers**
10	Metal Mining	Except SIC Codes 1011, 1081, and 1094
12	Coal Mining	Except SIC Code 1241
20 through 39	Manufacturing	All SIC Codes
4911, 4931, and 4939	Electric and Other Services and Combination Utilities	Limited to facilities that combust coal and/or oil for the purpose of generating electricity for distribution in commerce
4953	Refuse Systems	Limited to facilities regulated under RCRA Subtitle C
5169	Chemicals and Allied Products	None
5171	Petroleum Bulk Stations and Terminals	None
7389	Business Services	Limited to facilities primarily engaged in solvent recovery services on a contract or fee basis

Table 2-2 presents a listing of each SIC (and NAICS*) Code for the food processing industry with brief descriptions. You should determine the SIC Code(s) for your facility, based on the activities on site. For assistance in determining which SIC Code best suits your facility refer to *Standard Industrial Classification Manual, 1987* published by the Office of Management and Budget.

*NAICS - North American Industry Classification System. The NAICS is replacing the SIC system. Dual systems will be used for a transition period which began in 1997. The NAICS uses six digits (vs. four for the SIC) which allows for a finer division of industries in a larger economy. Additional information on the NAICS is available from the U.S. Census Bureau on http://www.census.gov/epcd/www/naics.html .

Table 2-2
SIC and NAICS Codes for Food Processing Industries

SIC Code	NAICS Code	Description
2011	311611	Meat products
2013	311612	Sausages and other prepared meat products
2015	311615 311999	Poultry slaughtering and processing
2021	311512	Creamery butter
2022	311513	Natural, processed, and imitation cheese
2023	311514	Dry, condensed, and evaporated dairy products
2024	31152	Ice cream and frozen desserts
2026	311511	Fluid milk
2032	311422 311999	Canned specialities
2033	311421	Canned fruit, vegetables, preserves, jams, and jellies
2034	311211 311423	Dried and dehydrated fruits, vegetables, and soup mixes
2035	311421 311941	Pickled fruits and vegetables, vegetable sauces and seasonings, and salad dressings
2037	311411	Frozen fruits, fruit juices, and vegetables
2038	311412	Frozen specialities, not elsewhere classified
2041	311211	Flour and other grain mill products
2043	31123 31192	Cereal breakfast foods
2044	311212	Rice milling
2045	311822	Prepared flour mixes and dough
2046	311211	Wet corn milling
2047	311111	Dog and cat food
2048	311119 311611	Prepared feeds and feed ingredients for animals and fowls, except dogs and cats
2051	311812	Bread and other bakery products, except cookies and crackers
2052	311812 311821 311919	Cookies and crackers
2053	311813	Frozen bakery products, except bread
2061	311311	Cane sugar, except refining
2062	311312	Cane sugar refining
2063	311313	Beet sugar

Table 2-2 (Continued)

SIC Code	NAICS Code	Description
2064	31133 31134	Candy and other confectionery products
2066	31132	Chocolate and cocoa products
2067	31134	Chewing gum
2068	311911	Salted and roasted nuts and seeds
2074	311223 311225	Cottonseed oil mills
2075	311222 311225	Soybean oil mills
2076	311223 311225	Vegetable oil mills, except corn, cottonseed, and soybean
2077	311225 311613 311711 311712	Animal and marine fats and oils
2079	311222 311223 311225	Shortening, table oils, margarine, and other edible fats and oils not elsewhere classified
2082	31212	Malt beverages
2083	311213	Malt
2084	31213	Wines, brandy, and brandy spirits
2085	31214	Distilled and blended liquors
2086	312111 312112	Bottled and canned soft drinks and carbonated waters
2087	31193 311942 311999	Flavoring extracts and flavoring syrups, not elsewhere classified
2091	311711	Canned and cured fish and seafoods
2092	311712	Prepared fresh or frozen fish and seafoods
2095	31192 311942	Roasted coffee
2096	311919	Potato chips, corn chips, and similar snacks
2097	312113	Manufactured ice
2098	311823	Macaroni, spaghetti, vermicelli, and noodles

Table 2-2 (Continued)

SIC Code	NAICS Code	Description
2099	31134 31183 31192 111998 311423 311911 311941 311942 311991 311999	Food preparations, not elsewhere classified

Most food processing industry facilities are in SIC Major Group 20 and are required to prepare a report (or reports) if they meet the employee and chemical activity thresholds. Note that auxiliary facilities can assume the SIC Code of another covered facility if the primary function is to service the covered facility's operations. For the purposes of EPCRA Section 313, auxiliary facilities are engaged in performing support services for another, primary facility, or multiple establishments of a primary facility. In addition, auxiliary facilities perform an integral role in the primary facility's activities. In general, the auxiliary facility's basic administrative services (e.g., paperwork, payroll, employment) are performed by the primary facility. Therefore, if an auxiliary facility's primary function is to support/service a food processing facility with SIC Code 20, the auxiliary facility is also covered by the EPCRA Section 313 reporting requirements. Warehouses supporting a food processing facility are an example of auxiliary facilities that may assume SIC Code 20 and therefore, could be subject to reporting.

If your facility has more than one SIC Code (i.e., several establishments with different SIC Codes are owned or operated by the same entity and are located at your facility), you are subject to reporting requirements if:

- All the establishments have SIC Codes covered by EPCRA Section 313; OR

- The total value of the products shipped or services provided at establishments with covered SIC Codes is greater than 50% of the value of the entire facility's products and services; OR

- Any one of the establishments with a covered SIC Code ships and/or produces products or provides services whose value exceeds the value of services provided, products produced and/or shipped by any other establishment within the facility.

The value added by a covered establishment determines whether it represents the primary SIC Code for the facility.

Example - Primary SIC Code

A facility has two establishments. The first assumes SIC Code 0119 (cash grains, not elsewhere classified) that is not typically subject to EPCRA Section 313 reporting. However, the second establishment assumes SIC Code 204 (Grain Mill Products) that is subject to reporting. The facility then determines that the grain product is worth $500/ton as received from the non-covered establishment and the value of the product is $1,500/ton after processing by the covered establishment. The value added by the covered establishment (SIC Code 204) is more than 50% of the product value; therefore, the primary SIC Code is 204 and the entire facility is subject to reporting.

COMMON ERROR - Multi-Establishment Facilities

Some "multi-establishment" food processing facilities overlook the fact that they may have to submit Form R or Form A reports for chemicals used in agricultural operations. For example, if the value of the products and services from a processing plant exceeds the value from a farming operation that is operated on an adjacent or contiguous site and owned by the same person or entity a Form R or Form A may be required for EPCRA Section 313 chemicals used on the farm.

Ships and barges are not considered facilities for reporting under EPCRA Section 313. For example, a fish processing factory on a ship that moves to various locations would not be subject to EPCRA Section 313 even though it may be in SIC Code 2091. In this example, releases and other waste management activities from the ship may not need to be reported; however, those from the shipping terminal should be considered (by the terminal if it must report).

A pilot plant within a covered SIC Code is considered a covered facility and is subject to reporting, provided it meets the employee and activity criteria. (Note that pilot plants

are not eligible for the laboratory exemption, which is discussed in Chapter 3.) Warehouses on the same site as facilities in a covered SIC Code are also subject to reporting, but stand-alone warehouses that are auxiliary facilities and that do not assume a covered SIC Code as their primary SIC Code are not subject to reporting.

2.3 Number of Employees

If your facility meets SIC Code and activity threshold criteria, you are required to prepare a Form R or Form A report if your facility has 10 or more full-time employees or the equivalent. A full-time employee equivalent is defined as a work year of 2,000 hours. If your facility's employees aggregate 20,000 or more hours in a calendar year, you meet the 10 or more employee criterion.

The following should be included in your employee calculations:

- Owners;
- Operations/manufacturing staff;
- Clerical staff;
- Temporary employees;
- Sales personnel;
- Truck drivers (employed by the facility);
- Other non-manufacturing or off-site facility employees directly supporting the facility;
- Paid vacation and sick leave; and
- Contractor employees (maintenance, construction, etc. but excluding contracted truck drivers).

In general, if an individual is employed or hired to work at the facility, all the hours worked by that individual must be counted in determining if the 20,000 hour criterion has been met.

Example - Calculating Employees

Your facility has six full-time employees working 2,000 hours/year in the plant manufacturing a food product. You also employ two full-time sales people and a delivery truck driver that are assigned to the plant, each working 2,000 hours/year but predominantly on the road or from their homes. The wastewater treatment plant (on-site and owned by the facility) is operated by a contractor who spends an average of two hours per day and five days per week at the plant. Finally, you built an addition to the plant warehouse during the year, using four contractor personnel who were on site full time for six months (working an average of 1,000 hours each). You would calculate the number of full-time employee equivalents as follows:

- Hours for your nine full-time employees (six plant personnel, two salespeople, and one delivery truck driver) for the year are:
  (9 employees) (2,000 hours/year) = 18,000 hours;

- Hours for the wastewater treatment plant operator are:
  (2 hours/day) (5 days/week) (52 weeks/year) = 520 hours; and

- Hours for the construction crew are:
  (4 contractors) (1,000 hours) = 4,000 hours.

Your facility has a total of 22,520 hours for the year, which is above the 20,000 hours/year threshold; therefore, you meet the employee criterion.

COMMON ERROR - Farm Workers and Part Time/Seasonal Workers

Remember to include any part-time and seasonal employees in your calculation, including workers on an adjacent farm that is part of the facility.

2.4 Manufacturing, Processing, and Otherwise Use of EPCRA Section 313 Chemicals

If you are in a covered SIC Code and have 10 or more full-time employee equivalents, you must determine which EPCRA Section 313 chemicals are manufactured, processed, or otherwise used at your facility. You should prepare a list of all chemicals used by all establishments at the facility, including the chemicals found in mixtures and trade name products. This list should then be compared to the CURRENT list of EPCRA Section 313 chemicals found in the *TRI Forms and Instructions* document for that reporting year (also available from the EPCRA Hotline, 1-800-424-9346). Once you identify the EPCRA Section 313 chemicals at your facility, you must evaluate the activities involving each chemical and determine if any activity thresholds are met.

Note that chemicals are periodically added, delisted, or modified. Therefore, it is imperative that you refer to the appropriate reporting year's list. Also, note that a list of synonyms for EPCRA Section 313 chemicals can be found in the U.S. EPA publication *Common Synonyms for Chemicals Listed Under Section 313 of the Emergency Planning and Community Right-To-Know Act*. Table 2-3 lists EPCRA Section 313 chemicals commonly reported for the food processing industry and the process in which they are typically used. This list is not intended to be all inclusive and should only be used as a guide.

Table 2-3
EPCRA Section 313 Chemicals Commonly Encountered in Food Processing

Process	Chemicals
Water Treatment	Chlorine and chlorine dioxide
Refrigerant Uses	Ammonia, ethylene glycol, Freon 113, dichlorodifluoromethane, CFC-114, chlorodi-fluoromethane
Food Ingredients	Phosphoric acid, various food dyes, various metals (e.g. zinc, copper, manganese, selenium, metal compounds) and peracetic acid
Reactants	Ammonia, benzoyl peroxide, chlorine, chlorine dioxide, ethylene oxide, phosphoric acid, propylene oxide
Catalysts	Nickel and nickel compounds
Extraction/Carrier Solvents	n-Butyl alcohol, dichloromethane, n-hexane, phosphoric acid, cyclohexane, and tert-butyl alcohol
Cleaning/Disinfectant Uses	Chlorine, chlorine dioxide, formaldehyde, nitric acid, phosphoric acid, and 1,1,1-trichloroethane
Wastewater Treatment	Ammonia, hydrochloric acid aerosols, and sulfuric acid aerosols
Fumigants	Bromomethane, ethylene oxide, propylene oxide, and bromine
Pesticides/Herbicides	Various pesticides and herbicides (e.g., aldrin, captan, 2, 4-D, hydrazine, lindane, maneb, parathion, zineb, malathion, atrazine, diazinon bromine, and naphthalene)
Byproducts	Ammonia, chloroform, methanol, hydrogen fluoride, and nitrate compounds
Can Making/Coating	Various ink and coating solvents (e.g. glycol ethers, MEK, toluene, methyl isobutyl ketone, xylene), various listed metals (e.g. manganese, nickel, chromium), and various metal pigment compounds (e.g., many pigments contain copper, barium, chromium, zinc, or lead)

2.5 Activity Categories

There are three activity categories for the listed chemicals defined in EPCRA Section 313: Manufacturing (which includes importing), Processing, and Otherwise Use. The activity thresholds which have been in effect since reporting year 1989 are 25,000 pounds per year for manufacturing, 25,000 pounds per year for processing, and 10,000 pounds per year for otherwise use. These thresholds apply to each chemical individually. The quantity of chemicals stored on site or purchased is not relevant for threshold determinations. Rather, the determination is based solely on the quantity actually manufactured (including imported), processed, or otherwise used. Therefore, EPCRA Section 313 toxic chemicals that are brought on site and stored, but are not incorporated into a product for distribution or not otherwise used on site during the reporting year, are not considered towards any activity thresholds.

Expanded definitions, with examples, of each of the three activities are found in Chapter 3, Tables 3-2, 3-3, and 3-4. The terms are briefly defined in Table 2-4:

Table 2-4
Activity Categories

Activity Category	Definition	Threshold (lbs/yr)
Manufacture	To produce, prepare, import, or compound a toxic chemical. "Manufacture" also applies to a toxic chemical that is produced coincidentally during the manufacture, processing, otherwise use, or disposal of another chemical or mixture of chemicals as a byproduct, and a toxic chemical that remains in that other chemical or mixture of chemicals as an impurity during the manufacturing, processing, or otherwise use or disposal of any other chemical substance or mixture. An example would be the production of ammonia or nitrate compounds in a wastewater treatment system.	25,000

Table 2-4 (cont.)

Activity Category	Definition	Threshold (lbs/yr)
Process	To prepare a listed EPCRA Section 313 chemical, or a mixture or trade name product containing an EPCRA Section 313 chemical, for distribution in commerce (usually the intentional incorporation of an EPCRA Section 313 chemical into a product). For example, zinc compounds may be processed as an additive in dog food, and would have to be reported if you exceeded the reporting threshold. Processing includes the preparation for sale to your customers (and transferring between facilities within your company) of a chemical or formulation that you manufacture. For example, if you manufacture a chemical or product, package it, and then distribute it into commerce, this chemical has been manufactured AND processed by your facility.	25,000
Otherwise Use	Generally, use of a listed EPCRA Section 313 chemical that does not fall under the Manufacture or Process definitions is classified as Otherwise Use. A listed chemical that is Otherwise Used is not intentionally incorporated into a product that is distributed in commerce, but may be used instead as a manufacturing or processing aid (e.g., catalyst), in waste processing, or as a fuel (including waste fuel). For example, n-butyl alcohol used as a carrier solvent for spices is classified as Otherwise Used. On May 1, 1997 U.S. EPA revised the interpretation of "otherwise use". The following new "otherwise use" definition becomes effective with the 1998 reporting year (62 FR 23834, May 1, 1997): Otherwise use means "any use of a toxic chemical contained in a mixture or other trade name product or waste, that is not covered by the terms "manufacture" or "process." Otherwise use of a toxic chemical does not include disposal, stabilization (without subsequent distribution in commerce), or treatment for destruction unless: 1) The toxic chemical that was disposed, stabilized, or treated for destruction was received from off site for the purposes of further waste management; OR 2) The toxic chemical that was disposed, stabilized, or treated for destruction was manufactured as a result of waste management activities on materials received from off site for the purposes of further waste management activities."	10,000

Relabeling or redistribution of an EPCRA Section 313 chemical where no repackaging occurs does not constitute manufacturing, processing, or otherwise use of that chemical. This type of activity should not be included in threshold calculations.

Also, note that the threshold determinations for the three activity categories (manufacturing, processing, and otherwise use) are mutually exclusive. That is, you must conduct a separate threshold determination for each activity category and if you exceed any threshold, all releases and other waste management activities of EPCRA Section 313 toxic chemicals at the facility must be considered for reporting.

Example - Relabeling

You buy a mixture in small containers which contains a listed toxic chemical. When it arrives you put your own label on each container and put the containers in a larger box with several other items you manufacture, and sell the larger box as a kit. The quantity of the EPCRA Section 313 chemical in the small containers should not be counted toward the processing (because you did not repackage the toxic chemical) or otherwise use thresholds, nor should it be counted toward the manufacturing activity threshold unless the small containers were imported. However, you must consider other chemicals that you manufactured in the kit toward manufacturing and processing threshold determinations.

2.6 How Do You Report?

You must file a report (Form R) for each EPCRA Section 313 chemical that exceeds a threshold for manufacturing, OR processing, OR otherwise use (providing you meet the employee and SIC Code criteria). Provided you meet certain criteria you may file a Form A rather than a Form R. The *TRI Forms and Instructions* contain detailed directions for the preparation and submittal of Form R or Form A reports for each listed chemical for the reporting year. The *TRI Forms and Instructions* are sent to all facilities which submitted Form R or Form A reports the preceding year. However, if you do not receive a courtesy copy, you may request copies of the *TRI Forms and Instructions* from the EPCRA Hotline (1-800-424-9346).

2.7 Form R

Form R is the more detailed and more common report. If you are submitting a Form R, it is essential that you use the *TRI Forms and Instructions* for the appropriate reporting year. U.S. EPA encourages the electronic submittal of the Form R, via the Automated Toxic Chemical Release Inventory Reporting Software (ATRS). Use of the ATRS will save time in data

entry and photocopying and reduce errors via on-line validation routines and use of pick lists. The ATRS can be found on the Internet at:

- **http://www.epa.gov/opptintr/atrs**

The ATRS is available in both DOS and Windows versions. More information can be found in the *TRI Forms and Instructions* and by calling the ATRS User Support Hotline at (703) 816-4434.

The Form R consists of two parts:

Part I, Facility Identification Information. This part may be photocopied and re-used for each Form R you submit, except for the signature which must be original for each submission.

Part II, Chemical Specific Information. You must complete this part separately for each toxic chemical or chemical category; it cannot be reused year to year even if reporting has not changed.

Submission of incomplete Form Rs may result in issuance of a Notice of Technical Error (NOTE), Notice of Significant Error (NOSE), or Notice of Non-compliance (NON). See the current *TRI Forms and Instructions* for more detailed information on completing and submitting the Form R.

2.8 Form A

Form A, also referred to as the "Certification Statement," was developed to reduce the annual reporting burden for facilities with minimal amounts of EPCRA Section 313 chemicals released and/or otherwise managed as a waste (59 FR 61488, November 1994; applicable beginning reporting year 1994 and beyond). The following two criteria must be met in order to use a Form A:

- First, the amount of the chemical manufactured, processed, OR otherwise used cannot exceed one million pounds. It is important to note that the quantities for each activity are mutually exclusive and must be evaluated independently. If the quantity for any one of the activities exceeds 1,000,000 pounds a Form A cannot be submitted.

- Second, the total annual reportable amount of the listed chemical cannot exceed 500 pounds per year. The "reportable amount" is defined as the sum of the on-site amounts released (including disposal), treated, recycled, and combusted for energy recovery, combined with the sum of the amounts transferred off site for recycling, energy recovery, treatment, and/or release (including disposal). This total corresponds to the total of data elements 8.1 through 8.7 on the 1997 version of the Form R.

Example - Form A Threshold

Providing the combined annual reportable amounts from all activities does not exceed 500 pounds, a facility that manufactures 900,000 pounds of an EPCRA Section 313 chemical and processes 150,000 pounds of the same listed toxic chemical is eligible to use the Form A because the facility did not exceed the one million pounds for either activity, even though the total activity usage exceeds one million pounds.

The Form A Certification Statement must be submitted for each eligible EPCRA Section 313 chemical. The information on the Form A will be included in the publicly accessible TRI database. Note that separate establishments at a facility cannot submit separate Form As for the same chemical; rather, only one Form A per EPCRA Section 313 chemical can be submitted per facility.

Like the Form R, Form A includes facility identification information. However, no release and/or other waste management estimations to any media are required. You must simply certify that the total annual reportable quantity does not exceed 500 pounds. Many facilities have indicated that the initial time required to determine whether they qualify for submitting a Form A is equivalent to the time needed to complete a Form R. However, once your facility has completed estimates to justify the submission of a Form A, a considerable amount of time will be saved in subsequent years. It is strongly recommended that you document your initial rationale and refer to it every year, to verify you have not modified a part of the process that would invalidate the initial rationale.

2.9 Trade Secrets

If you submit trade secret information, you must prepare two versions of the substantiation form as prescribed in 40 CFR Part 350 (see 53 FR 28801, July 29, 1988), as well as two versions of the Form R (or Form A). One set of forms should be "sanitized" (i.e., it should provide a generic name for the toxic chemical identity). This version will be made available to the public. The second version, the "unsanitized" version, should provide the actual identity of the toxic chemical and have the trade secret claim clearly marked in Part I, Section 2.1 of the Form R or Form A. The trade secrets provision only applies to the toxic chemical identity. All other parts of the Form R or Form A must be filled out accordingly.

Individual states may have additional criteria for confidential business information and the submittal of both sanitized and unsanitized reports for toxic chemicals. Facilities may jeopardize the trade secret status of a toxic chemical by submitting an unsanitized version to a state agency or tribal government that does not require an unsanitized version.

More information on trade secret claims, including contacts for individual state's submission requirements, can be found in the *TRI Forms and Instructions*.

2.10 Recordkeeping

Complete, accurate, and preferably electronic records are absolutely essential to meaningful compliance with EPCRA Section 313 reporting requirements. Compiling and maintaining good records will help you to reduce the effort and cost in preparing future reports, and to document how you arrived at the reported data in the event of a U.S. EPA compliance audit. U.S. EPA requires you to maintain records substantiating the Form R or Form A submission, for a minimum of three years. Each facility must keep copies of the Form R or Form A along with all supporting documents, calculations, work sheets, and other forms that you use to prepare the Form R or Form A. U.S. EPA may request this supporting documentation during a regulatory audit.

Specifically, U.S. EPA requires that the following records must be maintained for a period of three years from the date of the submission of a report (summarized from 40 CFR 372.10):

1) A copy of each report that is submitted.

2) All supporting materials and documentation used by the person to make the compliance determination that the facility or establishment is a covered facility.

3) Documentation supporting the report that is submitted, including documentation supporting:

- Claimed allowable exemptions;
- Threshold determinations;
- Calculations for each quantity reported as being released, either on or off site, or otherwise managed as waste;
- Activity use determinations, including dates of manufacturing, processing, or use;
- The basis of all estimates;
- Receipts or manifests associated with transfers to off-site locations; and
- Waste treatment methods, treatment efficiencies, ranges of influent concentrations to treatment, sequential nature of treatment steps, and operating data to support efficiency claims.

4) All supporting materials used to make the compliance determination that the facility or establishment is eligible to submit a Form A.

5) Documentation supporting the Form A, including:

- Data supporting the determination that the alternate threshold applies;
- Calculations of annual reporting amounts; and
- Receipts or manifests associated with the transfer of each chemical in waste to off-site locations.

Because EPCRA Section 313 reporting does not require additional testing or monitoring you must determine the best readily available source of information for all estimates. Some facilities may have detailed monitoring data and off-site transfer records that are used for

estimates while others may only use purchase and inventory records. Examples of records that you should keep, if applicable, might include:

- Each Form R or Form A submitted;
- EPCRA Section 313 Reporting Threshold Worksheets (sample worksheets can be found in Chapter 3 of this document as well as in the *TRI Forms and Instructions)*;
- Engineering calculations and other notes;
- Purchase records from suppliers;
- Inventory data;
- National Pollutant Discharge Elimination System (NPDES)/State Pollutant Discharge Elimination System (SPDES) permits and monitoring reports;
- EPCRA Section 312, Tier II reports;
- Monitoring records;
- Air permits;
- Flow measurement data;
- Resource Conservation and Recovery Act (RCRA) hazardous waste generator's reports;
- Pretreatment reports filed with local governments;
- Invoices from waste management firms;
- Manufacturer's estimates of treatment efficiencies;
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Reportable Quantity (RQ) reports;
- RCRA manifests; and
- Process flow diagrams (including emissions, releases, and other waste management activities).

Chapter 3 - EPCRA Section 313 Threshold Determinations

3.0 PURPOSE

This chapter provides a step-by-step procedure for determining if any EPCRA Section 313 chemicals or chemical categories exceed a reporting threshold at your facility. Threshold determinations are essentially a three step process:

Step 1) Determine if you manufacture/import, process, or otherwise use any EPCRA Section 313 chemicals.

Step 2) Determine the quantity of each EPCRA Section 313 chemical you manufacture/import, process, or otherwise use.

Step 3) Determine which EPCRA Section 313 chemicals exceed a threshold.

3.1 Step 1 - Determining Which EPCRA Section 313 Chemicals are Manufactured (Including Imported), Processed, or Otherwise Used

Compile lists of all chemicals, compounds, and mixtures at your facility. For facilities with many different chemicals and mixtures it is often helpful to prepare two lists: one with the pure (single ingredient) chemicals (including chemical compounds) and one with the mixtures and trade name products. On the second list, under the name of each mixture/trade name product, write the names of all chemicals of which that product is comprised. Next, compare the chemicals on both lists to the current EPCRA Section 313 chemicals list found in the *TRI Forms and Instructions* (remember that chemicals may be periodically added and deleted and you should use the current instructions). Highlight the EPCRA Section 313 chemicals that are on your list. You must perform threshold calculations for these chemicals.

Review the list to be sure each chemical is shown by its correct EPCRA Section 313 name. For example, a common EPCRA Section 313 chemical found in the food processing industry is dichlorodifluoromethane. Dichlorodifluoromethane (Chemical Abstract Service (CAS) No. 75-71-8) has several synonyms including: CFC-12; difluorodichloromethane;

Freon 12. It must be reported on Form R (or Form A), Item 1.2, by its EPCRA Section 313 chemical name, dichlorodifluoromethane. Synonyms can be found in the U.S. EPA document *Common Synonyms for Chemicals Listed Under EPCRA Section 313 of the EPCRA* (EPA 745-R-95-008).

The original list of chemicals subject to EPCRA Section 313 reporting was a combination of chemical lists from New Jersey and Maryland. Refinements to the list have been made and changes are anticipated to continue. The list can be modified by U.S. EPA initiative or industry or the public can petition U.S. EPA to modify the list. When evaluating a chemical for addition or deletion from the list, U.S. EPA must consider potential acute and chronic human health effects and adverse environmental effects. U.S. EPA reviews these petitions and initiates a rulemaking to add or delete the chemical from the list, or publishes an explanation why it denied the petition.

While every chemical on the EPCRA Section 313 chemical list must be considered, certain chemicals are typically used in the food processing industry. As a guide, the most frequently reported EPCRA Section 313 chemicals for reporting year 1995 under SIC Major Group 20, and the processes they are typically used in, are listed in Table 2-3.

A computerized spreadsheet may be helpful in developing your facility's chemical list and performing threshold calculations. The spreadsheet could show the chemical or chemical mixture with corresponding component concentrations; the yearly quantity manufactured, processed, or otherwise used; and the CAS number. The spreadsheet could also be designed to identify the total quantity by activity category (amounts manufactured, processed, and otherwise used) for each EPCRA Section 313 chemical in every mixture, compound, and trade name product.

An initial investment of time will be required to develop this spreadsheet; however, the time and effort saved in threshold calculations in subsequent years will be significant. Such a

system will also reduce the potential of inadvertently overlooking EPCRA Section 313 chemicals that are present in mixtures purchased from off-site sources.

To develop the chemical list and the associated activity categories you may want to consult the following:

- Material Safety Data Sheets (MSDSs);
- Facility purchasing records;
- Inventory records;
- Air and water discharge permits; and
- Individual manufacturing/operating functions.

Useful information that is needed to prepare your reports and that you may want to include for each chemical on your spreadsheet is:

- The mixture name and associated EPCRA Section 313 chemical names;
- The associated CAS numbers;
- The trade name for mixtures and compounds;
- The throughput quantities; and
- Whether the chemical is manufactured, processed, or otherwise used at the facility (be sure to include quantities that are coincidentally manufactured and imported, as appropriate).

MSDSs are an excellent source of information for the type and composition of chemicals in mixtures, and are the best sources for determining whether you have purchased raw materials that contain EPCRA Section 313 chemicals. As of 1989, chemical suppliers of facilities in SIC Major Groups 20 through 39 are required to notify customers of any EPCRA Section 313 chemicals present in mixtures or trade name products that are distributed to facilities. The notice must be provided to the receiving facility and may be attached or incorporated into that product's MSDS. If no MSDS is required, the notification must be in a letter that accompanies the first shipment of the product to your facility. This letter must contain the chemical name, CAS number, and the weight or volume percent of the chemical (or a range) in mixtures or trade name products. Beginning with the 1998 reporting year, seven new industries will be covered by most of the EPCRA Section 313 reporting requirements, but will not be required to comply with most

of the supplier notification regulations. For more information on supplier notification, see *EPCRA Section 313 Question and Answers, Revised 1997 Version - Appendix A, Directive 9* (EPA-745-B-97-008) or *Supplier Notification Requirements* (EPA-560/4-91-006).

Carefully review the entire MSDS. Although new MSDSs must list whether EPCRA Section 313 chemicals are present, the language and location of this notification is not currently standardized. Depending on the supplier, this information could be found in different sections of the MSDS. Also, many EPCRA Section 313 chemicals are present as impurities or as small components of mixtures. These quantities must also be considered in threshold determinations unless the concentration is below the *de minimis* value (see Section 3.2.2.1). In some cases, if the chemical is present below *de minimis* concentration, it may be exempt. The most likely sections of an MSDS to provide information on EPCRA Section 313 chemicals are:

- Physical properties/chemical composition section;
- Regulatory section;
- Hazardous components section;
- Labeling section; and
- Additional information section.

Several chemicals on the EPCRA Section 313 chemical list include qualifiers related to use or form. Some chemicals are reportable ONLY if manufactured by a specified process or in a specified activity category. For example, isopropyl alcohol is only reportable if it is manufactured using the strong acid process and saccharin is reportable only if it is manufactured. Some other chemicals are only reportable if present in certain forms. For example, only yellow or white phosphorus is reportable, while black or red phosphorus is not.

The qualifiers, associated chemicals, and typical applicability to the food processing industry are presented below. A detailed discussion of the qualifier criteria can be found in the *TRI Forms and Instructions*.

- **Fume or dust** - Three metals (aluminum, vanadium, and zinc) are qualified with "fume or dust." This definition excludes "wet" forms such as solutions or slurries, but includes powder, particulate, or gaseous forms of these metals. For example, use of zinc metal as a food ingredient is therefore not subject to reporting unless the zinc is in the form of a fume or dust. However, the entire weight of all zinc compounds should be included in the threshold determination for zinc compounds. Keep in mind that only the metal portion of metal compounds is reported in the determination of release and/or other waste management amounts.

- **Manufacturing qualifiers** - Two chemicals that are widely used in food processing, saccharin and isopropyl alcohol, contain qualifiers relating to manufacture. The qualifier for saccharin means that only manufacturers of the chemical are subject to the reporting requirement. The qualifier for isopropyl alcohol means that only facilities that manufacture the chemical by the strong acid process are required to report. Facilities that only process or otherwise use these chemicals are not required to report. Thus, a facility that uses saccharin as a food ingredient or that uses isopropyl alcohol as a solvent in inks or coatings does not need to include these quantities in threshold or release calculations.

- **Solutions (ammonia, ammonium sulfate, and ammonium nitrate)** - On June 26, 1995, U.S. EPA deleted ammonium sulfate (solution) (CAS No. 7783-20-2) from the EPCRA Section 313 toxic chemical list and qualified the listing for ammonia (CAS No. 7664-41-7). The ammonia listing was modified by adding the following qualifier: "ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable salts and other sources; 10% of total aqueous ammonia is reportable under this listing)". The deletion of ammonium sulfate (solution) and the qualification of ammonia are effective as of reporting year 1994. Therefore, ammonium sulfate is no longer a reportable chemical under EPCRA Section 313. However, aqueous ammonia that is formed from the dissociation of ammonium salts (including ammonium sulfate) in water is reportable as is the aqueous ammonia generated from the dissociation of ammonium nitrate in water. You must determine the amount of aqueous ammonia generated from solubilizing these chemicals and apply it toward the threshold for ammonia. U.S. EPA has published guidance on reporting for ammonia and ammonium salts in *EPCRA Section 313 Question and Answers, Revised 1997 Version - Appendix A, Directive 8*. Additionally, ammonium nitrate must be included in threshold and release and other waste management calculations for the nitrate compounds category. U.S. EPA has published guidance for these chemicals in *Water Dissociable Nitrate Compounds Category and Guidance for Reporting* (Appendix D).

- **Nitrate Compounds (water dissociable; reportable only in aqueous solution)** - A nitrate compound is covered by this listing only when in water and if dissociated. Although the complete weight of the nitrate compound must be used for threshold determinations for the nitrate compounds category, only the nitrate portion of the compound must be considered for release and other waste management determinations. One issue recently raised by industry is how to report nitrate compounds in wastewater and/or sludge that is applied to farms as a nitrogen source (either on site or off site). Although the plants and microorganisms ultimately degrade these chemicals, U.S. EPA does not consider this to be a form of recycling or reuse. U.S. EPA's view is that the wastewater and/or sludge is being managed and should be reported as being disposed to land (either on site or off site as appropriate). See Appendix D for additional discussion on nitrate compounds.

- **Phosphorus (yellow or white)** - Only manufacturing, processing, or otherwise use of phosphorus in the yellow or white chemical forms require reporting. Black and red phosphorus are not subject to EPCRA Section 313 reporting.

- **Asbestos (friable)** - Asbestos only needs to be considered when it is handled in the friable form. Friable refers to the physical characteristics of being able to crumble, pulverize, or reduce to a powder with hand pressure.

- **Aluminum oxide (fibrous)** - Beginning with reports for calendar year 1989, aluminum oxide is only subject to threshold determination when it is handled in fibrous forms. U.S. EPA has characterized fibrous aluminum oxide for purposes of EPCRA Section 313 reporting as a man-made fiber that is commonly used in high-temperature insulation applications such as furnace linings, filtration, gaskets, joints, and seals.

- **Sulfuric acid (acid aerosols)** - On June 26, 1995, U.S. EPA promulgated a final rule delisting non-aerosol forms of sulfuric acid (CAS No. 7664-93-9) from the EPCRA Section 313 toxic chemical list (effective for the 1994 reporting year). Therefore, threshold determinations and release and other waste management estimates now only apply to the aerosol forms. U.S. EPA considers the term aerosol to cover any generation of airborne acid (including mists, vapors, gas, or fog) without any particle size limitation.

- **Hydrochloric acid (acid aerosols)** - On July 25, 1996, U.S. EPA promulgated a final rule delisting non-aerosol forms of hydrochloric acid (CAS No. 7647-01-0) (effective for the 1995 reporting year). Therefore, threshold determinations and release and other waste management

estimates now only apply to the aerosol forms. U.S. EPA considers the term aerosol to cover any generation of airborne acid (including mists, vapors, gas, or fog) without any particle size limitation.

3.2 Step 2. Determining the Quantity of Each EPCRA Section 313 Chemical Manufactured/Imported, Processed, or Otherwise Used

The next step is to determine the quantities manufactured, processed, and otherwise used for each EPCRA Section 313 chemical on your list. Table 3-1 lists the reporting thresholds for each of these activity categories (Tables 3-2 through 3-4 provide detailed definitions of subcategories for each Activity Category).

Table 3-1
Reporting Thresholds

Activity Category	Threshold
Manufacturing (including importing)	25,000 pounds per year
Processing	25,000 pounds per year
Otherwise used	10,000 pounds per year

Each threshold must be individually calculated; they are mutually exclusive and are not additive.

Example -Threshold Determination

If your facility manufactures 22,000 pounds of an EPCRA Section 313 chemical and you also otherwise use 8,000 pounds of the same chemical, you have not exceeded either threshold, and an EPCRA Section 313 report for that chemical is not required. However, if your facility manufactures 28,000 pounds per year of an EPCRA Section 313 chemical and otherwise uses 8,000 pounds of the same chemical, you have exceeded the manufacturing threshold and ALL releases and other waste management activities of that chemical must be reported on the Form R, including those from the "otherwise used" activity.

COMMON ERROR - Threshold Determination

The amount of the EPCRA Section 313 chemical that is actually manufactured (including the quantity imported), processed, or otherwise used, not the amount in storage or in the system, should be the amount applied to the threshold determination. For example, your facility uses hexane to extract oil from soybeans in a reactor that holds 50,000 pounds of hexane. Most of the hexane remains in the reactor and additional hexane is added only to replace fugitive releases and small losses that occur when removing the product. Over the course of a year, you add 5,000 pounds of hexane to the reactor to replenish losses. In this example, only the 5,000 pounds that were added to the system count toward the "otherwise use" threshold. Therefore, unless you "otherwise use" more than 5,000 pounds elsewhere at the facility, the "otherwise use" threshold has not been exceeded and you would not have to report for hexane.

Each of the activity categories is divided into subcategories. As discussed in the *TRI Forms and Instructions*, you are required to designate EACH category and subcategory that applies to your facility. Detailed definitions, including descriptions of subcategories for each activity and examples, are presented in Tables 3-2, 3-3, and 3-4.

Table 3-2
Definitions and Examples of Manufactured Chemicals

Manufacturing Activity Subcategory	Definition	Examples in the Food Processing Industry*
Produced or imported for on-site use/processing	A chemical that is produced or imported and then further processed or otherwise used at the same facility.	Chlorine dioxide produced on site for water treatment
Produced or imported for sale/distribution	A chemical that is produced or imported specifically for sale or distribution outside the manufacturing facility.	
Produced as a byproduct	A chemical that is produced coincidentally during the production, processing, or otherwise use of another chemical substance or a mixture and is separated from that substance or mixture. Toxic chemicals produced and released as a result of waste treatment or disposal are also considered byproducts.	Ammonia produced through breakdown of proteins in a wastewater treatment system
Produced as an impurity	A chemical that is produced coincidentally as a result of the manufacture, processing, or otherwise use of another chemical and remains primarily in the mixture or product with that other chemical.	

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Table 3-3
Definitions and Examples of Processed Chemicals

Processing Activity Subcategory	Definition	Examples in the Food Processing Industry*
Reactant	A natural or synthetic chemical used in chemical reactions for the manufacture of another chemical substance or product. Examples include feedstocks, raw materials, intermediates, and initiators.	Ammonia used as a starter component in the batch process manufacture of cheese Propylene oxide reacted with corn starch to produce hydroxyalkyl starches
Formulation component	A chemical that is added to a product or product mixture prior to further distribution of the product and acts as a performance enhancer during use of the product. Examples include additives, dyes, reaction diluents, initiators, solvents, inhibitors, emulsifiers, surfactants, lubricants, flame retardants, and rheological modifiers.	Zinc compounds used as additives in dog food Phosphoric acid used as an ingredient in the preparation of baking ingredients and soft drinks Food dyes
Article component	A chemical that becomes an integral component of an article distributed for industrial, trade, or consumer use.	Pigments contained in inks and coatings that are applied to cans on site
Repackaging only	A chemical that is processed or prepared for distribution in commerce in a different form, state, or quantity. May include, but is not limited to, the transfer of material from a bulk container, such as a tank truck, to smaller containers such as cans or bottles.	

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Table 3-4
Definitions and Examples of Otherwise Used Chemicals

Otherwise Use Activity Subcategory	Definition	Examples in the Food Processing Industry*
Chemical processing aid	A chemical that is added to a reaction mixture to aid in the manufacture or synthesis of another chemical substance but is not intended to remain in or become part of the product or product mixture. Examples include process solvents, catalysts, inhibitors, initiators, reaction terminators, and solution buffers.	Nickel catalyst used in the hydrogenation of vegetable oil n-Butyl alcohol used as a carrier solvent for spices Chlorine used as a bleaching agent for flour Chlorine used for water treatment Solvents contained in inks and coatings that are applied on site
Manufacturing aid	A chemical that aids the manufacturing process but does not become part of the resulting product and is not added to the reaction mixture during the manufacture or synthesis of another chemical substance. Examples include process lubricants, metalworking fluids, coolants, refrigerants, and hydraulic fluids.	Ammonia used as a refrigerant Ethylene oxide used as a bacteriocide during processing of spices
Ancillary or other use	A chemical that is used for purposes other than aiding chemical processing or manufacturing. Examples include cleaners, degreasers, lubricants, fuels (including waste fuels), and chemicals used for treating wastes.	Nitric acid used to clean process equipment Fumigants used to treat grain products.

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

3.2.1 Concentration Ranges for Threshold Determination

You are required to use the best readily available information for all calculations in EPCRA reporting; however, the exact concentration of an EPCRA Section 313 chemical in a mixture or trade name product may not be known. The supplier or MSDS may only list ranges, or upper or lower bound concentrations. U.S. EPA has developed guidance on how to use information in this situation for threshold determinations.

- If the concentration is provided as a lower and upper bound or as a range, you should use the mid-point in your calculations for the threshold determination. For example, the MSDS for the trade name product states methanol is present in a concentration of not less than 20% and not more than 40%, or it may be stated as present at a concentration between 20 to 40%. You should use 30% methanol in your threshold calculations.

- If only the lower bound concentration of the EPCRA Section 313 chemical is specified and the concentration of other components are given, subtract the other component values from 100%. The remainder should be considered the upper bound for the EPCRA Section 313 chemical and you should use the given lower bound to calculate the mid-point as discussed above. For example, the MSDS states that a solvent contains at least 50% MEK and 20% non-hazardous surfactants. Subtracting the non-hazardous contents from 100% leaves 80% as the upper bound for MEK. The mid-point between upper (80%) and lower (50%) bounds is 65%, the value you should use in your threshold calculation.

- If only the lower bound concentration is specified and no information on other components is given assume the upper bound concentration is 100% and calculate the mid-point as above.

- If only the upper bound concentration is provided you must use this value in your threshold calculation.

Note that there is special guidance for concentration ranges that straddle the *de minimis* value. See Section 3.2.2.1 and the *1997 Q&A Document, Appendix A, Directive #2* for more information regarding *de minimis* if applicable.

3.2.2 Evaluation of Exemptions

When determining thresholds, you can exclude quantities of any EPCRA Section 313 chemicals that are manufactured, processed, or otherwise used in exempt activities. Exemptions are divided into four classes:

1. *De Minimis* Exemption;
2. Article Exemption;
3. Facility-Related Exemption; and
4. Activity-Related Exemptions.

COMMON ERROR - Exempt Activities

Quantities of EPCRA Section 313 chemicals used for exempt activities do not need to be included in your threshold calculations, even if they are used in a reportable activity elsewhere in the facility.

3.2.2.1 *De Minimis* Exemption

If the amount of EPCRA Section 313 chemical(s) present in a mixture or trade name product processed or otherwise used is below its *de minimis* concentration level, that amount is considered to be exempt from threshold determinations and release and other waste management calculations (note that this exemption does not apply to manufacturing, except for importation or as an impurity as discussed below). The *de minimis* concentration is 1%, except for Occupational Safety and Health Administration (OSHA)-defined carcinogens, which have a 0.1% *de minimis* concentration. Note that if a mixture contains more than one member of a compound category, the weight percent of all members must be summed. If the total meets or exceeds the category's *de minimis* level, the *de minimis* exemption does not apply. U.S. EPA has published several detailed questions and answers and a directive in the *1997 Q&A Document* (*Q&As #210 through #228 and Appendix A, Directive #2*) that may be helpful if you have additional concerns about the *de minimis* exemption. The *TRI Forms and Instructions* list each EPCRA Section 313 chemical and compound category with the associated *de minimis* value.

The *de minimis* exemption also applies to EPCRA Section 313 chemicals that are coincidentally manufactured below the *de minimis* level as an impurity and subsequently distributed in commerce. It also applies to listed toxic chemicals below the *de minimis* concentration in an imported mixture or trade name product.

Information may only be available that lists the concentration of chemicals in mixtures as a range. U.S. EPA has developed guidance on how to determine quantities that are applicable to threshold determination, release, and other waste management calculations when this range straddles the *de minimis* value. In general, only the quantity of the EPCRA Section 313 chemical whose concentration exceeds the *de minimis* must be considered. Therefore, U.S. EPA

allows facilities to estimate the quantity below the *de minimis* and exclude it from further consideration.

Examples - *de minimis* Concentration Ranges

Example 1:

A facility processes 8,000,000 pounds of a mixture containing 0.25 to 1.25% manganese. Manganese is subject to a 1% *de minimis* concentration exemption. The amount of mixture subject to reporting is the quantity containing manganese above the *de minimis* concentration:

(8,000,000)(1.25% - 0.99%)/(1.25% - 0.25%)

The average concentration of manganese that is not exempt (above the *de minimis)* is:

(1.25% + 1.00%)/(2)

Therefore, the amount of manganese that is subject to threshold determination and release and other waste management estimates is:

$$\left[\frac{(8{,}000{,}000)(1.25\%-0.99\%)}{(1.25\%-0.25\%)}\right]\left[\frac{(1.25\%+1.00\%)}{(2)}\right] = 23{,}400 \text{ pounds}$$

= 23,400 pounds manganese
= 23,000 pounds with two significant figures (which is below the processing threshold)

In this example, because the facility's information pertaining to manganese was available to two decimal places, 0.99 was used to determine the amount below the *de minimis* concentrations. If the information was available to one decimal place, 0.9 should be used, as in Example 2 below.

Example 2:

As in Example 1, manganese is present in a mixture, of which 8,000,000 pounds is processed. The MSDS states the mixture contains 0.2% to 1.2% manganese. The amount of mixture subject to reporting (above *de minimis*) is:

(8,000,000) (1.2% - 0.9%)/(1.2% - 0.2%)

The average concentration of manganese that is not exempt (above *de minimis*) is:

(1.2% + 1.0%)/(2)

Therefore, the amount of manganese that is subject to threshold determinations and release and other waste management estimates is:

$$\left[\frac{(8{,}000{,}000)(1.2\%-0.9\%)}{(1.2\%-0.2\%)}\right]\left[\frac{(1.2\%+1.0\%)}{(2)}\right] = 26{,}400 \text{ pounds}$$

= 26,400 pounds manganese
= 26,000 pounds with two significant figures
(which is above the processing threshold)

The exemption does not apply to listed chemicals that are coincidentally manufactured as byproducts that are separated from the product, nor does it apply to chemicals that are coincidentally manufactured as a result of waste treatment or other management activities, nor to waste brought on site for management. (Under EPCRA Section 313, U.S. EPA does not consider waste to be a mixture.) For example, many facilities treat waste solvents by incinerating them. Combustion processes that use coal as the primary fuel source can result in the coincidental manufacture of sulfuric and hydrochloric acid aerosols and metal compounds. Since the *de minimis* exemption does not apply to the coincidental manufacture of chemicals as byproducts, the formation of these compounds must be considered for threshold, release, and other waste management calculations.

Examples - *de minimis*

Your facility purchases a food additive containing 0.8% Basic Green 4, a food dye. The quantity purchased qualifies for the *de minimis* exemption and does not need to be included in threshold determinations, release, or otherwise managed calculations since its concentration is less than 1 percent.

Your facility uses a mixture containing 1.1% phosphoric acid and 0.6% manganese in processing. The *de minimis* exemption would apply to manganese because the concentration is below 1%; however, it would not apply to phosphoric acid. All of the phosphoric acid must be included in threshold determinations, release, and other waste management calculations.

Once the *de minimis* level has been equaled or exceeded, the exemption no longer applies to that process stream, even if the toxic chemical later falls below the *de minimis* concentration. All releases and other waste management activities are subject to reporting after the *de minimis* concentration has been equaled or exceeded. The facility does not have to report releases and/or other waste management activities that took place before the *de minimis* was exceeded.

3.2.2.2 Article Exemption

An article is defined as a manufactured item that:

- Is formed to a specific shape or design during manufacture;
- Has end-use functions dependent in whole or in part upon its shape or design; and
- Does not release an EPCRA Section 313 chemical under normal conditions of processing or otherwise use of the item at the facility.

If you receive a manufactured article from another facility and process or otherwise use it without changing the shape or design, and your processing does not result in the release of more than 0.5 pound of the EPCRA Section 313 chemical in a reporting year, then the EPCRA Section 313 chemical in that article is exempt from threshold determinations and release and other waste management reporting.

The shape and design can be changed somewhat during processing and otherwise use as long as part of the item retains the original dimensions. That is, as a result of processing or otherwise use, if an item retains its initial thickness or diameter, in whole or in part, then it still meets the article definition. If the item's basic dimensional characteristics are totally altered during processing or otherwise use, the item would not meet the definition. As an example, items that do not meet the definition would be items that are cold extruded, such as lead ingots that are formed into wire or rods. However, cutting a manufactured item into pieces that are recognizable as the article would not change the exemption status as long as the diameter and the thickness of the item remain unchanged. For instance, metal wire may be bent and sheet metal may be cut, punched, stamped, or pressed without losing the article status as long as no change is made in the diameter of the wire or tubing or the thickness of the sheet and no releases occur.

Any processing or otherwise use of an article that results in a release above 0.5 pound per year for each toxic chemical for all like articles also negates the exemption. Cutting, grinding, melting, or other processing of a manufactured item could result in a release of a toxic chemical during normal conditions of use and, therefore, could negate the exemption as an article

if the total exceeds 0.5 pound in a year. However, if all of the resulting waste is recycled or reused, either on site or off site so the release and/or other waste management of the listed chemical does not exceed 0.5 pound, then the article's exemption status is maintained. Also, if the processing or otherwise use of similar manufactured items results in a total release and/or other waste management of less than or equal to 0.5 pound of any individual EPCRA Section 313 chemical to any environmental media in a calendar year, U.S. EPA will allow this quantity to be rounded to zero and the manufactured items to maintain their article exemption. The 0.5 pound limit does not apply to each individual article, but applies to the sum of all releases and other waste management activities from processing or otherwise use of like articles for each EPCRA Section 313 chemical. The *1997 Q&A Document* presents several specific questions and answers/discussion pertaining to the article exemption.

3.2.2.3 Facility-Related Exemption

Listed toxic chemicals that are manufactured, processed, or otherwise used in laboratories are exempted from the threshold determination (and subsequent release and other waste management calculations).

- **Laboratory Exemption**. This exemption includes EPCRA Section 313 chemicals that are used under supervision of a technically qualified individual. It applies only to laboratory sampling and analysis, research and development, and quality assurance and quality control activities. It does not include pilot plant scale or specialty chemical production. It also does not include laboratory support activities. For example, chemicals used to maintain laboratory equipment are not eligible for laboratory exemption.

3.2.2.4 Activity-Related Exemptions

Some exemptions apply to the "otherwise use" of a toxic chemical. EPCRA Section 313 chemicals used in these activities do not need to be included in a facility's threshold determination (nor the associated release and/or other waste management calculations). The following activities are considered exempt:

- **Materials used in routine janitorial or facility grounds maintenance**. Examples are bathroom cleaners, fertilizers, and garden pesticides in similar type or concentration distributed to consumers. Materials used to clean process equipment do not meet this exemption. Pesticides and fertilizers used in agricultural operations at a food processing facility are not exempt under this category.

- **Personal use of items**. Examples are foods, drugs, cosmetics, and other personal items including those items used in cafeterias and infirmaries. Office supplies such as correction fluid are also exempt.

Example - Personal Use Exemption

Ammonia used to clean a cafeteria grill is exempt from threshold determinations and release and other waste management calculations. Chlorine added to the water supply system to prepare potable water for consumption at the facility is also exempt under the personal use exemption.

- **Structural components of the facility**. Exemptions apply to listed toxic chemicals present in materials used to construct, repair, or maintain structural components of a facility. An example common to all facilities would be the solvents and pigments used to paint the buildings. Materials used to construct, repair, or maintain process equipment are not exempt.

- **Materials used with facility motor vehicles**. This category includes the use of listed toxic chemicals for the purpose of maintaining motor vehicles operated by the facility. Common examples include gasoline, radiator coolant, windshield wiper fluid, brake and transmission fluid, oils and lubricants, batteries, cleaning solutions, and solvents in paint used to touch up the vehicle. Motor vehicles include cars, trucks, some cranes, forklifts, tow motors, locomotives, and aircraft. Note that this exemption applies to the OTHERWISE USE of the chemical. The coincidental manufacture of listed chemicals resulting from combustion of gasoline is not exempt and should be considered as part of the manufacturing threshold.

Example - Motor Vehicle Exemption

Methanol is purchased for use as a processing aid and as a windshield washer anti-freeze in company vehicles. The amount used for the latter purpose would be subtracted from the facility total BEFORE the facility total is compared to the activity threshold. Even if the facility still exceeds the otherwise use threshold, the amount in the anti-freeze is exempt from release and other waste management reporting.

This exemption does NOT apply to stationary equipment. The use of lubricants and fuels for stationary process equipment (e.g., pumps and compressors) and stationary energy sources (e.g., furnaces, boilers, heaters), are NOT exempt.

Example - Process Equipment Chemical Use

Lubricants containing listed toxic chemicals used on facility vehicles or on-site structural maintenance activities that are not integral to the process are exempt activities. However, lubricants used to maintain pumps and compressors, which aid in facility operations, are not exempt and the amount of the chemical in the lubricant should be applied to the otherwise use threshold.

- **EPCRA Section 313 chemicals in air or water drawn from the environment or municipal sources**. Included are listed toxic chemicals present in process water and non-contact cooling water drawn from the environment or a municipal source, or chemicals present in air or compressed air used in combustion.

Example - Chemicals in Process Water

A facility uses river water for one of its processes. This water contains approximately 100 pounds of a listed chemical. The facility ultimately returns the water that contains the entire 100 pounds of the listed chemical to the river. The chemical in the water can be considered exempt because the listed toxic chemical was present as it was drawn from the environment. The facility does not need to consider the chemical drawn with river water for threshold determinations or release and other waste management reporting.

3.2.3 Additional Guidance on Threshold Calculations for Certain Activities

This section covers two specific situations in which the threshold determination may vary from normal facility operations: reuse and remediation activities of listed toxic chemicals.

3.2.3.1 Reuse Activities

Threshold determinations of listed toxic chemicals that are reused at the facility are based only on the amount of the toxic chemical that is added during the year, not the total volume in the system. For example, a facility operates a refrigeration unit that contains 15,000 pounds of anhydrous ammonia at the beginning of the year. The system is charged with 2,000 pounds of anhydrous ammonia during the year. The facility has therefore "otherwise used" only 2,000 pounds of the covered toxic chemical and is not required to report (unless the facility has additional "otherwise use" activities of ammonia that, when taken together, exceed the reporting threshold). If, however, the whole refrigeration unit was recharged with 15,000 pounds of anhydrous ammonia during the year, the facility would exceed the otherwise use threshold, and be required to report.

3.2.3.2 Remediation Activities

EPCRA Section 313 chemicals undergoing remediation (e.g., Superfund) are not being manufactured, processed, or otherwise used. Therefore, they are not included in the threshold determinations.

However, if a facility is undergoing remediation for an EPCRA Section 313 chemical and it is also being manufactured, processed, or otherwise used by the facility, the facility may be subject to the reporting requirements. If a listed toxic chemical exceeds one of the reporting thresholds by other facility activities, all releases or other waste management activities of that chemical must be reported, including releases or other waste management activities resulting from remediation.

Excavation of material already landfilled does not constitute a release or other waste management activity for EPCRA Section 313 reporting purposes. However, any release or other waste management of a toxic chemical due to remediation must be reported in Section 5 or 6 of the Form R and should be considered as part of the reportable amount for Form A, if the

chemical exceeds any reporting threshold as a result of other manufacturing, processing, or otherwise use activities elsewhere at the facility. Routine activities (e.g., dredging a lagoon), even if not performed every year, are not considered to be remedial actions.

3.2.3.3 Recycling Activities

For on-site recycling and reuse systems, where the same EPCRA Section 313 chemical is recycled and reused multiple times, the recycled quantity should be counted only once for threshold calculations. (Please note that for reporting of waste management activities, the quantity of the EPCRA Section 313 chemical should be counted every time it exits the recycling unit.) EPCRA Section 313 chemicals recycled off site and returned to the facility should be treated as newly purchased materials for EPCRA Section 313 threshold determination.

3.3 Step 3. Determine Which EPCRA Section 313 Chemicals Exceed a Threshold

The final step is to determine which chemicals exceed a threshold. At this point you should have:

1. Determined each EPCRA Section 313 chemical at your facility.

2. Determined the activity category for each listed toxic chemical (manufactured, processed, or otherwise used) and calculated the quantity for each activity.

Now, you must sum the usage for each chemical by category, subtract all exempt quantities, and compare the totals to the applicable thresholds. Each EPCRA Section 313 chemical exceeding any one of the activity thresholds requires the submission of a Form R. Provided you meet certain criteria you may file a Form A rather than a Form R.

COMMON ERROR - What if Your Facility Has No Releases and/or Other Waste Management Quantities of EPCRA Section 313 Chemicals?

If you meet all reporting criteria and exceed any threshold for a chemical, you must file a Form R **OR** Form A for that chemical, even if you have zero releases and other waste management activities. Exceeding the chemical activity threshold, not the quantity released and/or otherwise managed as waste determines whether you must report. Note that if the release and/or other waste managed quantity is 500 pounds or less you may be eligible to file the abbreviated Form A rather than a Form R (see Section 2.8).

To determine if a chemical exceeds a reporting threshold, you must calculate the annual activity usage of that chemical. Start with the amount of chemical at the facility as of January 1, add any purchases during the year and the amount manufactured (including imported), and subtract the amount left in the inventory on December 31. If necessary, adjust the total to account for exempt activities (see Section 3.2.2 for a discussion of exemptions). You should then compare the result to the appropriate threshold to determine if you are required to submit an EPCRA Section 313 report for that chemical. Keep in mind that the threshold calculations are independent for each activity category: manufactured, processed, and otherwise used. If more than one activity category applies, the amount associated with each category is determined separately.

Table 3-5 presents a work sheet that may be helpful when conducting your threshold determinations. Table 3-6 illustrates an example of how the work sheet can be used for the following example:

Example - Threshold Worksheet

Assume your facility purchases two mixtures that contain xylene in the applicable reporting year. You purchased 25,000 pounds of Mixture A (which is 50% xylene per the MSDS) and 110,000 pounds of Mixture B (which contains 20% xylene). Further, you determine that you "process" the entire quantity of Mixture A, while you "process" only half of Mixture B and "otherwise use" the other half. You do not qualify for any exempt activities. In this example, you would have processed a total of 23,500 pounds of xylene (12,500 pounds from activities associated with Mixture A and 11,000 pounds from activities associated with Mixture B). You would also have otherwise used a total of 11,000 pounds (all from Mixture B). Therefore, you would not have exceeded the 25,000 pound threshold for processing; however, you would have exceeded the 10,000 pound threshold for otherwise use and would be required to submit a Form R or Form A.

Table 3-5 EPCRA Section 313 Reporting Threshold Worksheet

Facility Name:
Toxic Chemical or Chemical Category:
CAS Number:
Reporting Year:

Date Worksheet Prepared: _____
Prepared By: _____

Amounts of the toxic chemical manufactured, processed, or otherwise used.

Mixture Name or Other Identifier	Information Source	Total Weight (lb)	Percent TRI Chemical by Weight	TRI Chemical Weight (in lbs)	Amount of the Listed Toxic Chemical by Activity (in lbs.):		
					Manufactured	Processed	Otherwise Used
1.							
2.							
3.							
4.							
Subtotal:					(A)_____lbs.	(B)_____lbs.	(C)_____lbs.

Exempt quantity of the toxic chemical that should be excluded.

Mixture Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the Toxic Chemical Exempt from Above (in lbs.):		
			Manufactured	Processed	Otherwise Used
1.					
2.					
3.					
4.					
Subtotal:			(A_1)_____lbs.	(B_1)_____lbs.	(C_1)_____lbs.
Amount subject to threshold:			($A-A_1$)_____ lbs.	($B-B_1$)_____ lbs.	($C-C_1$)_____ lbs.
Compare to threshold for EPCRA Section 313 reporting.			**10,000 lbs.**	**25,000 lbs.**	**25,000 lbs.**

If any threshold is exceeded, reporting is required for all activities. Do not submit this worksheet with Form R; retain it for your records.

Table 3-6. Sample EPCRA Section 313 Reporting Threshold Worksheet

Facility Name: ABC Food Company
Toxic Chemical or Chemical Category: Xylene (mixed isomers)
CAS Number: 1330-20-7
Reporting Year: 1997

Date Worksheet Prepared: May 1, 1998
Prepared By: A.B. Calloway

Amounts of the toxic chemical manufactured, processed, or otherwise used.

Mixture Name or Other Identifier	Information Source	Total Weight (lb)	Percent TRI Chemical by Weight	TRI Chemical Weight (in lbs)	Amount of the Listed Toxic Chemical by Activity (in lbs.):		
					Manufactured	Processed	Otherwise Used
1. Mixture A	MSDS	25,000	50%	12,500	---	12,500	---
2. Mixture B	MSDS	110,000	20%	22,000	---	11,000	11,000
3.							
4.							
Subtotal:					(A) 0 lbs.	(B) 23,500 lbs.	(C) 11,000 lbs.

Exempt quantity of the toxic chemical that should be excluded.

Mixture Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the Toxic Chemical Exempt from Above (in lbs.):		
			Manufactured	Processed	Otherwise Used
1. None					
2.					
3.					
4.					
Subtotal:			(A_1) 0 lbs.	(B_1) 0 lbs.	(C_1) 0 lbs.
Amount subject to threshold:			(A-A_1) 0 lbs.	(B-B_1) 23,500 lbs.	(C-C_1) 11,000 lbs.
Compare to threshold for EPCRA Section 313 reporting.			10,000 lbs.	25,000 lbs.	25,000 lbs.

If any threshold is exceeded, reporting is required for all activities. Do not submit this worksheet with Form R; retain it for your records.

Chapter 4 - Estimating Releases and Other Waste Management Quantities

4.0 PURPOSE

This chapter is intended to guide the user in developing a systematic approach for estimating quantities of EPCRA Section 313 chemicals released and otherwise managed from food processing operations. Figure 4-1 diagrams a recommended approach for estimating quantities of reportable EPCRA Section 313 chemicals.

This chapter also includes common EPCRA Section 313 reporting and compliance issues as they apply to the food processing industry. The general discussion (Section 4.1) is followed by a presentation of specific examples and issues pertaining to twelve common chemical use categories in the food processing industry (Section 4.2). These chemical use categories are:

- Water treatment;
- Refrigerant uses;
- Food ingredients;
- Reactants;
- Catalysts;
- Extraction/carrier solvents;
- Cleaning/disinfectant uses;
- Wastewater treatment;
- Fumigants;
- Pesticides/herbicides;
- Byproducts; and,
- Can making/coating.

COMMON ERROR - Other Reporting

The requirements for EPCRA Section 313 reporting are not mitigated in any way by exemptions for food products under other mechanisms such as regulations of the Food and Drug Administration (FDA) and OSHA. Also, you should remember that EPCRA has three separate chemical lists: the Section 302 "extremely hazardous substances," the Section 311 "hazardous chemicals," and the EPCRA Section 313 "toxic chemicals." These lists are independent of one another. For example, OSHA excludes food products from its MSDS requirements. This exclusion exempts them from EPCRA Section 311 reporting, but it does not affect the EPCRA Section 313 requirements.

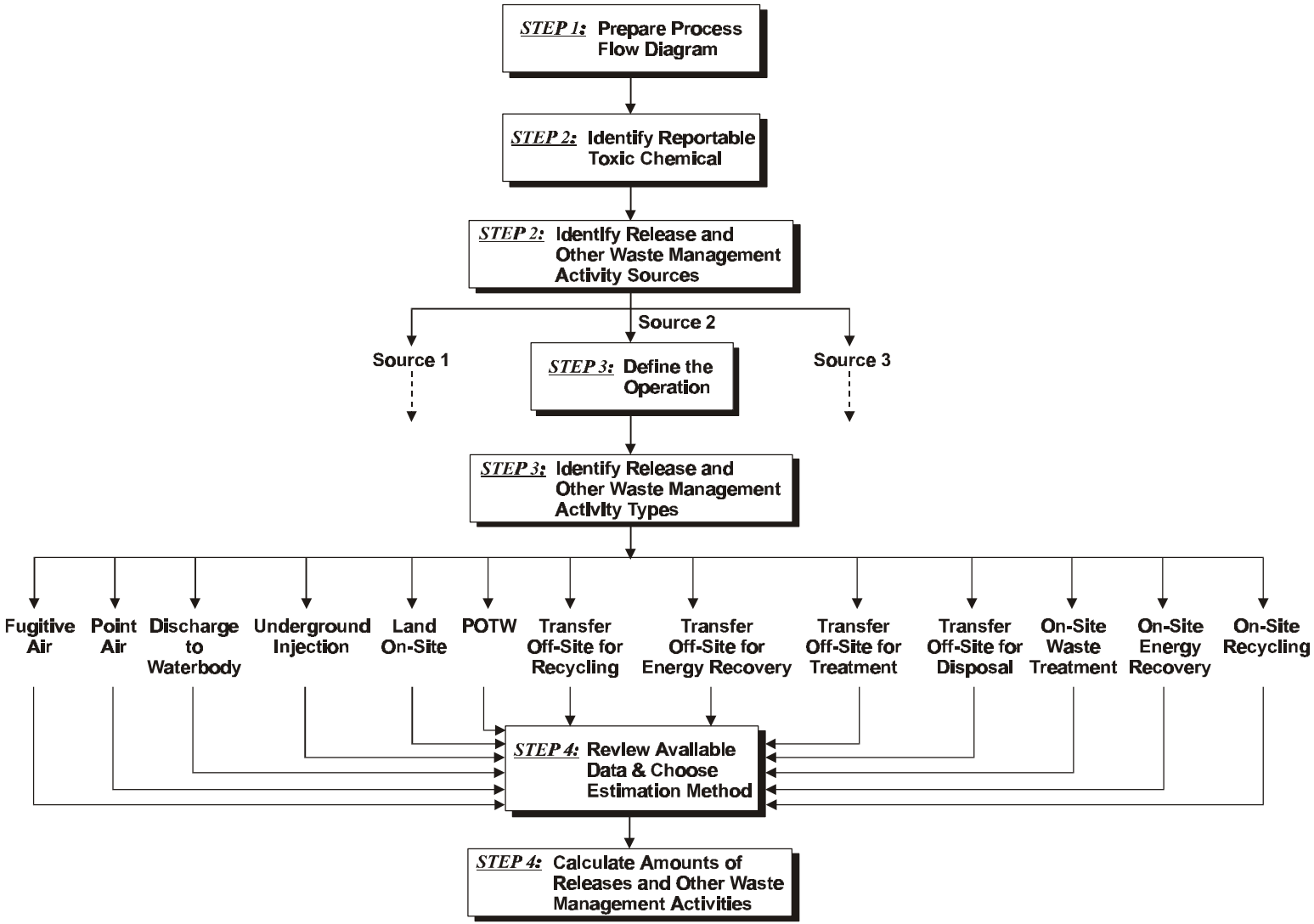

Figure 4-1 Release and Other Waste Management Calculation Approach

4.1 General Steps for Determining Releases and Other Waste Management Activity Quantities

Releases and other waste management activities can be determined by completing the following four steps. See Figure 4-1 for illustration of the four-step process.

Step 1) Prepare a process flow diagram.

Step 2) Identify potential sources of chemicals released and/or other waste management activities.

Step 3) Identify on-site releases, off-site transfers, and/or on-site waste management activity types.

Step 4) Determine the most appropriate method(s) to develop and calculate the estimates for releases and other waste management activity quantities.

These steps are described in detail in the following sections.

4.1.1 Step 1: Prepare a Process Flow Diagram

Preparing a process flow diagram will help you to identify potential sources of chemicals that are released and/or otherwise managed as waste at your facility. Depending on the complexity of your facility, you may want to diagram individual processes or operations rather than the entire facility. The diagram should show how materials flow through the processes and identify material input, generation, and output points. Looking at each operation separately, you can determine where EPCRA Section 313 chemicals are manufactured, processed, or otherwise used and the medium to which they will be released, transferred, or otherwise managed.

4.1.2 Step 2: Identify Potential Sources of Chemical Release and/or Other Waste Management Activities

Once a process flow diagram has been developed, you must determine the potential sources and which EPCRA Section 313 chemicals may be released and/or otherwise

managed from each unit operation and process. Remember to include upsets and routine maintenance activities. Potential sources include:

- Relief valves;
- Pumps;
- Tower stacks;
- Volatilization from process or treatment;
- Fittings;
- Transfer operations;
- Flanges;
- Storage tanks;
- Stock pile losses;
- Waste treatment discharges;
- Process discharge stream;
- Container residues;
- Recycling and energy recovery byproducts;
- Accidental spills and releases;
- Storm water runoff;
- Clean up and housekeeping practices;
- Treatment sludge; and
- Combustion byproducts.

Next, you must identify the EPCRA Section 313 chemicals that are released or otherwise managed from each source. A thorough knowledge of the facility operations and processes is required to determine these chemicals. You should also consider whether any of the EPCRA Section 313 chemicals are coincidentally manufactured at your facility. Table 2-3 identifies EPCRA Section 313 chemicals typically used in the 12 chemical use categories (described in detail in Section 4.2) common to food processing operations. This table can be used as an aid in identifying which chemicals are found in your process. The list may not include all the chemicals your facility uses that are subject to reporting, and it may include many chemicals that you do not use.

4.1.3 Step 3: Identify On-Site Releases, Off-Site Transfers and/or On-Site Waste Management Activity Types

For each identified source of an EPCRA Section 313 chemical, you must examine all possible releases and waste management activities. Figure 4-2 schematically represents the possible releases and other waste management activities as they correspond to individual data elements of the Form R. Remember to include both routine operations and accidents when identifying types. This diagram along with the following descriptions can be used as a checklist to make sure all possible types of releases and other waste management activities have been considered.

a. **Fugitive or Non-Point Air Emissions (Part II, Section 5.1 of Form R)** - Emissions to the air that are not released through stacks, vents, ducts, pipes, or any confined air stream. Examples include:

- Equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.;
- Releases from building ventilation systems, such as a roof fan in an open room;
- Evaporative losses from solvent cleaning tanks, surface impoundments, and spills; and
- Emissions from any other fugitive or non-point source.

b. **Stack or Point Air Emissions (Part II, Section 5.2 of Form R)** - All emissions to the air which occur through stacks, vents, ducts, pipes, or any confined air stream, including storage tank emissions and emissions from air pollution control equipment. Note that emissions released from general room air through a ventilation system are not considered stack or point releases for the purpose of EPCRA Section 313 reporting unless they are channeled through an air pollution control device. Instead, they are considered fugitive releases. However, you should note that some state air quality agencies consider ventilation systems to be a stack or point source. Check with your state agency.

c. **Discharges to Receiving Streams or Water Bodies (Part II, Section 5.3 of Form R)** - Direct wastewater discharges to a receiving stream or surface water body. Discharges usually occur under a NPDES permit.

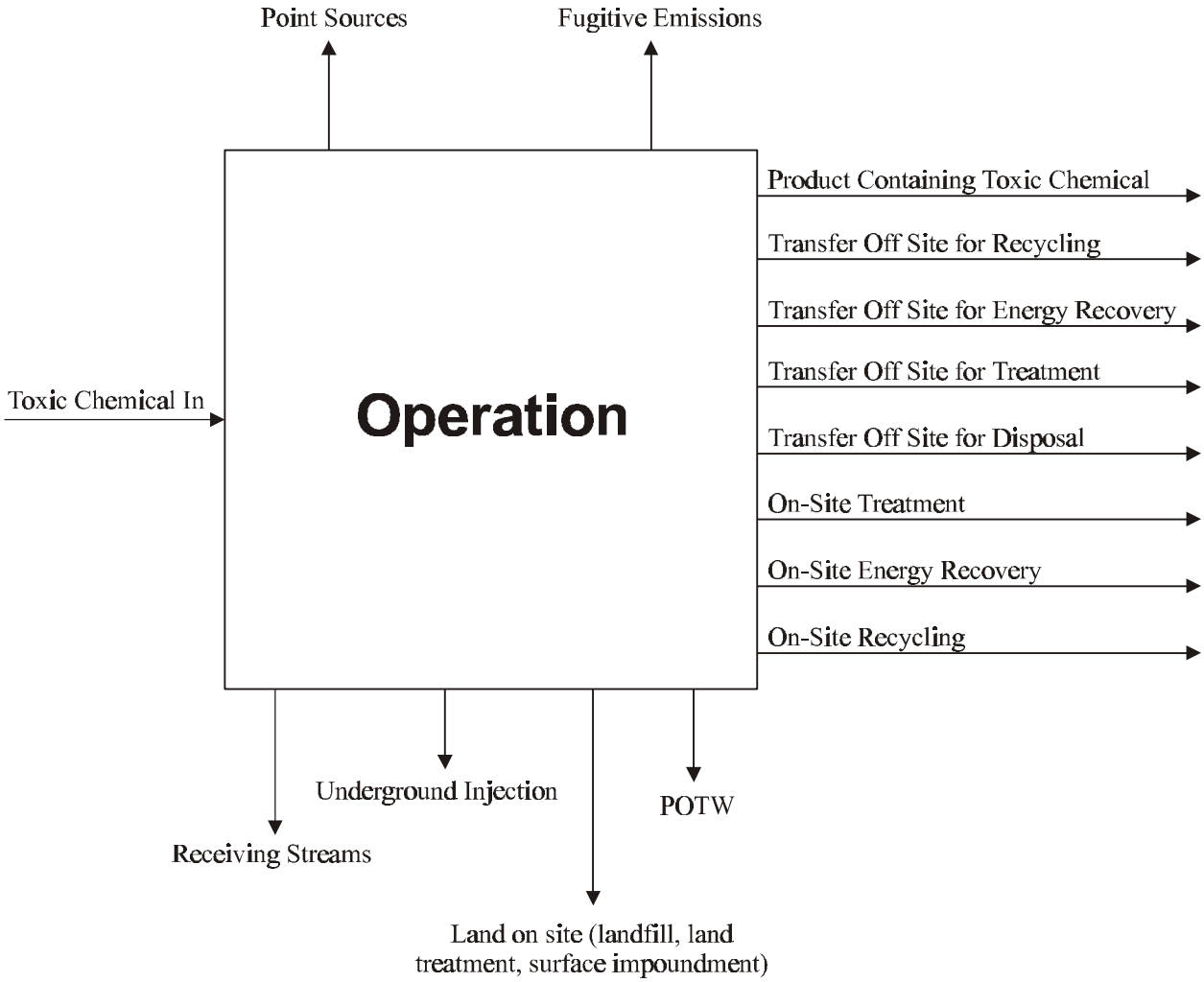

Figure 4-2. Possible Release and/or Other Waste Management Types for EPCRA Section 313 Chemicals

d. **Underground Injection On Site to Class I Wells (Part II, Section 5.4.1 of Form R) and to Class II through V Wells (Part II, Section 5.4.2 of Form R)** - Disposal into an underground well at the facility. These wells may be monitored under an Underground Injection Control (UIC) Program permit. RCRA Hazardous Waste Generator Reports may be a good source of information for wastes injected into a Class I well. Injection rate meters may provide information for all the well classes.

e. **Releases to Land On Site (Part II, Section 5.5 of Form R)** - All releases to land on site, both planned (i.e., disposal) and unplanned (i.e., accidental release or spill). The four predefined subcategories for reporting quantities released to land within the boundaries of the facility are:

(1) **Landfill** - The landfill may be either a RCRA permitted or a non-hazardous waste landfill. Both types are included if they are located on site. Leaks from landfills do not need to be reported as a release.

(2) **Land treatment/application farming** - Land treatment is a disposal method in which a waste containing a toxic chemical is applied to or incorporated into soil. Volatilization of a toxic chemical due to the disposal operation must be included in the total fugitive air releases and should be excluded from land treatment/application farming to avoid double counting.

Sludge and/or aqueous solutions that contain biomass and other organic materials are often collected and applied to farm land. This procedure supplies a nitrogen source for plants and supplies metabolites for microorganisms. U.S. EPA considers this operation to be land treatment/farming if it occurs on site. If a facility sends this material off site for the same purpose, it is considered to be a "transfer to an off-site location, disposal" and should be reported under Sections 6.2 and 8.1 of the Form R.

The ultimate disposition of the chemical after application to the land does not change the required reporting. For example, even if the chemical is eventually biodegraded by microorganisms or plants, it is not considered recycled, reused, or treated.

(3) **Surface impoundment** - A surface impoundment is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials that is designed to hold an accumulation of wastes containing free liquids. Examples include: holding, settling, storage, and elevation pits; ponds; and lagoons.

You do not have to report quantities of a toxic chemical that are released to a surface impoundment as part of a wastewater treatment process in this section. However, if the sludge from the surface impoundment contains the toxic chemical, then the toxic chemical in the sludge must be estimated in this section unless the sludge is removed and subjected to another waste management activity. In that case, it should be reported for that activity, as appropriate.

(4) **Other disposal** - Releases to land that do not fit the categories of landfills, land treatment, or surface impoundment are classified as other disposal. This disposal may include any spills or leaks of the toxic chemical to land.

f. **Transfers Off Site to a Publicly Owned Treatment Works (POTW) (Part II, Section 6.1 of Form R)** - The amount of toxic chemical in water transferred to an off-site POTW. Note that metals and metal compounds transferred to a POTW must also be reported in Section 8.1.

g. **Transfers to Other Off-Site Locations (Part II, Section 6.2 of Form R**) - All off-site transfers containing the toxic chemical for the purposes of waste treatment, disposal, recycling, or energy recovery. Off-site transfer for disposal includes underground injection, landfill/surface impoundment, other land disposal and transfer to a waste broker. The amount transferred off site for disposal must also be reported in Section 8.1.

Also reported in Section 6.2 would be any residual chemicals in "empty" containers transferred off site. U.S. EPA expects that all containers (bags, totes, drums, tank trucks, etc.) will have a small amount of residual solids and/or liquid. On-site cleaning of containers must be considered for EPCRA Section 313 reporting. If the cleaning occurs with a solvent (organic or aqueous), you must report the disposition of the waste solvent as appropriate. If the containers are sent off site for disposal or reclamation, you should report the listed toxic chemical in this section.

Actual data and a knowledge of the unloading methods at your facility can be used to estimate the quantity of residual chemicals in containers. However, U.S. EPA has developed guidance to assist facilities if no site-specific information is available. Table 4-1 provides results from experimentation on residue quantities left in drums and tanks when emptied. These results are presented as the mass percent of the vessel capacity, and are categorized based on unloading method, vessel material, and bulk fluid material properties such as viscosity and surface tension.

Table 4-1
Summary of Residue Quantities From Pilot-Scale Experimental Study[a,b]
(weight percent of drum capacity)

Unloading Method	Vessel Type	Value	Material			
			Kerosene[c]	Water[d]	Motor Oil[e]	Surfactant Solution[f]
Pumping	Steel drum	Range Mean	1.93 - 3.08 2.48	1.84 - 2.61 2.29	1.97 - 2.23 2.06	3.06 3.06
Pumping	Plastic drum	Range Mean	1.69 - 4.08 2.61	2.54 - 4.67 3.28	1.70 - 3.48 2.30	Not Available
Pouring	Bung-top steel drum	Range Mean	0.244 - 0.472 0.404	0.266 - 0.458 0.403	0.677 - 0.787 0.737	0.485 0.485
Pouring	Open-top steel drum	Range Mean	0.032 - 0.080 0.054	0.026 - 0.039 0.034	0.328 - 0.368 0.350	0.089 0.089
Gravity Drain	Slope-bottom steel tank	Range Mean	0.020 - 0.039 0.033	0.016 - 0.024 0.019	0.100 - 0.121 0.111	0.048 0.048
Gravity Drain	Dish-bottom steel tank	Range Mean	0.031 - 0.042 0.038	0.033 - 0.034 0.034	0.133 - 0.191 0.161	0.058 0.058
Gravity Drain	Dish-bottom glass-lined tank	Range Mean	0.024 - 0.049 0.040	0.020 - 0.040 0.033	0.112 - 0.134 0.127	0.040 0.040

[a]From "Releases During Cleaning of Equipment." Prepared by PEI Associates, Inc., for the U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, Washington DC, Contract No. 68-02-4248. June 30, 1986.

[b]The values listed in this table should only be applied to similar vessel types, unloading methods, and bulk fluid materials. At viscosities greater than 200 centipoise, the residue quantities can rise dramatically and the information on this table is not applicable.

[c]For kerosene, viscosity = 5 centipoise, surface tension = 29.3 dynes/cm^2

[d]For water, viscosity = 4 centipoise, surface tension = 77.3 dynes/cm^2

[e]For motor oil, viscosity = 97 centipoise, surface tension = 34.5 dynes/cm^2

[f]For surfactant solution viscosity = 3 centipoise, surface tension = 31.4 dynes/cm^2

The following example describes how the information in the table can be used to estimate the quantity of an EPCRA Section 313 chemical in water that was used to clean drums on site.

Example - Container Residue

You have determined that a Form R for an EPCRA Section 313 chemical must be submitted. The facility purchases and uses 1,000 steel drums that contain 55 gallons of a solution that contains 10% of the chemical. Further, it is assumed that the physical properties of the solution are similar to water. The solution is pumped from the drums directly into a mixing vessel and the "empty" drums are triple-rinsed with water. The rinse water is indirectly discharged to a POTW and the cleaned drums are sent to a drum reclaimer.

In this example, it can be assumed that all of the residual solution in the drums was transferred to the rinse water. Therefore, the quantity transferred to the drum reclaimer should be reported as "zero."

The quantity of residual solution that is transferred to the rinse water can be estimated by multiplying the mean weight percent of residual water from pumping a steel drum by the weight of solution in the drum (density of solution multiplied by drum volume). If the density is not known, it may be appropriate to use the density of water (8.34 pounds per gallon):

(2.29%) (8.34 pounds/gallon) (55 gallons/drum) (1,000 drums)
= 10,504 pounds solution

The concentration of the EPCRA Section 313 chemical in the solution is only 10%.

(10,504 pounds solution) (10%) = 1,050 pounds

Therefore, 1,050 pounds of the chemical are transferred to the POTW.

h. On-Site Waste Treatment (Part II, Section 7A of Form R) - All on-site waste treatment of reported toxic chemicals. The information reported in Section 7A focuses on the treatment of the waste stream. The information includes: type of waste stream (gaseous, aqueous or non-aqueous liquid, solid); treatment methods or sequence; influent concentrations of the toxic chemical; treatment efficiency of each method or sequence; and whether efficiency data is based on actual operating data. Metals and metal portions of metal compounds subjected to a combustion process are not destroyed but should still be reported as going through the treatment process, with a treatment efficiency of zero. Note that only the metal portion of metal compounds should be reported in the Form R. The following example illustrates how Section 7A should be completed for on-site treatment of a wastewater stream containing three EPCRA Section 313 chemicals.

Example - On-Site Waste Treatment

A process at the facility generates a wastewater stream containing an EPCRA Section 313 chemical (chemical A). A second process generates a wastewater stream containing two EPCRA Section 313 chemicals, a metal (chemical B) and a mineral acid (chemical C). Thresholds for all three chemicals have been exceeded and you are in the process of completing separate Form Rs for each chemical.

All wastewater streams are combined and sent to an on-site wastewater treatment system before being released to a POTW. This system consists of an oil/water separator which removes 99% of chemical A; a neutralization tank where the pH is adjusted to 7.5, thereby destroying 100% of the mineral acid (chemical C), and a settling tank where 95% of the metal (chemical B) is removed from the water (and eventually land filled off site).

Section 7A should be completed slightly differently when you file the Form R for each of the chemicals. The table accompanying this example shows how Section 7A should be completed for each chemical. First, on each Form R you should identify the type of waste stream in Section 7A.1a as wastewater (aqueous waste, code W). Next, on each Form R you should list the code for each of the treatment steps that is applied to the entire waste stream, regardless of whether the operation affects the chemical for which you are completing the Form R (for instance, the first four blocks of Section 7A.1b of all three Form Rs should show: P19 (liquid phase separation), C11 (neutralization), P11 (settling/clarification), and N/A (to signify the end of the treatment system). Note that Section 7A.1b is the only section of the Form R that is not chemical specific. It applies to the entire waste stream being treated. Section 7A.1c of each Form R should show the concentration of the specific chemical in the influent to the first step of the process (oil/water separation). For this example, assume chemicals A, B, and C are all present at concentrations greater than 1%. Therefore, code "1" should be entered. Section 7A.1d is also chemical specific. It applies to the efficiency of the entire system in destroying and/or removing the chemical for the Form R you are currently completing. You should enter 99% when filing for chemical A, 95% for chemical B, and 100% for chemical C. Finally, you should report whether the influent concentration and efficiency estimates are based on operating data for each chemical, as appropriate.

Chemical A					
7A.1a	7A.1b	7A.1c	7A.1d	7A.1e	
W	1. P19 2. C11 3. P11 4. N/A 5. _____ 6. _____ 7. _____ 8. _____	1	99 %	Yes X	No ___

Chemical B					
7A.1a	7A.1b	7A.1c	7A.1d	7A.1e	
W	1. P19 2. C11 3. P11 4. N/A 5. _____ 6. _____ 7. _____ 8. _____	1	95 %	Yes X	No ___

Chemical C					
7A.1a	7A.1b	7A.1c	7A.1d	7A.1e	
W	1. P19 2. C11 3. P11 4. N/A 5. _____ 6. _____ 7. _____ 8. _____	1	100 %	Yes X	No ___

Note that the quantity removed and/or destroyed is not reported in Section 7 and that the efficiency reported in Section 7A.1d refers to the amount of EPCRA Section 313 chemical destroyed and/or removed from the applicable waste stream. The amount actually destroyed should be reported in Section 8.6 (quantity treated on site). For example, when completing the Form R for chemical B you should report "0" pounds in Section 8.6 because the metal has been removed from the wastewater stream, but not actually destroyed. The quantity of chemical B that is ultimately land filled off site should be reported in Section 6.2 and 8.1. However, when completing the Form R for chemical C you should report the entire quantity in Section 8.6 because raising the pH to 7.5 will completely destroy the mineral acid.

i. **On-Site Energy Recovery (Part II, Section 7B of Form R)** - All on-site energy recovery of reported EPCRA Section 313 chemicals. U.S. EPA's view is that chemicals that do not contribute significant heat energy during combustion processes should not be considered for energy recovery. Therefore, only chemicals with a significant heating value that are combusted in an energy recovery unit, such as an industrial furnace, kiln, or boiler can be reported for energy recovery. If an EPCRA Section 313 chemical is incinerated on site but does not significantly contribute energy to the process (e.g., chlorofluorocarbons), it must be considered on-site waste treatment (see 4.1.3, h. above). Metals and metal portions of metal compounds will never be treated or combusted for energy recovery. Note that only the metal portion of metal compounds should be reported in the Form R.

j. **On-Site Recycling (Part II, Section 7C of Form R)** - All on-site recycling methods used on listed EPCRA Section 313 chemicals.

k. **Source Reduction and Recycling Activities (Part II, Section 8 of Form R)**[1] - Provide information about source reduction and recycling activities related to the EPCRA Section 313 chemical for which releases and/or other waste management activities are being reported. Section 8 uses some data collected to complete Part II, Sections 5 through 7. For this reason, Section 8 should be completed last. The relationship between Sections 5, 6, and 8.8 to Sections 8.1, 8.3, 8.5, and 8.7 are provided in equation forms below.

(1) **Quantity Released (Part II, Section 8.1 of Form R)** - The quantity reported in Section 8.1 is the quantity reported in all of Section 5 plus the quantity of metals and metal compounds reported as discharged off site to POTWs in Section 6.1 plus the quantity reported as sent off site for disposal in Section 6.2 minus

[1]The Subsection 8.1 through 8.8 designation are for the 1997 Form R. Please refer to the current reporting year *TRI Forms and Instructions* for any changes.

the quantity reported in Section 8.8 that was released or transferred off site for disposal:

Section 8.1 = Section 5 + Section 6.1 (metals and metal compounds) + Section 6.2 (disposal only) - Section 8.8 (release or off-site disposal only)

(2) Quantity Used for Energy Recovery On-Site (Part II, Section 8.2 of Form R) - Estimate the quantity of the EPCRA Section 313 chemical in wastes combusted for energy recovery on site. This estimate should be the quantity of the chemical combusted in the process for which codes were reported in Section 7B. Test data from trial burns or other monitoring data may be used to estimate the quantity of the EPCRA Section 313 chemical combusted for energy recovery purposes. If monitoring data are not available, vendor specifications regarding combustion efficiency may be used as they relate to the reportable EPCRA Section 313 chemical. A quantity must be reported in Section 8.2 when a method of on-site energy recovery is reported in Section 7B and vice versa. Two conditions need to be met to report the combustion of a EPCRA Section 313 chemical in waste as energy recovery: the chemical (1) must have a significant heating value and (2) must be combusted in an energy recovery unit, such as a waste heat boiler, an industrial furnace, or a kiln. If a toxic chemical which does not have a significant heating value (except metals and metal compounds) is combusted for energy recovery on site, it must be considered on-site waste treatment (see 4.1.3.h). Metal and metal compounds in a waste that is combusted or treated on site must be considered as on-site disposal because typically they will be ultimately disposed. Metals and metal portions of metal compounds will never be treated or combusted for energy recovery. Note that only the metal portion of metal compounds should be reported in the Form R. Also, note that "NA" should be reported for EPCRA Section 313 chemicals which are halogens, CFCs, and metals.

(3) Quantity Used for Energy Recovery Off-Site (Part II, Section 8.3 of Form R) - The quantity reported in Section 8.3 is the quantity reported in Section 6.2 for which energy recovery codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for energy recovery:

Section 8.3 = Section 6.2 (energy recovery) - Section 8.8 (off-site energy recovery)

Two conditions need to be met to report the combustion of a EPCRA Section 313 chemical in waste as energy recovery: the chemical (1) must have a significant heating value and (2) must be combusted in a energy recovery unit, such as a waste heat boiler, an industrial furnace, or a kiln. If a toxic chemical which does not have a significant heating value (except metals and metal compounds) is sent off site for energy recovery, it must be considered off-site waste treatment (see 4.1.3.g). Metal and metal compounds sent off site for energy recovery or treatment must be considered sent off site for disposal because typically they will ultimately be disposed. Metals and metal portions of metal compounds will never be treated or combusted for energy recovery. Note that only the metal portion of metal compounds should be reported in the Form R. Also, note that "NA" should be reported for EPCRA Section 313 chemicals which are halogens, CFCs, and metals.

(4) Quantity Recycled On-Site (Part II, Section 8.4 of Form R) - Estimate the quantity of the EPCRA Section 313 chemical recycled in wastes on site. This estimate should be the quantity of the chemical recycled in the process for which codes were reported in Section 7C. A quantity should be reported in Section 8.4 when a method of on-site recycling is reported in Section 7C and vice versa. To estimate this quantity, you should determine if operating data exist which indicate a recovery efficiency and use that efficiency value combined with throughput data to calculate an estimate. If operating data are unavailable, use available vendor specifications.

(5) Quantity Recycled Off-Site (Part II, Section 8.5 of Form R) - The quantity reported in Section 8.5 must be the same as the quantity reported in Section 6.2 for which recycling codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for recycling:

Section 8.5 = Section 6.2 (recycling) - Section 8.8 (off-site recycling)

(6) Quantity Treated On-Site (Part II, Section 8.6 of Form R) - Waste treatment in Section 8 is limited to the destruction or chemical conversion of the EPCRA Section 313 chemical in wastes. The quantities reported in Section 8.6 will be those treated in a subset of the processes for which codes were reported in Section 7A, where treatment includes physical removal from a waste stream. To estimate the quantity treated, you should determine if

operating data exist which indicate a treatment (e.g., destruction or chemical conversion of an EPCRA Section 313 chemical) efficiency and use that efficiency value combined with throughput data to calculate an estimate. Because metals cannot be destroyed or chemically converted into something other than the metal or a metal compound, metals cannot be reported as treated in Sections 8.6 or 8.7. Note that conversion of a metal from one oxidation state to another (e.g., Cr(VI) to Cr(III)) is not considered treatment in Section 8.6. If operating data are unavailable, use available vendor specifications. Section 7A must be completed if a quantity is entered into Section 8.6.

(7) Quantity Treated Off-Site (Part II, Section 8.7 of Form R) - The quantity reported in Section 8.7 must be the same as the quantity reported in Section 6.2 for which treatment codes are reported plus quantities sent to a POTW as reported in Section 6.1, except for metals and metal compounds. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for treatment:

Section 8.7 = Section 6.1 (except metals and metal compounds) + Section 6.2 (treatment) - Section 8.8 (off-site treatment)

Because metals cannot be destroyed or chemically converted into something other than the metal or a metal compound, metals cannot be reported as treated in Sections 8.6 or 8.7. Quantities of metals reported in Section 6.1 and 6.2 as being treated should be reported in Section 8.1 (Quantity Released) unless the facility has knowledge that the metal is being recovered.

(8) Quantity Released to the Environment as a Result of Remedial Actions, Catastrophic Events, or One-Time Events Not Associated with Production Processes (Part II, Section 8.8 of Form R) - The purpose of this section is to separate quantities recycled, used for energy recovery, treated, or released (including disposed) that are associated with normal or routine production from those quantities that are not. The quantity reported in Section 8.8 is the quantity of the EPCRA Section 313 chemical released directly into the environment or sent off site for recycling, waste treatment, energy recovery, or disposal during the reporting year due to any of the following events:

- Remedial actions;
- Catastrophic events such as earthquakes, fires, or floods; or
- One-time events not associated with normal or routine production processes.

The quantity reported in Section 8.8 should not be included with quantities reported in Part II, Sections 8.1 through 8.7 of Form R, but should be included in Part II, Sections 5 and 6 of Form R as appropriate.

Spills that occur as a routine part of production operations and could be reduced or eliminated by improved handling, loading, or unloading procedures are included in the quantities reported in Section 8.1 through 8.7 as appropriate. Releases and off-site transfers from remediation of a EPCRA Section 313 chemical or an unpreventable accident unrelated to production (such as a hurricane) are reportable in Section 8.8.

On-site treatment, energy recovery, or recycling of EPCRA Section 313 chemicals in wastes generated as a result of remedial actions, catastrophic events, or one-time events not associated with production processes are not reported in Part II, Section 8.8 nor Sections 8.1 through 8.7 of Form R.

COMMON ERROR - Double Counting

Releases and/or other waste management activities should not be inadvertently "double counted." A single wastewater discharge should not be listed as both a release to water (on site) and a discharge to POTW (off site). Similarly, a release to land should not be listed as both a release to land (on site) and a transfer to an off-site landfill. Estimates of releases and other waste management activities should be prepared for Sections 5 through 7 of the Form R. For the most part, Section 8 relies on the data collected to complete these previous sections. Therefore, Section 8 should be completed last. However, the data elements of Section 8 (8.1 through 8.7) are mutually exclusive and care should be taken to avoid double counting.

4.1.4 Step 4: Determine the Most Appropriate Method(s) to Develop and Calculate the Estimates for Releases and Other Waste Management Activity Quantities

After you have identified all of the potential sources for release and other waste management activity types, you must next estimate the quantities of each reportable chemical. U.S. EPA has identified four basic methods that may be used to develop estimates (each estimate

has been assigned a code that must be identified when reporting). The methods and corresponding codes are:

- Monitoring Data or Direct Measurement (M);
- Mass Balance (C);
- Emission Factors (E); and,
- Engineering Calculations (O).

Descriptions of these techniques are provided in *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form*. They are also briefly described below. A more detailed discussion of selected calculation techniques is presented in Appendix B. U.S. EPA does not require you to conduct additional sampling or testing for EPCRA Section 313 reporting; however, you are required to use the best, readily available information available to determine the method that will result in the most accurate estimate. For example, it may not be appropriate to use emission factors or engineering calculations if more accurate data, such as stack testing results, are available. You are required to identify only the primary method used for each estimation.

Based on site-specific knowledge and potential data sources available, you should be able to determine the best method for calculating each release and other waste management activity quantity.

Many potential sources of data exist for these (and other) methods of developing estimates. Table 4-2 presents potential data sources and the estimation methodology in which they are most likely to be used.

Once all potential sources, release and other waste management activity types and estimation methods have been determined an estimate for each chemical can be developed corresponding to the elements on Form R.

Table 4-2
Potential Data Sources for Release and Other Waste Management Calculations

DATA SOURCES	
Monitoring Data	**Mass Balance**
• Stack monitoring data • Outfall monitoring data • Air permits • Industrial hygiene monitoring data • NPDES permits • POTW pretreatment standards • Effluent limitations • RCRA permit • Hazardous waste analysis • pH for acids • Continuous emission monitoring	• Supply records • Hazardous material inventory • Air emissions inventory • Pollution prevention reports • Hazardous waste manifests • Spill event records
Emission Factors	**Engineering Calculations**
• AP-42 emission factors • Facility or trade association derived chemical specific emission factors	• Volatilization rates • Raoult's Law • Henry's Law • Solubilities • SOCMI or trade association emission factors • Facility or trade association derived non-chemical specific emission factors.

4.1.4.1 Monitoring Data or Direct Measurement (code M)

Using monitoring data or direct measurements is usually the best method for developing chemical release and/or other waste management activity quantity estimates. Your facility may be required to perform monitoring under provisions of the Clean Air Act (CAA), Clean Water Act (CWA), RCRA, or other regulations. If so, data should be available for developing estimates. Data may have also been collected for your facility through an occupational health and safety assessment. If only a small amount of direct measurement data is available or if you believe the monitoring data are not a representative sample, you must decide if another estimation method would give a more accurate result.

Example - Monitoring Data

Data from the on-site wastewater treatment facility indicate that the annual average concentration of copper in the discharge is 2 mg/L. The wastewater treatment facility processed 1.5 million gallons of water in 1997. The treated wastewater is discharged to an off-site POTW. The amount of copper transferred off site to the POTW (for Section 6.1 of the Form R) is estimated as follows:

Amount of copper transferred

$$= (2\ \text{mg/L}) \left(\frac{\text{g}}{1{,}000\ \text{mg}}\right) \left(\frac{\text{lbs}}{453.59\ \text{g}}\right) \left(\frac{\text{L}}{0.2642\ \text{gal}}\right) (1{,}500{,}000\ \text{gal/yr})$$

$$= 25\ \text{lbs/yr}$$

COMMON ERROR - Treatment Efficiencies

Vendor data on treatment efficiencies often represent ideal operating conditions. You should adjust such data to account for downtime and process upsets during the year that would result in lower efficiencies. Remember that efficiencies reported by vendors are often general and may not apply to specific chemicals. For example, an incinerator or flare may be 99.99% efficient in destroying organic chemicals, but will have a 0% efficiency in destroying metals.

4.1.4.2 Mass Balance (code C)

A mass balance involves determining the amount of a toxic chemical entering and leaving an operation. The mass balance is written as follows:

Input + Generation = Output + Consumption

where:

- Input refers to the materials (chemicals) entering an operation. For example, chlorine added to process water as a disinfectant would be considered an input to the water treatment operation.

- Generation identifies those chemicals that are created during an operation (manufactured, including coincidental manufacturing). For example, when nitrogen sources are used in biological wastewater treatment systems, additional ammonia may be coincidentally manufactured.

- Output means any avenue by which the toxic chemical leaves the operation. Output may include on-site releases and other waste management activities to the environment; transfers for treatment, storage, or disposal; or the amount of chemical that leaves with the final product. In a can coating operation, for example, pigments in the paint may leave the operation as part of the product (the coating on the can) and on paint spray booth filters sent for disposal.

- Consumption refers to the amount of chemical that is converted to another substance during the operation (i.e., reacted). For example, phosphoric acid would be consumed by a neutralization during wastewater treatment.

The mass balance technique may be used for manufactured, processed, or otherwise used chemicals. It is typically most useful for "otherwise used" chemicals that do not become part of the final product, such as catalysts, solvents, acids, and bases. For large inputs and outputs, a mass balance may not be the best estimation method, because slight uncertainties in mass calculations can yield significant errors in the release and other waste management estimates.

Example - Mass Balance

A facility uses a volatile EPCRA Section 313 chemical as a refrigerant and adds 20,000 pounds to the refrigeration system in 1997 (to make up for system losses). The chemical is released to the air from relief vents, during system filling operations and from leaks in valves and fittings. During system maintenance, the lines are bled directly into water and the system is vented to the air. Monitoring data of the wastewater, including chemical concentrations and wastewater throughput, indicate that 1,200 pounds of the chemical were discharged to the wastewater in 1997. The remaining losses are assumed to be fugitive air releases and are estimated as follows:

Fugitive air releases of the EPCRA Section 313 chemical

= Amount input (lbs/yr) – Amount released to wastewater (lbs/yr)

= 20,000 lbs/yr – 1,200 lbs/yr

= 18,800 lbs/yr

COMMON ERROR - Mass Balances for Otherwise Used Chemicals

Most reportable chemicals in the food processing industry are classified as "otherwise used" by the EPCRA Section 313 definition. Such chemicals rarely leave the facility with the product. In these instances, all throughput may be lost during processing through on-site releases to air, water, or land, or it may be shipped off site in wastes. Thus, the entire throughput is often reportable on Form R as releases or other waste management activities to various media. Be sure to consider the entire throughput in these circumstances and partition it as appropriate. A mass balance may be the best starting point from which to estimate the releases and other waste managed quantities.

4.1.4.3 Emission Factors (code E)

An emission factor is a representative value that attempts to relate the quantity of a chemical released with an associated activity. These factors are usually expressed as the weight of chemical released divided by a unit weight, volume, distance, or duration of the activity releasing the chemical (e.g., pounds of chemical released per pounds of product produced). Emission factors, commonly used to estimate air emissions, have been developed for many different industries and activities. You should carefully evaluate the source of the emission factor and the conditions for its use to determine if it is applicable to the situation at your facility.

Emission factors are available in U.S. EPA's *Compilation of Air Pollutant Emission Factors* (AP-42). The use of AP-42 emission factors is appropriate in developing estimates for emissions from boilers and process heaters. Equations are presented in AP-42 to calculate chemical specific emission factors for liquid material loading/unloading of transportation vehicles and storage tanks. AP-42 can be accessed at the following Internet site:

- **http://www.epa.gov/ttn/chief/ap42.html**

It should be noted that, for purposes of EPCRA Section 313 reporting, the only estimates that can be reported as "emission factors (code E)" are published chemical-specific emission factors.

Example - Emission Factors

Example 1:
Emission factors have been developed for air releases of fuel constituents and combustion products from boiler operations. AP-42 lists a range of formaldehyde emission factors when No. 6 fuel oil is consumed:

0.024 to 0.061 lbs formaldehyde generated/10^3 gallons No. 6 fuel oil fired.

A facility operating a boiler using No. 6 fuel oil could use the above emission factor to determine the amount of formaldehyde generated and subsequently released to the air. If 1,000,000 gallons of No. 6 fuel oil is used during a reporting year, the amount of formaldehyde generated would be between:

(0.024 lbs/10^3 gal) (1,000,000 gallons) and (0.061 lbs/10^3 gal) (1,000,000 gallons)
= 24 and 61 lbs of formaldehyde

NOTE: No. 6 fuel oil contains other listed chemicals that should be considered for EPCRA Section 313 reporting.

Example 2:
The output from a fermentation process at a facility that produces red wine is 100,000 gallons per year (gal/yr) of fermented juice. AP-42 provides an n-butyl alcohol emission factor for this process of 5.5×10^{-5} pounds of n-butyl alcohol emitted per 1,000 gallons of fermented juice produced (5.5×10^{-5} lb/10^3 gal). Annual air emissions of n-butyl alcohol from this process are estimated as follows:

The amount of n-butyl alcohol released to air

= (100,000 gal/yr fermented juice) (5.5×10^{-5} lbs n-butyl alcohol/10^3 gal fermented juice)

= 0.0055 lbs/yr

4.1.4.4 Engineering Calculations (code O)

Engineering calculations are assumptions and/or judgements used to estimate quantities of listed toxic chemicals released or otherwise managed. The quantities are estimated by using physical and chemical properties and relationships (e.g., Ideal Gas law, Raoult's law) or by modifying an emission factor to reflect the chemical properties of the toxic chemical in question. Engineering calculations rely on the process parameters; you must have a thorough knowledge of your facility operations to complete these calculations.

Engineering calculations can also include computer models. Several computer models are available for estimating emissions from landfills, wastewater treatment, water treatment, and other processes.

Non-chemical-specific emission factors, Synthetic Organic Chemicals Manufacturing Industry (SOCMI) emission factors, industry-determined emission factors for processes or equipment, and site-specific emission factors also can be used as discussed in Section 4.1.4.3, but must be classified as “engineering calculations” for EPCRA Section 313 reporting.

Example - Engineering Calculations

Example 1:
Stack monitoring data are available for xylene but you are required to report for toluene. Toluene is used in the same application as xylene at your facility. You can estimate the emissions of toluene by adjusting the monitoring data of xylene by a ratio of the vapor pressure for xylene to toluene. This example is an engineering calculation based on physical properties and process operation information:

From facility stack monitoring data, an estimated 200 lbs of xylene are released as air emissions during the reporting year. Toluene is also present in the air emissions, but not monitored. The stack operates at approximately 125°C. Based on literature data, the vapor pressures at 125°C for toluene is 1.44 atmospheres and for xylene is 0.93 atmospheres. Using a ratio of the vapor pressures, the amount of toluene released as air emissions from the stack can be calculated:

$$\frac{\text{X lbs/yr toluene}}{\text{200 lbs/yr xylene}} = \frac{\text{1.44 atm (vapor pressure of toluene)}}{\text{0.93 atm (vapor pressure of xylene)}}$$

$$\text{X lbs/yr toluene} = \frac{\text{(200 lbs/yr xylene) (1.44 atm toluene)}}{\text{(0.93 atm xylene)}}$$

Completing the calculation, the facility determines that 310 lbs of toluene were released as stack air emissions during the reporting year.

Example 2:
A can making/coating process uses 10,000 gallons per year of a paint that is 3% xylene by volume. All of the xylene in the paint is assumed to evaporate during the coating operation. The coating process is equipped with a fume collection hood that captures 80% of the paint vapors. The remaining 20% of the paint vapors are assumed to be released as fugitive air emissions. The collection hood routes the paint vapors to an incinerator that is vented to the atmosphere and has a destruction efficiency of 99% for xylene. The specific gravity of xylene is 0.86 and the density of water is 8.34 lb/gal. Fugitive air emissions and stack air emissions may be estimated as follows:

1. The total amount of xylene released to air (assumed to be the total amount of xylene in paint)

   = (10,000 gal/yr paint) (3% xylene) (0.86 xylene specific gravity) (density of water, 8.34 lbs/gal)

   = 2,152 lb/yr xylene evaporated from paint operations

2. The amount of xylene released as fugitive air emissions

   = (2,152 lbs/yr) (20%)
   = 430 lbs/yr

3. The amount of xylene released as point air emissions

   = (2,152 lbs/yr) (80% capture efficiency) (100% - 99% incinerated)
   = 17 lbs/yr

4.1.4.5 Estimating Release and Other Waste Management Quantities

Once all sources, types, and appropriate estimation methodologies have been identified, you can estimate the release and other waste management activity quantities for each element of the Form R. The recommended approach is that you estimate amounts from all sources at your facility to each type as identified by the elements of Form R. Table 4-3 presents a work sheet that may be helpful in compiling this information. Keep in mind if the total annual reportable quantity, corresponding to the total of the quantities in Part II, Sections 8.1 through 8.7, on the 1997 version of the Form R, is less than 500 pounds, you may use Form A rather than Form R.

If you submit a Form R, you must also enter on-site waste treatment information in Section 7A, including the code for each treatment method used, the destruction and removal efficiency for the chemical in the treated waste stream, and the concentration of the chemical in the influent to treatment. You should report treatment methods that do not actually destroy or remove the chemical by entering "0" for removal efficiency. Similarly, on-site energy recovery methods and on-site recycling methods must be reported in Section 7B and 7C, respectively.

Table 4-3 Release and Other Waste Management Quantity Estimation Worksheet

Facility Name: Date Worksheet Prepared: ___
Toxic Chemical or Chemical Category: Prepared by:
CAS Number:
Reporting Year:

ON SITE		
Release or Other Waste Management Activity Type	**Amount (lbs)**	**Basis of Estimate**
FUGITIVE AIR (Sections 5.1 and 8.1 of Form R)		
Equipment Leaks		
Process Areas		
Evaporative Losses (spills, surface impoundments)		
Total =		
STACK AIR (Sections 5.2 and 8.1 of Form R)		
Process Vents		
Storage Tanks		
Control Device Stacks		
Other		
Total =		
RECEIVING STREAM/WATER BODY DISCHARGE (Sections 5.3 and 8.1 of Form R)		
Stormwater Discharge		
On-Site Treatment Plant Discharge		
Total =		
ON-SITE UNDERGROUND INJECTION (Sections 5.4 and 8.1 of Form R)		
ON-SITE LAND (Sections 5.5 and 8.1 of Form R)		
Landfill		
Land Treatment/Application Farming		
Surface Impoundment		
Other		
Total =		
ON-SITE ENERGY RECOVERY (Section 8.2 of Form R)		
ON-SITE RECYCLING (Section 8.4 of Form R)		
ON-SITE TREATMENT (Section 8.6 of Form R)		

OFF SITE			
Release or Other Waste Management Activity Type	**Amount (lbs)**	**Basis of Estimate**	**Off-Site Location (name)**
DISCHARGE TO PUBLICLY OWNED TREATMENT WORKS (Section 6.1 of Form R)			
OFF-SITE ENERGY RECOVERY (Section 6.2, energy recovery only, and also 8.3 of Form R)			
OFF-SITE RECYCLING (Section 6.2 recycling only and also 8.5 of Form R)			
OFF-SITE TREATMENT (Section 6.1 + 6.2 treated only and also 8.7 (except metals) of Form R)			
QUANTITY RELEASED and/or OTHER WASTE MANAGEMENT ACTIVITY TYPE- OFF-SITE (Section 6.2 disposal & Section 6.1 (metals only) and Section 8.1			

4.2 Process Descriptions (Chemical Use Categories)

This section describes the 12 common chemical use categories found in the food processing industry. Each subsection lists the commonly used EPCRA Section 313 chemicals, gives an overview of the process involved, identifies the appropriate chemical activities and reporting thresholds, describes methods for estimating quantities of chemicals released and/or otherwise waste managed, and discusses common reporting errors.

4.2.1 Water Treatment

Commonly Used EPCRA Section 313 Chemicals - Chlorine, chlorine dioxide

Process Description - Chlorine is used to treat process water at food processing facilities. It is received as a compressed gas and added to process water as a disinfectant. The treated water uses include:

- Component of a food product;
- Wash or convey food products;
- Control odor in fish meal processing; and
- Cleaning purposes.

At a few plants, chlorine dioxide is manufactured by reacting liquid sodium chlorite, chlorine gas, and water for use in similar processes. During water treatment, the facility may coincidentally manufacture listed chemicals, such as chloroform, as byproducts.

Reporting Threshold - Depending upon the application, these chemicals may be manufactured, processed, or otherwise used, and therefore subject to different reporting thresholds. The most common situation is when purchased chlorine is used to treat water for washing or conveying fruits or vegetables or for cleaning equipment. In this case, the chlorine is otherwise used as a chemical processing aid, and subject to the 10,000-pound reporting threshold. Production of chlorine dioxide on site is considered manufacturing (produced for on-site use/processing), and should be applied to the 25,000-pound manufacturing threshold. If the

chlorine dioxide is subsequently used as a disinfectant, the quantity used should also be applied to the 10,000-pound otherwise used threshold.

Estimating Release and Other Waste Management Quantities- The only release that would be expected in this application is small fugitive air releases of chlorine and chlorine dioxide. These releases occur from sources such as leaks in valves and fittings and losses during cylinder changeovers. For the quantities of chlorine typically used for water treatment purposes, engineering judgment can be used to estimate fugitive releases (e.g., based on the volume of the connecting hose and the number of changeovers). If significant quantities of chlorine are handled, these fugitive releases can be estimated using the SOCMI factors presented in *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form*.

No releases are typically expected of either of these chemicals to water. Chlorine reacts very quickly with water to form HOCl, Cl^-, and H^+. Although this is an equilibrium reaction, at a pH above 4 the equilibrium shifts almost completely toward formation of these products. Therefore, essentially zero releases of chlorine to water occur under normal circumstances. Releases of chlorine dioxide to water should be considered but are unlikely based on its strong oxidizing potential and the constant supply of organics in the waste stream.

Example - Chlorine Calculations

Example Release Estimate:

Once Cl_2 is introduced into water or wastewater, it is transformed to HOCl or other compounds.

$$Cl_2 + H_2O \rightleftharpoons HOCl + H^+ + Cl^-$$

The equilibrium constant, Keq, for the reaction is 4.5×10^{-4} at 25° C; therefore:

$$Keq = 4.5 \times 10^{-4} = \frac{[H^+]\ [C1^-]\ [HOC1]}{[C1_2]} \quad \text{Equation 1}$$

The brackets in Equation 1 represent the concentration of the chemical species in terms of gram moles/L. At a pH above 4, the reaction is essentially complete and little Cl_2 remains. In addition, HOCl may further dissociate into OCl^- and react with ammonia in water to form chloroamines. Cl_2 also will react directly with other compounds in water.

Releases of chlorine as Cl_2 to water or POTW will therefore be very small. By applying the Cl_2/HOCl equilibrium relationship, Cl_2 releases to water can be calculated. The following example presents Cl_2 releases for a hypothetical chlorination process in which 100,000 pounds of Cl_2 gas is used during the year, the applied dose is 10 mg/L (this is an extremely high value), the pH of the discharge is 8, and the facility chlorinates incoming well water and discharges the water to a stream.

$$\text{Applied dose} = \frac{10\ \text{mg}\ C1_2/\text{L}}{71{,}000\ \text{mg}\ C1_2/1\ \text{mol}\ C1_2}$$

[Molecular weight of Cl_2 is 71 gms/mole]

$$= 1.41 \times 10^{-4}\ \text{mol}\ Cl_2/\text{L} = [Cl_2]\ \text{applied}$$

The goal of this calculation is to find the equilibrium concentration of Cl_2 after its reaction with water (i.e., the $[Cl_2]$ equilibrium). From the stoichiometry of the Cl_2/H_2O reaction:

$$[Cl^-] = [HOCl] \text{ at equilibrium}$$

Also from stoichiometry:

$$[Cl^-] = [Cl_2]\ \text{applied} - [Cl_2]\ \text{equilibrium} = 1.41 \times 10^{-4} - [Cl_2]\ \text{equilibrium}$$

The pH of the water is maintained at a level of 8; therefore:

$$[H^+] = 1 \times 10^{-8}$$

Substituting into Equation 1:

$$Keq = 4.5 \times 10^{-4} = \frac{(1 \times 10^{-8})\ (1.41 \times 10^{-4} - [C1_2]\ \text{equilibrium})^2}{[C1_2]}\ \text{equilibrium}$$

Example - Chlorine Calculations (cont.)

Solving for [Cl_2] equilibrium yields:

Cl_2 equilibrium = 4.42×10^{-13} mol Cl_2/L

Translating this into a mass-per-volume basis:

Cl_2 equilibrium = $(4.42 \times 10^{-13}$ mol Cl_2/L) (71 g Cl_2/mol) (1000 mg/L)
= 3.14×10^{-8} mg Cl_2/L

The applied Cl_2 dose is 10 mg/L, and the remaining Cl_2 after equilibrium is 3.14×10^{-8} mg/L. The fraction of the applied Cl_2 dose remaining is therefore:

$$\text{Fraction of } C1_2 \text{ remaining} = \frac{3.14 \times 10^{-8}}{10} = 3.14 \times 10^{-9}$$

Cl_2 releases to water = (100,000 lb) (3.14×10^{-9}) = 0.0003 lb

Similar calculations can be performed for other pH levels at an applied Cl_2 dose of 10 mg/L:

NAVY2\ 0910-01.docp H	Cl_2 usage, lb	$[H^+]$	Cl_2 equilibrium concentration, mg/L	Fraction of applied Cl_2 dose remaining	Cl_2 release, lb
8	100,000	1×10^{-8}	3.14×10^{-8}	3.14×10^{-9}	0.0003
6	100,000	1×10^{-6}	3.14×10^{-6}	3.14×10^{-7}	0.03
4	100,000	1×10^{-4}	3.14×10^{-4}	3.14×10^{-5}	3

COMMON ERROR - Reporting

The most common reporting error for chlorine or chlorine dioxide treated water is reporting discharges or transfers when the chemicals have been treated on site. As indicated above, if the discharge is maintained at a pH above 4, none of these chemicals are expected to be released to water streams. Although some facilities may monitor the residual chlorine concentration in their water, this parameter does not represent the Cl_2 concentration. Residual chlorine is the sum of the Cl_2, HOCl, and OCl^- concentrations. Because the Cl_2 concentration will be negligible under neutral pH conditions, direct discharges to water or transfers to a POTW may be reported as zero. Note that if your facility performs no other release and/or other waste management practices involving chlorine, you may be able to file a Form A rather than a Form R.

4.2.2 Refrigerant Uses

Commonly Used EPCRA Section 313 Chemicals - Ammonia, ethylene glycol, Freon 113, dichlorodifluoromethane (CFC-12), dichlorotetrafluoroethane (CFC-114), chlorodifluoromethane (HCFC-22).

Process Description - Ammonia and (to a much lesser extent) ethylene glycol are used as heat exchange media in refrigeration processes. These chemicals are continuously reused in closed-loop units. The ammonia is handled as a gas, while the ethylene glycol is handled as a liquid. Both chemicals must be added to refrigeration systems to replace amounts lost through leaks or when purging a section of the system for maintenance.

Reporting Threshold - Refrigerants are otherwise used (as a manufacturing aid) and are therefore subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Ammonia is a volatile chemical and will be released to air through system filling operations, relief vents, and leaks from valves and fittings. All the anhydrous ammonia lost through these means should be reported as fugitive air releases. If the system is vented to the air during system maintenance, this amount should also be reported as a fugitive air release. The lines may be bled directly into water during system maintenance. In this situation, the anhydrous ammonia transferred to water should be estimated and reported as transfers to a POTW or directly discharged to water. Note that beginning with reporting year 1994, U.S. EPA revised the ammonia listing as follows: "ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable salts and other sources; 10% of total aqueous ammonia is reportable under this listing)." U.S. EPA has published guidance for reporting ammonia and ammonium salts (Appendix C). This guidance states the total ammonia that should be considered for reporting can be estimated by summing all anhydrous ammonia and 10% of the aqueous ammonia.

Ethylene glycol is used in heat exchange applications and released as a result of other leaks in the system piping or drainage of the system for maintenance purposes. Releases and waste management types will be limited to wastewater and non-aqueous liquid waste streams.

Releases and other waste management activities in refrigeration applications are best estimated by mass balance. Total release and other waste management amounts are equivalent to the amounts of the chemicals that have been added to the system to replace losses. Ammonia is usually released to air, whereas ethylene glycol will usually be transferred to water . When ammonia is bled to water, an aqueous solution is formed that contains both ammonia and the ammonium ion. Ammonia estimates obtained from calculations using mass balance equations are sufficient for reporting requirements if monitoring data are not available. The amount of ammonia released to air can then be estimated as the difference between total usage and the amount bled to water.

If a facility "manufactures," "processes," or "otherwise uses" aqueous ammonia, the quantity applied toward threshold determinations for the ammonia listing is 10% of the total quantity of the aqueous ammonia "manufactured," "processed," or "otherwise used." The quantity reported when calculating the amount of ammonia that is released, transferred, or otherwise managed as waste is 10% of the total quantity of aqueous ammonia released, managed as waste, or transferred. See Appendix C for more detailed information.

COMMON ERROR - Threshold Determination

The most common error in refrigerant uses is basing the threshold determination on the total amount of the chemicals in the system. The throughput to be used for a threshold determination is only the amount of new chemicals added to the system during the year (i.e., to charge a new system or to replace amounts lost through leaks and maintenance activities on an existing system). Thus, though a refrigeration system may contain more than 10,000 pounds of ammonia, an EPCRA Section 313 report is not required unless more than 10,000 pounds of new ammonia are added to the system during the year. The quantities of the chemicals added during the year can best be determined from purchase and inventory records.

4.2.3 Food Ingredients

Commonly Used EPCRA Section 313 Chemicals - Phosphoric acid, peracetic acid, various listed food dyes (e.g., C.I. Food Red 5, C.I. Food Red 15), and various listed metal/metal compounds (e.g., zinc, zinc compounds, copper, copper compounds, manganese, manganese compounds, selenium).

Process Description - Various EPCRA Section 313 chemicals are present in food ingredients and become part of the final food product. Several reportable metal and metal compounds are used as formulation components in prepared feeds, such as zinc compounds, which are used as an additive in dog food. Phosphoric acid may be used as a food ingredient in the preparation of baking ingredients and soft drinks. Several food dyes are also on the list of EPCRA Section 313 chemicals. Food ingredients are handled as solids or liquids and may undergo various types of physical processing such as blending.

Reporting Threshold - Food ingredients are processed (as a formulation component) and are therefore subject to the 25,000-pound reporting threshold, regardless of whether they are regulated by the FDA.

Estimating Release and Other Waste Management Quantities - Most chemicals used as food ingredients are not volatile, and since they become part of the final product, only minor release and otherwise managed quantities would be expected from their processing. If the total quantity released and otherwise managed does not exceed 500 pounds, you may be eligible to submit the abbreviated Form A. Engineering judgment can generally be used to estimate releases to air or water from handling or mixing operations. The largest source of release may be equipment cleanup (e.g., tank cleaning, clean-in-place systems). Factors for estimating such releases can be found in *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form*. For storage tank losses (including loading and unloading) of chemicals handled as liquids, estimates of air releases can be made using methods described in *Compilation of Air Pollutant Emission Factors, AP-42*. Storage tank losses are

considered point air releases for EPCRA Section 313 reporting. Portions of spills of liquids could be reported as fugitive air releases, discharges to wastewater, or off-site transfers depending upon the volatility of the chemical and the ultimate disposal of the material.

Any phosphoric acid in facility water (e.g., from washdowns or spills) is likely neutralized before discharge or transfer. If the pH is maintained above 6, the acid is considered completely neutralized and you may report zero releases or transfers. Estimates of releases of phosphoric acid to water that do occur can be based upon the pH of the wastewater effluent. Operating records showing the periods during which the pH falls below 6 can be a good basis for estimating these discharges. Releases can be calculated using the effluent flow rate during the excursion period, the duration of the excursion, and the average pH during the excursion period. More information on estimating acid releases can be found in *Estimating Releases for Mineral Acid Discharges Using pH Measurements.*

COMMON ERRORS - Reporting

One potential reporting error in food ingredient applications is incorrectly submitting a Form R for saccharin. A Form R or Form A is only required for saccharin if the facility manufactures the chemical on site. Processing of saccharin as a food ingredient is not subject to EPCRA Section 313 reporting.
A second potential error is failure to estimate releases and/or other waste management activities of food ingredient chemicals that occur during storage, transfer, and mixing operations. Total usage of the chemicals can be determined from purchasing records. Engineering judgment can be used to estimate the minor releases and/or subsequent waste management activities that may occur during these operations.

4.2.4 Reactants

Commonly Used EPCRA Section 313 Chemicals - Ammonia, chlorine, ethylene oxide, phosphoric acid, propylene oxide.

Process Description - Various chemicals may be processed as reactants in the food industry. These chemicals are raw materials or starting materials for food products. For example, ethylene oxide is used as a reactant in the processing of starch to improve the viscosity of the product. Chlorine, chlorine dioxide, and benzoyl peroxide are used as treatments for flour;

phosphoric acid is processed in the manufacture of certain food products such as pet foods. Ammonia is used as a starter component in the batch process manufacture of cheese. Propylene oxide is reacted with cornstarch to produce hydroxyalkyl starches. These chemicals may be handled as gases under pressure, liquids, or aqueous solutions.

Reporting Threshold - Depending upon the nature of the process, these chemicals are either processed (as a reactant) and therefore subject to the 25,000-pound reporting threshold, or otherwise used (as a chemical processing aid) and subject to the 10,000-pound reporting threshold. The key difference is whether the chemical intentionally leaves the facility with the product. In the examples given above, ethylene oxide, phosphoric acid, and propylene oxide are processed. Chlorine, chlorine dioxide, benzoyl peroxide, and ammonia are otherwise used.

Estimating Release and Other Waste Management Quantities - Most of the throughput of these chemicals are expected to be consumed during the reaction. Minor fugitive air releases of volatile chemicals such as ethylene oxide, ammonia, and chlorine will occur from leaks in valves and fittings and losses during cylinder changeovers. If significant quantities of these chemicals are handled, these fugitive releases can be estimated using the SOCMI factors presented in *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form*. If only small quantities are handled, engineering judgment should be used to estimate fugitive releases (e.g., based on the volume of the connecting hose and the number of changeovers).

Estimates of air releases from storage tank losses should be made as discussed in Section 4.2.3 (including loading and unloading of chemicals handled as liquids).

Spills are the most likely source of liquid solution releases or other waste management activities of phosphoric acid or aqueous ammonia. Phosphoric acid is generally neutralized to a pH of 6.0 or higher before discharge; therefore, you may be able to report zero

releases as discussed in Section 4.2.3. Guidance on estimating ammonia releases is discussed in Section 4.2.2.

COMMON ERROR - Reporting

The most common reporting error in this application is failure to account for minor fugitive air releases during storage and transfer of volatile chemicals such as ethylene oxide, chlorine, or ammonia before their use as reactants.

4.2.5 Catalysts

Commonly Used EPCRA Section 313 Chemicals - Nickel/nickel compounds

Process Description - Certain EPCRA Section 313 metals may be used as catalysts to help promote a desired reaction in food processing operations. For example, a nickel catalyst may be used to aid in the hydrogenation of vegetable oil. Such chemicals are not consumed in the reaction and do not become part of the product. The catalyst may eventually become spent or contaminated and require disposal or regeneration.

Reporting Threshold - Catalysts are otherwise used (as a chemical processing aid) and are subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Catalysts are typically not volatile and do not become part of the final product. Therefore, the total amount of chemical added to the system during the year is ultimately released or otherwise managed via wastewater or solid waste with a small fraction of the catalyst being lost through handling and processing. Typically, the bulk of the spent catalyst is shipped off site for regeneration. Releases or other waste management activity via wastewater would likely only occur from plant washdowns and should be minor.

COMMON ERRORS - Reporting

The most common reporting error in catalyst usage is basing the threshold determination on the total amount of the chemical in the processing system. Similar to refrigerant chemicals, the throughput to be used for a threshold determination is only the amount of new chemical added to the system during the year. Therefore, the processing system may contain more than 10,000 pounds of catalyst, but an EPCRA Section 313 report is not required unless more than 10,000 pounds of new catalyst is added to the system during the year. The quantities of catalyst added during the year can best be determined from purchase and inventory records.

Another possible error would be submitting a Form R or Form A for aluminum oxide, which is used as a catalyst in manufacture of edible fats and oils. Beginning with reporting year 1989, aluminum oxide is reportable only when handled in fibrous forms. Thus, its use as a catalyst in food processing is not subject to a threshold determination.

4.2.6 Extraction/Carrier Solvents

Commonly Used EPCRA Section 313 Chemicals - n-butyl alcohol, dichloromethane, phosphoric acid, n-hexane, cyclohexane, tert-butyl alcohol.

Process Description - Certain EPCRA Section 313 chemicals may be used as extraction or carrier solvents in the food processing industry. For example, n-butyl alcohol may be used as a carrier solvent for spices. Dichloromethane may be used as an extraction solvent for hops and flavorings and to remove caffeine from coffee. Phosphoric acid may be used to remove impurities from vegetable oil. n-Hexane is commonly used to extract the oil from soybeans. Extraction and carrier solvents are normally handled as liquids and do not become part of the final food product.

Reporting Threshold - Extraction and carrier solvents are otherwise used (as a chemical processing aid) and are subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Releases and other waste management activities of these chemicals may be through any media depending on the physical state of the chemical and the process in which it is used. Release and waste management amounts are often best estimated by a mass balance, where it is generally reasonable to assume that the total amount released or managed will equal the usage of the chemical. It is often

possible to use a mass balance in conjunction with monitoring data to estimate the release or other waste managed amount to one medium. This can be accomplished by subtracting the difference between total usage and the amount known to be released and/or otherwise waste managed to other media.

If volatile solvents such as dichloromethane are used, the quantity released to the air is equal to total solvent usage for these purposes minus any amounts that are captured or destroyed by control devices (such as carbon absorbers or thermal oxidizers). A mass balance may be the best method for estimating these releases. If no controls exist, all the solvent should be reported as fugitive or point air releases. If destructive controls are used (e.g., thermal oxidizers), the amount of solvent destroyed can be determined using engineering assumptions of the solvent quantity reaching the control device and its destruction efficiency. If nondestructive controls are used (e.g., absorbers), the amount of the captured solvent in wastes sent off site for recycling, treatment, or disposal can be determined through analysis of these wastes. The quantity released to air is the difference between total usage and the amount captured and/or destroyed.

Note that the treatment efficiency reported in Section 7A of Form R refers to the waste stream concentrations sent to the treatment system and the corresponding effluent from the system, while the quantity reported in Section 8.6 refers to the quantity actually destroyed. If a system transfers 100% of the chemical from an air stream to a water stream without any destruction, the efficiency of the system in removing the chemical from the air stream should be reported as 100% in Section 7A; however, “zero” should be reported in Section 8.6 because the chemical has not been treated for destruction. Water releases, or subsequent waste management from control devices can be estimated from monitoring data.

In aqueous extraction processes, the EPCRA Section 313 chemical may be transferred to water. If this medium is the only one to which it is transferred, a mass balance may be the best method for estimating the quantity discharged or otherwise managed. Waste solvents are often shipped off site for disposal, combustion for energy recovery, treatment, or recycling. If

releases and/or waste management activities involve several media, wastewater monitoring data or permit requirements along with waste manifests from off-site transfers can be used to estimate the release and other waste management quantities.

COMMON ERRORS - Reporting

A common reporting error for extraction or carrier solvents is failure to account for all the chemical usage through release and/or other waste management. Typically, none of the solvent should be assumed to remain with the food product. All usage should be accounted for through air releases, amounts captured or destroyed in control devices, and amounts sent off site. The total usage is best determined from purchasing records for the solvent.

Another common reporting error is overestimation of the amount of solvent in waste sent off site. This quantity should be based on analysis of the waste. Most likely, the waste is not 100% solvent, and the total amount of waste shipped off site must be adjusted for the solvent concentration. Many facilities that receive waste solvents will provide information on the quantity of solvents present. This information is a key component of a mass balance for estimating solvent release and/or other waste management quantities.

4.2.7 Cleaning/Disinfectant Uses

Commonly Used EPCRA Section 313 Chemicals - Chlorine, chlorine dioxide, formaldehyde, nitric acid, phosphoric acid, 1,1,1-trichloroethane.

Process Description - Nitric acid and phosphoric acid in their liquid form may be used to clean process equipment in the food industry. Chlorine can also be used for cleaning purposes by reacting it with sodium hydroxide to form a sodium hypochlorite solution. Chlorine dioxide is used as a germicidal disinfectant or sanitizer. Formaldehyde is used as a sterilant to limit microbial action in beet sugar processing equipment.

Reporting Threshold - The acids and formaldehyde are otherwise used in this application (ancillary or other use) and are therefore subject to the 10,000-pound reporting threshold. Chlorine used to produce sodium hypochlorite is processed (as a reactant), and has a 25,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Nitric acid and phosphoric acid in cleaning applications are usually collected and released or otherwise waste

managed via water. If the pH is maintained above 6, the acids are considered completely neutralized, and you may report zero releases or transfers as discussed in Section 4.2.3.

Chlorine used to produce sodium hypochlorite is consumed during the reaction with sodium hydroxide. Therefore, the only quantities released or otherwise managed would normally be small fugitive air releases from such sources as leaks in valves and fittings and losses during cylinder changeovers. Chlorine release and other waste managed quantities should be estimated as discussed in Section 4.2.1.

Estimates of air releases from storage tank losses (including loading and unloading operations) should be made using methods described in *AP-42* as discussed in Section 4.2.3.

COMMON ERRORS - Reporting for Mineral Acids and Chlorine

The most common reporting error for cleaning uses of acids is overestimation of releases or other waste-management activity quantities via water. If the pH of the wastewater discharge is maintained between 6 and 9, which is required by many permits, the acid is neutralized and zero releases to water or transfers off site may be reported.

Another common error is the overestimation of discharges or transfers to water for chlorine and chlorine dioxide. (See Section 4.2.1).

Another type of reporting error in this application involves confusing cleaning chemicals with chlorine. Chemicals called "chlorine bleach" are often used for cleaning purposes. These cleaners normally contain chemicals such as sodium hypochlorite or calcium hypochlorite, and very little free chlorine (Cl_2). They are not subject to EPCRA Section 313 reporting requirements.

4.2.8 Wastewater Treatment

Commonly Used EPCRA Section 313 Chemicals - Ammonia, chlorine, hydrochloric acid (acid aerosols), sulfuric acid (acid aerosols), nitric acid, and phosphoric acid.

Process Description - Various EPCRA Section 313 chemicals are used in wastewater treatment processes at some food processing plants. Mineral acids and bases are

often added for pH control and ammonia may be added to provide a nitrogen source for biological treatment systems.

Sulfuric acid is the most frequently used acid. However, as previously discussed in Section 3.1, U.S. EPA has promulgated final rules delisting non-aerosol forms of both sulfuric and hydrochloric acid. Therefore, threshold determinations and release estimates for these chemicals now only apply to the aerosol forms. U.S. EPA considers the term aerosol to cover any airborne acid (including mists, vapors, gas, or fog) without regard to particle size. If liquid solutions of these acids are used, the mass of the acid should not be considered for threshold or release or other waste management calculations. However, if vapors or other aerosols are generated from the process, the mass of the acid aerosol that is produced must be applied toward the manufacturing threshold. If the aerosol is then processed or otherwise used, its mass should be applied to those thresholds as applicable. Releases should be reported as fugitive air releases (assuming a threshold has been met).

Example - Sulfuric Acid Aerosol

When a scrubber is used to remove sulfuric acid aerosol prior to or in a stack, the aerosol is usually converted to a non-aerosol form. The non-aerosol form of sulfuric acid is not reportable under EPCRA Section 313 because the qualifier to the sulfuric acid listing includes only the acid aerosol form. While the sulfuric acid as a discrete chemical has not actually been destroyed by the scrubber, the form of the acid reportable under EPCRA Section 313 has been destroyed. Therefore, since the sulfuric acid removed by the scrubber is converted to a non-reportable form, the quantity removed by the scrubber should be reported as having been treated for destruction. However, all the sulfuric acid aerosol that is produced, prior to or after the scrubber, counts toward the "manufacturing" threshold, and any sulfuric acid aerosol that is not removed by the scrubber and continues out of the stack must be reported as a release to air.

The principal base used is sodium hydroxide. However, U.S. EPA delisted this chemical. Therefore, it does not need to be considered for EPCRA Section 313 reporting.

Ammonia can be generated in biological treatment systems when proteins break down. Ammonia may also be added to the system as a metabolic nitrogen source for the microbes. However, as previously discussed, beginning with reporting year 1994, U.S. EPA

revised the ammonia listing as follows: “ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable salts and other sources; 10% of total aqueous ammonia is reportable under this listing).” Appendix C contains the U.S. EPA published guidance for reporting ammonia and ammonium salts.

Reporting Threshold - Acids used for pH adjustment are considered to be otherwise used as a processing aid and are subject to the 10,000-pound otherwise use threshold. In addition to the otherwise use threshold, sulfuric or hydrochloric acid aerosols that are produced are also subject to the 25,000-pound manufacturing threshold.

Ammonia is considered otherwise used (ancillary or other use) when used for wastewater treatment and is therefore subject to the 10,000-pound reporting threshold. If additional ammonia is produced in the treatment system, this quantity is considered to have been coincidentally manufactured as a byproduct. This activity also should be considered and the quantity produced should be applied to the 25,000-pound manufacturing threshold.

Estimating Release and Other Waste Management Quantities - Most of the ammonia usage is released or otherwise managed as waste via water except for small quantities of ammonia that may be released to air from storage and transfer operations before its introduction into the wastewater treatment system. Estimating quantities of ammonia that are released and otherwise waste managed is discussed in Section 4.2.2.

Estimates of air releases from storage tank losses (including loading and unloading operations) should be made using methods described in *AP-42* as discussed in Section 4.2.3. Spills of such liquids could be reported as fugitive air releases, discharges to wastewater, or off-site transfers depending upon the volatility of the chemical and the disposal of the clean up material.

COMMON ERROR - Reporting

A common error in wastewater treatment is the failure to report the ammonia that may be coincidentally manufactured as a byproduct during the treatment process. Other reportable chemicals also may be coincidentally manufactured during such treatments depending upon the chemicals present. Section 4.2.11 discusses calculations for such chemicals.

4.2.9 Fumigants

Commonly Used EPCRA Section 313 Chemicals - Bromomethane (methyl bromide), ethylene oxide, propylene oxide, bromine.

Process Description - Various EPCRA Section 313 chemicals are used as fumigants, either alone or in a mixture with carrier gases, during certain types of food processing operations. For example, ethylene oxide can be used as a bacteriocide during processing of spices. Bromomethane (methyl bromide) can be used as an insecticide in grain storage facilities. In such applications, these chemicals are handled and used as gases. The fumigant is usually released to air when fumigation is complete. If the process is conducted in a pressurized container, the fumigant may be vented to a treatment device such as a scrubber.

Reporting Threshold - Fumigants are considered otherwise used (as ancillary use) and are therefore subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - If no control devices exist, you should assume the total quantity of these volatile chemicals is released to air. The air releases should be partitioned between fugitive air releases from leaks in valves and fittings and losses during cylinder changeovers, and point source air releases from fumigation operations when the building air is routed through a control device. A mass balance is the best approach for estimating releases or other waste management quantities, with an assumption of minor fugitive air releases. The point source air release total must be adjusted based on the destruction and removal efficiencies of the control devices, with the amount captured and

separated to another medium reported as a discharge to water or a transfer to an off-site facility as appropriate.

COMMON ERROR - Reporting

The threshold determination should be based upon the quantity of the EPCRA Section 313 chemical, not the carrier gas. The EPCRA Section 313 chemical may sometimes represent only a small percent of the total gas volume.

4.2.10 Pesticides/Herbicides

Commonly Used EPCRA Section 313 Chemicals - Bromine, napthalene, and various listed pesticides and herbicides (e.g., aldrin, captan, 2,4-D, hydrazine, lindane, maneb, parathion, zineb, atrazine, malathion, diazinon).

Process Description - Pesticides and herbicides may be handled as solids or as solids mixed with a liquid to form a sprayable solution. They are typically sprayed mechanically over the area being treated. Agricultural activities are normally not subject to EPCRA Section 313 reporting because they do not fall within the appropriate SIC Codes. However, some food processing facilities have multiple establishments with different SIC Codes (including agricultural activities where pesticides may be used). For example, a food processing establishment in a facility may process crops grown at the facility in a separate establishment. If the total value of the products at establishments in SIC Codes covered under EPCRA Section 313 exceeds 50% of the value of the entire facility's products or services, or if any single covered establishment produces or ships products whose value exceeds those of any other establishment within the facility, the entire facility is subject to EPCRA Section 313 reporting. Such a multi-establishment facility must report releases and/or other waste management activities for all listed chemicals, even from establishments that are not in covered SIC Codes (see Section 2.2 for further discussion).

In other words, some food processing facilities may be required to report for pesticides and herbicides because of the use of these chemicals in related agricultural activities at

the same site. For example, an establishment that processes sugarcane grown at a farm at the same facility may have to submit an EPCRA Section 313 report for 2,4-D.

Reporting Threshold - Pesticides and herbicides are otherwise used (ancillary or other use), and are therefore subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Pesticides and herbicides sprayed onto the area being treated should be considered released on site to land. Minor amounts of these chemicals could be released to air and/or water from aerial spraying.

COMMON ERRORS - Reporting

The most common reporting error in use of pesticides and herbicides is failure to submit a Form R or Form A for these chemicals because they are used only for agricultural purposes at a covered facility. As explained above, a Form R or Form A may be required depending on the primary SIC Code of a multi-establishment facility.

The threshold determination for pesticides and herbicides should be based upon the quantity of the EPCRA Section 313 chemical used, not the entire quantity of the pesticide formulation. Such formulations often contain other chemicals that are not reportable, and the EPCRA Section 313 chemical may represent only a small percent of the total quantity of material used.

Some facilities also may fail to report any release or other waste management activity of these chemicals because they are broken down by soil microorganisms, and do not accumulate in the soil from normal agricultural use. The total amount of the EPCRA Section 313 chemicals used should be reported without consideration of its disposition after it is applied to the soil.

4.2.11 Byproducts or Impurities

Commonly Produced EPCRA Section 313 Chemicals - Ammonia, chloroform, methanol, hydrogen fluoride, sulfuric acid (acid aerosol), hydrochloric acid (acid aerosol), formaldehyde, metal compounds, nitrate compounds.

Process Description - Various EPCRA Section 313 chemicals may be coincidentally manufactured as byproducts at food processing plants during processing

operations, waste treatment and combustion processes. For example, ammonia can be produced through breakdown of proteins in a wastewater treatment system. Chloroform can be produced in a water treatment system employing chlorine, and sulfuric acid can be produced when coal is used as a fuel for combustion. Effective January 1, 1998 (for the Form R reports due July 1, 1999), U.S. EPA issued a revised interpretation of "otherwise used" to include treatment, by a covered facility, of wastes received from off site for destruction, disposal, and/or stabilization. The amount of an EPCRA Section 313 chemical received from off site for waste management must be included in the "otherwise used" threshold determination. Similarly, if the treatment of a waste received from off site creates an EPCRA Section 313 chemical, even if the original waste did not contain an EPCRA Section 313 chemical, the created amount must be included in the "otherwise used" threshold determination.

Reporting Threshold - Chemicals produced under these circumstances are normally considered manufactured as byproducts and are subject to the 25,000-pound reporting threshold (note that the *de minimis* exemption does not apply to coincidentally manufactured byproducts). Occasionally, the produced chemical may be subsequently otherwise used (e.g., ammonium sulfate generates an aqueous solution of ammonia, the ammonia is then otherwise used for water treatment). In these cases, this quantity is also subject to the otherwise use threshold of 10,000 pounds. For the situation where a waste is received from off site for destruction, disposal, and/or stabilization, the amount of EPCRA Section 313 chemical in the waste, or the amount of EPCRA Section 313 chemical created in the treatment of the waste, must be included in the "otherwise used" threshold determination. If the 10,000-pound threshold is reached for the facility, all releases and other waste management activities for the chemical must be reported.

Example - Treatment of Wastes from Off-Site

A covered facility receives a waste containing 12,000 pounds of Chemical A, an EPCRA Section 313 chemical, from off site. The facility treats the waste, destroying Chemical A and in the treatment process manufactures 10,500 pounds of Chemical B, another EPCRA Section 313 chemical. Chemical B is disposed on site.

Since the waste was received from off site for the purpose of waste management, the amount of Chemical A must be included in the "otherwise used" threshold determination for Chemical A. The "otherwise use" threshold is 10,000 pounds and since the amount of Chemical A exceeds this threshold, all releases and other waste management activities for Chemical A must be reported.

Chemical B was "manufactured" in the treatment of a waste received from off site. However, the facility disposed of Chemical B on site and waste received from off site for treatment for destruction, disposal, or stabilization is considered to be "otherwise used" and the amount of Chemical B must be considered in the "otherwise used" threshold determination. Thus, the reporting threshold for Chemical B has also been exceeded and all releases and other waste management activities for Chemical B must be reported.

Estimating Release and Other Waste Management Quantities - The release or other waste management of a coincidentally manufactured chemical depends upon the physical state of the chemical and the process in which it is produced. The most likely receiving medium for chemicals coincidentally manufactured during food processing is water. The specific amounts released or otherwise managed as waste are often best estimated using monitoring data for the waste stream. Ammonia presents a special case because *anhydrous* ammonia (including ammonia generated from water dissociable ammonium salts) and nitrate compounds (water dissociable, reportable when in solution) are EPCRA Section 313 chemicals/compounds. Refer to Appendix C, *Guidance for Reporting Aqueous Ammonia*, for details describing threshold and release estimates for these chemicals.

In addition, many food processing facilities use coal and/or fuel oil in boilers or furnaces for process operations. The combustion of these fuels results in the coincidental manufacture of several EPCRA Section 313 chemicals and chemical compounds including: metal compounds, formaldehyde, hydrogen fluoride, and aerosol forms of sulfuric acid and hydrochloric acid. If any of these chemicals are manufactured, processed, or otherwise used in other activities, these fuel-combustion-generated quantities should be included in threshold determinations and release and other waste management estimates. U.S. EPA's *Guidance for Electricity Generating Facilities* describes estimation techniques for combustion processes in detail.

COMMON ERROR - Reporting

The most common reporting error is failure to take the manufacture of these chemicals into consideration when performing threshold determinations or release and other waste management estimates. If the only source of the chemical at a facility is through coincidental manufacture, it is likely that the 25,000-pound manufacturing threshold may not be exceeded. On the other hand, if the chemical is already reportable at your facility for other reasons, the release and other waste management amounts from its formation must be reported (again, note that the *de minimis* exemption does not apply to coincidentally manufactured byproducts).

4.2.12 Can Making/Coating

Commonly Used EPCRA Section 313 Chemicals - Metal can components such as manganese, nickel, and chromium; various listed ink and coating solvents (e.g., n-butyl alcohol, glycol ethers, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), toluene, 1,1,1-trichloroethane, xylene); and various listed metal compounds used as pigments (e.g., copper compounds, barium compounds, chromium compounds, zinc compounds, lead compounds).

Process Description - Some food processing plants fabricate cans using various stamping and coating operations. Strip metal is formed into can bodies and lids using stamping machines. Reportable chemicals may also be used during the fabrication of cans in welding, cementing, or soldering processes.

The largest reportable use of EPCRA Section 313 chemicals in can making is typically that of solvents and pigments in inks and coatings. Coatings may be applied to both the interior and exterior of the can, generally using roll coating, printing, or spraying processes. In larger operations, the coatings may be formulated on site. Various solvents may be used in printing and coating uses, both as pigment carriers and to clean up equipment and spills.

Reporting Threshold - EPCRA Section 313 chemicals in strip metals, solders, and welding rods are processed and are subject to the 25,000-pound reporting threshold. It is important that the *de minimis* and article exemptions be considered for the strip metal. In general, can making cannot be exempted from threshold determination under the article exemption. To decide if the exemption applies, careful consideration must be given to whether the shape of the metal is changed and whether releases and other waste managed quantities of the listed chemical exceed 0.5 pounds in a reporting year as a result of operations such as welding. The article exemption is explained more fully in *EPCRA Section 313 Release Reporting Guidance for Metal Fabrication and Electroplating (1998).*

Listed chemicals in ink and coating pigments that are intended to remain with the product are processed and are subject to the 25,000-pound reporting threshold. Formulation of the inks or coatings for use on site also constitutes processing of the solvents (as a formulation component).

Solvents used in inks and coatings that are intended to serve as carriers and evaporate during the process are not intended to remain with the product. Therefore, they are considered to be otherwise used (as a chemical processing aid). Solvents used for equipment cleanup are also considered otherwise used (ancillary use) and are subject to the 10,000-pound reporting threshold.

Estimating Release and Other Waste Management Quantities - Releases or other waste managed quantities from strip metal stamping operations are typically minor. Scrap from the process is usually shipped off site for metal recycling but could be sent for direct reuse, which is not reportable. Releases from large soldering or welding operations should be considered, but are typically small because they are often subject to air permitting requirements. Releases to air in such instances may therefore best be determined by the permit conditions or monitoring of the process. *EPCRA Section 313 Release Reporting Guidance for Metal Fabrication and Electroplating (1998)* also contains information on estimating releases and other waste managed quantities from these types of operations.

Most ink and coating solvents are volatile chemicals and it can be assumed the entire quantity used will evaporate during handling, blending, or drying of the ink or coating. The quantity released as a fugitive air emission is therefore equal to total solvent usage for these purposes minus any amount captured by control devices such as carbon absorbers or thermal oxidizers (e.g., incinerators). The air release from an air pollution control device (APCD) is considered a point source release. If the APCD simply transfers the EPCRA Section 313 chemical from the air stream to another medium, the quantity released or otherwise managed should be partitioned as appropriate.

If destructive controls are used (e.g., thermal oxidizers), you should estimate the amount of solvent destroyed using engineering assumptions based on the solvent quantity entering the control device and its destruction efficiency. If nondestructive controls are used (e.g., absorbers), the amount of the captured solvent in wastes sent off site for recycling, treatment, or disposal can be estimated through analysis of these wastes. Note that the treatment efficiency reported in Section 7A of Form R refers to the waste stream sent to the treatment system and the corresponding effluent from the system, while the quantity reported in Section 8.6 refers to the quantity actually destroyed. If a system transfers 100% of the chemical from an air stream to a water stream without any destruction, the efficiency of the system in removing the chemical from the air stream should be reported as 100% in Section 7A; however, “zero” should be reported in Section 8.6 because the chemical has not been treated for destruction. Water releases, or subsequent waste management from control devices can be estimated from monitoring data. Air releases are the difference between total usage and the amount captured in this manner.

The wastes shipped off site may also contain pigments. The quantity of the EPCRA Section 313 chemicals involved can be determined through analysis of the wastes or knowledge of the coating operation transfer efficiency. The total quantity of EPCRA Section 313 coating pigment used multiplied by the factor (1 - transfer efficiency) will yield the total quantity of chemical released or subsequently waste managed. Engineering assumptions can then be used to determine the media of these releases or waste management activities.

A portion of the solvents used to clean ink rollers or spills also will evaporate and should be reported as a fugitive air release (unless captured and sent through an air pollution control device, in which case a stack/point source release will result). The remaining portion is typically collected, placed in drums, and shipped off site for disposal, treatment, or reuse. The quantity of the EPCRA Section 313 chemicals can be determined through analysis of these wastes. The amount of cleanup solvent released to air can be estimated by mass balance, based on that total solvent used minus the waste solvent from this application sent for recycle or disposal.

Additional information on estimating release and/or other waste management quantities for printing and coating solvents can be found in the U.S. EPA publications, *EPCRA Section 313 Release Reporting Guidance for Printing Operations (1998)* and *EPCRA Section 313 Release Reporting Guidance for Roller, Knife, and Gravure Coating Operations (1998)*.

COMMON ERRORS - Reporting

One possible error in can making/coating operations is failure to report the metal content of the cans under the assumption that the metal is always subject to the article exemption. As previously stated, this consideration should be made on a case-by-case basis.

A common reporting error for solvents used in ink and coating applications is failure to account for all solvent usage through some release or other waste management activity. Typically, none of the solvent remains with the printed or coated product. All usage should be accounted for through air releases, amounts captured or destroyed in control devices, releases to water, waste amounts managed on site, and amounts sent off site. Total usage is best determined from purchasing records for the coating or ink and the percentage of the solvent in these materials (as reported in the MSDS).

Overestimation of the amount of solvent in waste sent off site also can occur. This quantity should be based on analysis of the waste. Most likely, the waste is not 100% solvent, and the total amount of waste shipped off site must be adjusted for the solvent concentration. Many facilities that receive waste solvents will provide information on the concentrations of chemicals present in the waste sent to them. This information is a key component if a mass balance is used for estimating the quantity of solvent released and otherwise waste managed.

Another potential error in this category is incorrectly classifying the chemical activity of the coating pigments. While solvents are typically intended to serve as carriers and do not remain with the product (meaning they are otherwise used); metals and other chemicals in pigments are often part of the formulation that intentionally stays with the product. These chemicals are processed and are subject to the higher 25,000-pound-per-year reporting threshold.

A final reporting error in these applications is incorrectly submitting a Form R or Form A for isopropyl alcohol, which is often used as an ink solvent. A Form R or Form A is only required for isopropyl alcohol if the facility manufactures the chemical on site using the strong acid process. Use of isopropyl alcohol as an ink or coating solvent is therefore not subject to EPCRA Section 313 reporting.

Appendix A

TRI GUIDANCE RESOURCES

Appendix A

TRI GUIDANCE RESOURCES

A.1 EPCRA Section 313 RELATED REFERENCES

40 CFR 372, Toxic Chemical Release Reporting; Community Right-to-Know; Final Rule
See 53 FR 4500, February 16, 1988.

Toxic Chemical Release Inventory Reporting Forms and Instructions for the Current Reporting Year
U.S. EPA publishes this document each year to provide current guidance for preparing the Form R and Form A reports. This document contains the most up-to-date list of chemicals for which reports are required. It includes a blank Form R and Form A and provides step-by-step instructions for completing each report. It also has a list of U.S. EPA regional and state contacts for EPCRA Section 313 reporting. The current version of this document should always be consulted in preparing the EPCRA Section 313 report.

Common Synonyms for Chemicals Listed Under EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act (EPA 745-R-95-008)
This glossary contains chemical names and their synonyms for substances covered by the reporting requirements of EPCRA Section 313. The glossary was developed to aid in determining whether a facility manufactures, processes, or uses a chemical subject to EPCRA Section 313 reporting.

Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act (as amended) (EPA 740-R-95-001)
List of chemicals covered by EPCRA Sections 302 and 313, CERCLA Hazardous Substances, and CAA 112(r). The list contains the chemical name, CAS Registry Number, and reporting requirement(s) to which the chemical is subject.

The Emergency Planning and Community Right-to-Know Act: EPCRA Section 313 Release Reporting Requirements, August, 1995 (EPA 745/K-95-052)
This brochure alerts businesses to their reporting obligations under EPCRA Section 313 and assists in determining whether their facility is required to report. The brochure contains U.S. EPA Regional contacts, the list of EPCRA Section 313 toxic chemicals and a description of the Standard Industrial Classification (SIC) codes subject to EPCRA Section 313.

EPCRA Section 313 Questions and Answers: Revised 1997 Version, November 1997 (EPA 745-B-97-008)

Executive Order 12856 - Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements: Questions and Answers (EPA 745-R-95-011)
This document assists federal facilities in complying with Executive Order 12856. This information has been compiled by U.S. EPA from questions received from federal facilities. This

document is intended for the exclusive use of federal facilities in complying with Sections 302, 303, 304, 311, 312, and 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and the Pollution Prevention Act of 1990, as directed by the Executive Order.

Supplier Notification Requirements (EPA 560/4-91-006)
This pamphlet assists chemical suppliers who may be subject to the supplier notification requirements under EPCRA Section 313. The pamphlet explains the supplier notification requirements, gives examples of situations which require notification, describes the trade secret provision, and contains a sample notification.

1994 and 1995 Toxic Release Inventory Data Quality Report (EPA 745-R-98-002)
The U.S. EPA conducted TRI data quality site surveys for the reporting years 1987, 1988, 1994, and 1995. The goals of these surveys were to identify areas in the TRI data collection process that could be improved, to provide a quantitative assessment of the accuracy of the data collected, and to disseminate further guidance on the completion of the TRI forms. This document summarizes the findings of these surveys. U.S. EPA is in the process of conducting another survey for reporting year 1996 and may conduct additional surveys in the future.

Toxics Release Inventory Public Data Release
Each year, U.S. EPA releases this publication which summarizes TRI data submitted for the most recent reporting year: where, how much, and which types of chemicals are being released into the environment. It provides comparisons to TRI submissions for earlier years. Extensive tables itemize releases and transfers by media, chemicals, location, and industry. Similar reports for each prior year are available for sale from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20420-9325 (202-512-1800).

Toxics Release Inventory Public Data Release State Fact Sheets
Each year, U.S. EPA releases the fact sheets in this document that summarize the basic TRI data for each state. This document is designed as a companion volume to EPA's Toxic Release Inventory Public Data Release, a more detailed examination of TRI data for the current and previous years.

Trade Secrets Rule and Form
See 53 FR 28772, July 29, 1988. This rule implements the trade secrets provision of the EPCRA (Section 322) and includes a copy of the trade secret substantiation form.

A.2 INFORMATION SOURCES

Most of the materials included as reference in this manual are available from the following sources:

National Center for Environmental Publications and Information (NCEPI)
P.O. Box 42419
Cincinnati, OH 45242-2419
(800) 490-9198
Fax: (513) 489-8695
Internet: *http://www.epa.gov/ncepihom/indxe.html*

Emergency Planning and Community Right-to-Know (EPCRA) Information Hotline
U.S. Environmental Protection Agency
(800) 424-9346 or (703) 412-9810 (for the Washington, D.C. metropolitan area)
TDD: (800) 553-7672

Internet Sites

- WATER8/CHEMDAT8: *http://www.epa.gov/ttn/chief/software.html#water8*
  WATER8 is an analytical model for estimating compound-specific air emissions from wastewtaer collection and treatment systems. CHEMDAT8 is a Lotus 1-2-3 spreadsheet for estimating VOC emissions from TSDF processes.

- Clearinghouse for Inventories and Emission Factors (CHIEF):
  http://www.epa.gov/ttn/chief/
  This site provides access to the latest information and tools for estimating emissions of air pollutants and performing emission inventories.

- Code of Federal Regulations, 40 CFR: *http://www.epa.gov/epacfr40*
  This site was created by U.S. EPA to expand access to Title 40 - Environmental Protections of the Code of Federal Regulations.

- Compilation of Air Pollutant Emission Factors (AP-42):
  http://www.epa.gov/ttn/chief/ap42etc.html
  This site provides access to files containing guidance for estimating emissions from specific sources and emission factors.

- Federal Register Notice: *http://www.epa.gov/EPA-TRI*
  This site provides access to all Federal Register notices related to the TRI program from 1994 to current.

- Material Safety Data Sheets (MSDSs): *http://msds.pdc.cornell.edu/issearch/msdssrch.htm*
  A key word searchable database of 325,000 MSDSs.

- TANKS: *http://www.epa.gov/ttn/chief/tanks.html*
  This site contains information on TANKS, a DOS-based computer software program that computes estimates of VOC emissions from fixed and floating-roof storage tanks.

- TRI homepage: *http://www.epa.gov/opptintr/tri*
  This site contains information on the Toxic Release Inventory and provides links to a variety of data and documents related to the TRI program.

- TOXNET: *http://tamas.nlm.nih.gov/~boyda/htdocs/TOXNET/factsheets/toxnet.html*
  TOXNET is a computerized system of files oriented to toxicology and related areas, maintained by the National Library of Medicine.

National Technical Information Service (NTIS)
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Call: (800) 553-6847; (703) 487-4650
Fax: (703) 321-8547
Publication Number PB97-502-587
E-mail: *info@ntis.fedworld.gov*

RTK-Net is an online network concerned with environmental issues, in particular, matters arising from the passage of the right-to-know provisions embodied in the EPCRA legislation. RTK-net was established by two non-profit organizations (Unison Institute and OMB Watch) to provide access to TRI, link TRI with other environmental data, and exchange information among public interest groups. RTK-Net is a full-service center providing free dial in access privileges to government and industry, as well as more complete database services, training and technical support, e-mail, and electronic conferences pertaining to issues such as health, activism, and environmental justice. For more information contact RTK-Net, 1742 Connecticut Ave., NW, Washington, DC 20009-1146 or phone 202-797-7200. You can register on-line by modem at 202-234-8570, parameters 8,n,1, and log in as "public".

Toxics Release Inventory - CD-ROM
The CD-ROM contains the complete Toxic Release Inventory since 1987, as well as Chemical Factsheets containing health and environmental effects information for TRI chemicals. User-friendly software provides the capability to search data by facility, location, chemical, SIC code, and many other access points. Other features allow flexibility in printing standard and custom reports, data downloading, and calculating releases for search sets (for example, calculate average air releases for all pulp and paper manufacturers). To order call or write:

U.S. Government Printing Office (GPO)
Superintendent of Documents
P.O. Box 371964
Pittsburgh, PA 15250-7954
Call: (202) 512-1800
Fax: (202) 512-2250
Stock Number: 055-000-0582-6

Toxic Release Inventory - On-Line Database

A computerized on-line database of the toxic release inventory data is available through the National Library of Medicine's (NLM) TOXNET on-line system 24 hours a day. Other NLM files on TOXNET can provide supporting information in such areas as health hazards and emergency handling of toxic chemicals. Information on accessing the TOXNET system is available from: TRI Representative, Specialized Information Services, National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20894, (301) 496-6531, average cost of $18.00 per hour.

A.3 INDUSTRY-SPECIFIC TECHNICAL GUIDANCE DOCUMENTS

In 1988 and 1990, U.S. EPA developed a group of individual guidance documents for industries or activities in industries who primarily manufacture, process, or otherwise use EPCRA Section 313 chemicals. See list of industries/activities below. U.S. EPA is currently revising some of these documents and preparing additional documents. The newer versions will be available beginning in the Fall of 1998.

Guidance for Chemical Distribution Facilities (Version 1.0), October 7, 1997

Guidance for Coal Mining Facilities (Version 1.0), September 26, 1997

Guidance for Electricity Generating Facilities (Version 1.0), September 15, 1997

Guidance for Metal Mining Facilities (Version 1.0), October 6, 1997

Guidance for Petroleum Bulk Storage Facilities (Version 1.0), September 15, 1997

Guidance for RCRA Subtitle C TSD Facilities and Solvent Recovery Facilities (Version 1.0) October 6, 1997

Electrodeposition of Organic Coatings

Electroplating Operations

Estimating Releases and Waste Treatment Efficiencies

Formulation of Aqueous Solutions

Incidential Manufacture/By-products

Leather Tanning and Finishing Processes

Metal Fabrication Industry

Monofilament Fiber Manufacture

Paper and Paperboard Production

Presswood & Laminated Wood Products Manufacturing

Printing Operations

Roller, Knife, and Gravure Coating Operations

Rubber Production and Compounding

Semiconductor Manufacture

Smelting Operations

Spray Application of Organic Coatings

Textile Dyeing

Welding Operations

Wood Preserving

U.S. EPA, Office of Compliance, published a series of documents in 1995 called Sector Notebooks. These documents provide information of general interest regarding environmental issues associated with specific industrial sectors. The Document Control Numbers (DCN) range from EPA/310-R-95-001 through EPA/310-R-95-018.

A.4 CHEMICAL-SPECIFIC GUIDANCE DOCUMENTS

U.S. EPA has also developed a group of guidance documents specific to individual chemicals and chemical categories. These are presented below.

Emergency Planning and Community Right-to-Know EPCRA Section 313: Guidance for Reporting Aqueous Ammonia, July 1995 (EPA 745-R-95-012)

Emergency Planning and Community Right-to-Know EPCRA Section 313: List of Toxic Chemicals within the Chlorophenols Category, November 1995 (EPA 745-B-95-004)

Estimating Releases for Mineral Acid Discharges Using pH Measurements, U.S. Environmental Protection Agency, June 1991.

Guidance for Reporting Sulfuric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size), November 1997 (EPA-745-R-97-007)

Toxic Release Inventory List of Toxic Chemicals within the Glycol Ethers Category and Guidance for Reporting, May 1995 (EPA 745-R-95-006)

Toxic Release Inventory List of Toxic Chemicals within the Nicotine and Salts Category and Guidance for Reporting, February 1995 (EPA 745-R-95-004)

Toxic Release Inventory List of Toxic Chemicals within the Polychlorinated Alkanes Category and Guidance for Reporting, February 1995 (EPA 745-R-95-001)

Toxic Release Inventory List of Toxic of Chemicals within the Polycyclic Aromatic Compounds Category, February 1995 (EPA 745-R-95-003)

Toxic Release Inventory List of Toxic Chemicals within the Strychnine and Salts Category and Guidance for Reporting, February 1995 (EPA 745-R-95-005)

Toxic Release Inventory List of Toxic of Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting, May, 1996 (EPA 745-R-96-004)

Toxics Release Inventory - List of Toxic Chemicals Within Ethylenebisdithiocarbamic Acid Category, November 1994, EPA 745-B-94-003.

Toxics Release Inventory - Copper Phthalocyanine Compounds Excluded for the Reporting Requirements Under the Copper Compounds Category on the EPCRA Section 313 List, April 1995, EPA 745-R-95-007.

Toxics Release Inventory - List of Toxic Chemicals Within Warfarin Category, November 1994, EPA 745-B-94-004.

A.5 OTHER USEFUL REFERENCES

Burgess, W.A. Recognition of Health Hazards in Industry. Harvard School of Public Health. Boston, Massachusetts, John-Wiley & Sons.

CRC Handbook of Chemistry and Physics. Latest Edition, Robert C. Weast, Editor, CRC Press, Inc., Florida.

Locating and Estimating Air Emissions from Various Sources. Available from: National Technical Information Services (NTIS), (703) 487-4650.

The Merck Index. Latest Edition, Merck & Co., Inc., New Jersey.

Perry, R.H. and C.H. Chilton, Chemical Engineer's Handbook. Latest Edition, McGraw-Hill Book Company, New York.

Sax, N.I. and R.J. Lewis, Sr., Hawley's Condensed Chemical Dictionary. Latest Edition, Van Nostrand Reinhold Company, New York.

Appendix B

BASIC CALCULATION TECHNIQUES

Appendix B

BASIC CALCULATION TECHNIQUES

This section will provide the basic techniques needed to use specific types of data or engineering calculations. Examples are provided for:

(1) Stack monitoring data;

(2) Industrial hygiene data;

(3) Raoult's Law;

(4) Air emission factors;

(5) RCRA hazardous waste analysis data;

(6) NPDES monitoring data.

(1) Stack Monitoring Data

The following is an example of a release calculation using monitoring data.

Example: Stack monitoring data are available for a paint booth. The measured average concentration of toluene is 0.1 ppmv (dry gas basis). The moisture content in the stack is typically 10%, and stack conditions are maintained at 80°C and atmospheric pressure. The stack gas velocity is 8 m/s. The diameter of the stack is 0.3 m. Calculate the point air release of toluene.

Step 1. Calculate volumetric flow of stack gas stream.

Volumetric flow = (gas velocity) [(π) (internal stack diameter)^2/4)]

Volumetric flow = (8 m/s) [(π)(0.3 m)^2/4] = 0.57 m^3/s

Step 2. Correct for moisture content in stack gas stream.

Stack exhausts may contain large amounts of water vapor. The concentration of the chemical in the exhaust is often presented on a dry basis. For an accurate release rate, correct the vent gas flow rate for the moisture content by multiplying by the term (1—fraction water vapor). The dry gas rate can then by multiplied by the chemical concentration.

(Note: If the toluene concentration is on a wet gas basis, no correction is necessary for moisture content.)

Dry volumetric flow = (Volumetric flow) (1-fraction water vapor)

Dry volumetric flow = ($0.57 m^3/s$) (1-0.10) = 0.51 m^3/s

Step 3. Convert ppmv to mg/m^3.

- ppmv is defined as one part of a chemical in 10^6 parts of gas ($m^3/10^6 m^3$).
- Use the molar volume of a gas, corrected for stack temperature and pressure conditions, calculated by the ideal gas law (PV = nRT). Note that the molar volume of an ideal gas at 0°C and 760 mmHg is 22.4L/mole.
- Molecular weight of toluene (MW) = 92.14 g/mole.
- R = the Ideal Gas Constant (0.082057 L - atm per mole-Kelvin)

To calculate the molar volume of stack gas, use the ideal gas equation.

$$\text{Molar volume} = \frac{V}{n} = \frac{RT}{P}$$

For the example, the stack conditions are 80°C (353 K) and atmospheric pressure (1 atm).

$$\text{Molar volume} = \left(0.082057 \ \frac{L-atm}{mole-K}\right) (353K)/(1atm)$$

= 29.0 L/mole

The conversion of ppmv to mg/m^3 can now be calculated.

$$\left(\frac{mg}{m^3}\right) = (\text{concentration of chemical, ppmv})\left(\frac{1}{\text{molar volume of gas}}\right)(MW)$$

Using the example, the concentration of toluene is calculated as follows:

$$\left(\frac{0.1\ m^3}{10^6\ m^3}\right)\left(\frac{mole}{29.0\ L}\right)\left(\frac{92.14\ g}{mole}\right)\left(\frac{L}{10^{-3}\ m^3}\right)\left(\frac{1{,}000\ mg}{1\ g}\right) = 0.3\ mg/m^3$$

Step 4. Calculate air releases.

Air releases are calculated as follows:

Air Release=(volumetric flow, m^3/s)(concentration, mg/m^3)(operating time, s/yr)

The paint booth is used 8 hours per day, 5 days per week, 52 weeks per year.

$$\text{Operating time} = \left(8\frac{hours}{day}\right)\left(5\frac{days}{week}\right)\left(52\frac{weeks}{year}\right) = 2{,}080\ hr/yr$$

$$\text{Air Release} = (0.51\ m^3/s)(0.3\ mg/m^3)\left(\frac{3{,}600\ s}{hr}\right)\left(\frac{2{,}080\ hr}{yr}\right)\left(\frac{lb}{454\ g}\right)\left(\frac{g}{1{,}000\ mg}\right)$$

$$= \underline{2.5\ lb/yr\ of\ toluene}$$

It is important to note that this calculation assumes the measured emissions are representative of actual emissions at all times; however, this is not always the case. Ideally, a continuous emissions monitor provides the most representative data.

Also note that monitoring and stack data may have units which are different than those used in the example. Modify conversion factors and constants to reflect your data when calculating air releases.

(2) Industrial Hygiene Data

The following is an example of a release calculation using industrial hygiene data.

Example: Occupational industrial hygiene data shows that workers are exposed to an average of 0.1 ppmv benzene (wet gas basis). The density of benzene vapor is 0.2 lb/ft^3. The ventilation system exhausts 20,000 acfm of room air at 70°F. The plant operates 24 hours per day, 330 days per year.

The benzene concentration is on a wet gas basis, therefore a moisture correction of the ventilation flow rate is not necessary. The industrial hygiene data is collected at the same ambient conditions as the ventilation system, therefore no adjustment for temperature or

pressure needs to be performed. A conservative estimation of benzene fugitive releases could be calculated as follows:

Air Release	=	(ventilation flow rate, ft^3/min)(operating time, min/yr)(concentration of chemical, ppmv)(vapor density of chemical, lb/ft^3)

Benzene releases per year would be calculated as follows:

$$\left(\frac{20{,}000\ ft^3}{minute}\right)\left(\frac{60\ minutes}{hour}\right)\left(\frac{24\ hr}{day}\right)\left(\frac{330\ days}{year}\right)\left(\frac{0.1\ ft^3\ benzene}{10^6\ ft^3\ air}\right)\left(\frac{0.2\ lb}{ft^3}\right)$$

$$= \underline{190\ lb/yr\ of\ benzene}$$

(3) Raoult's Law

The following is an example of a release calculation using Raoult's Law. Raoult's Law states that the partial pressure of a compound in the vapor phase over a solution may be estimated by multiplying its mole fraction in the liquid solution by the vapor pressure of the pure chemical.

$$P_A = X_{A,L}P^o = X_{A,G}P_T$$

where:

P°	=	Vapor pressure of pure liquid chemical A;
$X_{A,L}$	=	Mole fraction of chemical A in solution;
$X_{A,G}$	=	Mole fraction of chemical A in the gas phase;
P_A	=	Partial pressure of chemical A in the gas phase; and
P_T	=	Total pressure.

Example: A wash tank holds a solution containing 10% by weight of o-xylene (A) and 90% by weight of toluene (B). The tank is vented to the atmosphere; the process vent flow rate is estimated as 100 acfm (2.83m^3/min) based on a minimum fresh air ventilation rate. The molecular weight of o-xylene is 106.17 g/mole and toluene is 92.14 g/mole. The vapor pressure of o-xylene is 10 mmHg (0.19 psia). The total pressure of the system is 14.7 psia (atmospheric conditions). The process tank is in service 250 days/yr. Calculate the air release of o-xylene.

Step 1: Calculate the mole fraction of o-xylene in the liquid solution.

$$X_{A,L} = \frac{\frac{\text{wt fraction A}}{MW_A}}{\frac{\text{wt fraction A}}{MW_A} + \frac{\text{wt fraction B}}{MW_B}}$$

Where:

$X_{A,L}$	=	Mole fraction of chemical A in liquid solution;
MW	=	Molecular weight of chemical, g/g-mole; and
wt fraction	=	Weight fraction of chemical in material.

$$X_{A,L} = \frac{\left[\frac{0.1}{106.17}\right]}{\left[\frac{0.1}{106.17} + \frac{0.9}{92.14}\right]}$$

$$X_{A,L} = 0.09$$

Step 2: Calculate the mole fraction of o-xylene in the gas phase.

$$X_{A,G} = \frac{X_{A,L}P^{\circ}}{P_T}$$

where:

$X_{A,G}$	=	Mole fraction of chemical A in gas phase;
$X_{A,L}$	=	Mole fraction of chemical A in liquid solution;
P°	=	Vapor pressure of pure liquid chemical, A, psia; and
P_T	=	Total pressure of system, psia.

$$X_{A,G} = [0.09]\left[\frac{0.19 \text{ psia}}{14.7 \text{ psia}}\right] = 0.001$$

Step 3: Calculate releases using Raoult's Law.

$$\text{Emissions} = (X_{A,G})(\text{AFR})(t)(MW_A)\left(\frac{1}{MV}\right)$$

where:

Emissions	=	Air release of pollutant A, g-A/yr;
$X_{A,G}$	=	Mole fraction of chemical A in gas phase;
ATRS	=	Air flow rate of room, m^3/min;
t	=	Operating time of wash tank, min/yr;
MW	=	Molecular weight of chemical, g/g-mole; and
MV	=	Gas molar volume (22.4L/mole at standard temperature and pressure).

If conditions vary from standard temperature and pressure the gas molar volume can be calculated using the ideal gas law and tank conditions as presented in Example 1.

The emissions of o-xylene are calculated as shown below.

$$\text{Emissions} = (0.001)\left(\frac{2.83\ m^3}{\text{min}}\right)\left(\frac{250\ \text{day}}{\text{yr}}\right)\left(\frac{24\ \text{hr}}{\text{day}}\right)\left(\frac{60\ \text{min}}{\text{hr}}\right)\left(\frac{\text{mole}}{22.4\text{L}}\right)\left(\frac{106.17\text{g}}{\text{mole}}\right)\left(\frac{\text{L}}{10^{-3}m^3}\right)$$

$$\text{Emissions} = \left(4.8 \times 10^6\ \text{g/yr}\right)\left(\frac{\text{lb}}{454\ \text{g}}\right) = \underline{10{,}570\ \text{lb/yr of o-xylene}}$$

Air releases for toluene can be calculated in a similar manner.

(4) <u>Air Emission Factor</u>

The following is an example of a release calculation using air emission factors.

Example: An industrial boiler uses 300 gallons per hour of No. 2 fuel oil. The boiler operates 2,000 hours per year. Calculate emissions of formaldehyde using the AP-42 emission factors.

$$AE = (EF)(AU)$$

where:

AE = Annual emissions of pollutant, lb/yr
EF = Emission factor of pollutant, lb/10^3 gallon of fuel. EF for formaldehyde for an industrial boiler burning No. 2 fuel oil is 0.035 to 0.061 lb/10^3 gallons.
AU = Quantity of fuel used, gal/yr.

Using an emission factor of 0.061 pounds of formaldehyde per gallon of fuel, the air releases are calculated as follows:

$$AE = \left(\frac{0.061\ lb}{10^3\ gallons}\right)\left(\frac{300\ gallon}{hr}\right)\left(\frac{2{,}000\ hr}{yr}\right) = \underline{36.6\ lb/yr\ of\ formaldehyde}$$

(5) RCRA Waste Analysis

The following is an example of a calculation using RCRA waste analysis data.

Example: Spent paint wastes were disposed at an off-site waste treatment facility. The quantity of paint waste shipped was five 55-gallon drums per year. Analysis of the waste showed 5% cadmium by weight. Estimating the density of the paint waste to be 9.5 lb/gallon, the amount of cadmium to off-site disposal is calculated as follows:

Amount of cadmium = (amount of paint waste disposed, gal/yr) (concentration of cadmium, lb/lb) (density of paint waste, lb/gal)

$$\left(\frac{5\ drums}{yr}\right)\left(\frac{55\ gal}{drum}\right)\left(\frac{9.5\ lb}{gal}\right)\left(\frac{5\,lb-Cd}{100\,lb\ waste}\right) = \underline{131\ lb/yr\ of\ cadmium}$$

(6) NPDES Data

The following is an example of a calculation using NPDES data.

NPDES permits require periodic monitoring of the effluent stream. In this example, quarterly samples were taken to be analyzed for silver content. Each sample was an hourly, flowrate-based composite taken for one day to be representative of the discharge for that day. The total effluent volume for that day was also recorded. The following data were collected on each sample day.

Quarter	Discharge Flow Rate (10^6 gal/day)	Total Silver (µg/L)
1	0.5	10
2	0.6	10
3	0.4	6
4	0.2	<3

To calculate the amount of silver in pounds discharged on each sample day, the concentration of silver in the discharge is multiplied by the discharge flow rate for that day, as shown below for the first quarter sample.

Amount of silver = (daily flow rate) (silver concentration)

$$\left(\frac{10\,\mu g/L}{L}\right)\left(\frac{1g}{10^6\,\mu g/M}\right)\left(\frac{1\,lb}{454g}\right)\left(\frac{3.785L}{gal}\right)\left(\frac{0.5\times 10^6\,gal}{day}\right)$$

= 0.04 lbs/day of silver

The amount of silver discharged during each of the other three monitoring events was similarly determined to be:

0.05 lbs/day; 0.02 lbs/day, and 0.005 lbs/day.

For the last data point the concentration of silver was reported by the laboratory to be less than the detection limit of 3 µg/L. For this calculation the detection limit was used to calculate the daily discharge, a conservative assumption.

The average daily discharge was calculated to be:

$$\frac{0.04+0.05+0.02+0.005}{4} = 0.03\,lbs/day$$

The plant operates 350 days/year (plant shuts down for two weeks in July).

The estimated annual discharge of silver is calculated as follows:

Annual discharge = (350 days/year) (0.03 lbs/day) = 10.5 lbs of silver/year

Appendix C

GUIDANCE FOR REPORTING AQUEOUS AMMONIA

United States Environmental Protection Agency | Office of Pollution Prevention and Toxics, Washington, DC 20460 | July 1995, EPA 745-R-95-012

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW EPCRA Section 313

Guidance for Reporting Aqueous Ammonia

EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) requires certain facilities manufacturing, processing, or otherwise using listed toxic chemicals to report their environmental releases of such chemicals annually. Beginning with the 1991 reporting year, such facilities also must report pollution prevention and recycling data for such chemicals, pursuant to section 6607 of the Pollution Prevention Act, 42 U.S.C. 13106. When enacted, EPCRA Section 313 established an initial list of toxic chemicals that was comprised of more than 300 chemicals and 20 chemical categories. EPCRA Section 313(d) authorizes EPA to add chemicals to or delete chemicals from the list, and sets forth criteria for these actions.

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Section 1. Introduction

On June 30, 1995 EPA finalized four actions in response to a petition received in 1989 to delete ammonium sulfate (solution) from the list of toxic chemicals subject to reporting under EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), 42 U.S.C. 11001. The four actions taken are summarized as follows: (1) deleted ammonium sulfate (solution) from the EPCRA Section 313 list of toxic chemicals, (2) required that threshold and release determinations for aqueous ammonia be based on 10 percent of the total aqueous ammonia present in aqueous solutions of ammonia, (3) modified the ammonia listing by adding the following qualifier: ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable ammonium salts and other sources; 10 percent of total aqueous ammonia is reportable under this listing), and (4) deleted ammonium nitrate (solution) as a separately listed chemical on the EPCRA Section 313 list of toxic chemicals. All actions are effective for the 1994 reporting year for reports due July 1, 1995, with the exception of the deletion of ammonium nitrate (solution) as a separately listed chemical, which is effective for the 1995 reporting year for reports due July 1, 1996. At the time that these actions were finalized, EPA indicated that the Agency would develop, as appropriate, interpretations and guidance that the Agency determines are necessary to facilitate accurate reporting for aqueous ammonia. This document constitutes such guidance for reporting under the ammonia listing.

Section 1.1 Who Must Report

A plant, factory, or other facility is subject to the provisions of EPCRA Section 313, if it meets all three of the following criteria:

- It conducts manufacturing operations (is included in Standard Industrial Classification (SIC) codes 20 through 39); and
- It has 10 or more full-time employees (or the equivalent 20,000 hours per year); and
- It manufactures, imports, processes, or otherwise uses any of the toxic chemicals listed on the EPCRA Section 313 list in amounts greater than the "threshold" quantities specified below.

Section 1.2 Thresholds

Thresholds are specified amounts of toxic chemicals used during the calendar year that trigger reporting requirements.

If a facility *manufactures* or *imports* any of the listed toxic chemicals, the threshold quantity will be:

- 25,000 pounds per toxic chemical or category over the calendar year.

If a facility *processes* any of the listed toxic chemicals, the threshold quantity will be:

- 25,000 pounds per toxic chemical or category over the calendar year.

If a facility *otherwise uses* any of the listed toxic chemicals (without incorporating it into any product or producing it at the facility), the threshold quantity is:

- 10,000 pounds per toxic chemical or category over the calendar year.

Section 1.3 Chemical Sources of Aqueous Ammonia

If a facility manufactures, processes, or otherwise uses anhydrous ammonia or aqueous ammonia, they must report under the ammonia listing. EPA is providing a table of Chemical Abstract Service (CAS) numbers and chemical names to aid the regulated community in determining whether they need to report under the ammonia listing for aqueous ammonia. This table includes a list of water dissociable ammonium salts which, when placed in water, are a source of aqueous ammonia. The table contains only commonly used ammonium salts and therefore is not exhaustive. If a facility manufactures, processes, or otherwise uses aqueous ammonia, regardless of its source, it must report under the ammonia listing, even if the source of the aqueous ammonia is not listed in the table provided in this document.

Section 1.4 *De Minimis* Concentrations

The ammonia listing is subject to the one percent *de minimis* concentration. Thus, solutions containing aqueous ammonia at a concentration in excess of *one percent of the 10 percent reportable under this listing* should be factored into threshold and release determinations.

Section 2. Guidance for Reporting Aqueous Ammonia

Note: for the purposes of reporting under the ammonia listing for aqueous ammonia, water dissociable ammonium salts means that the ammonium ion dissociates from its counterion when in solution.

Section 2.1 Determining Threshold and Release Quantities for Ammonia

If a facility manufactures, processes, or otherwise uses *anhydrous ammonia*, the quantity applied towards threshold determinations for the ammonia listing is the total quantity of the anhydrous ammonia manufactured, processed, or otherwise used. The quantity reported when calculating the amount of ammonia that is released, transferred, or otherwise managed is the total quantity of *anhydrous ammonia* released or transferred.

If the facility manufactures, processes, or otherwise uses *anhydrous ammonia* in quantities that exceed the appropriate threshold and subsequently dissolves some or all of the *anhydrous ammonia* in *water*, then the following applies: 1) threshold determinations are based on 100 percent of the *anhydrous ammonia* (simply 10 percent of *aqueous ammonia*); 2) release, transfer, and other waste management quantities for the *aqueous ammonia* are calculated as 10 percent of total ammonia; 3) release, transfer, and other waste management quantities for the *anhydrous ammonia* are calculated as 100 percent of the *anhydrous ammonia*.

If a facility manufactures, processes, or otherwise uses *aqueous ammonia*, the quantity applied toward threshold determinations for the ammonia listing is 10 percent of the total quantity of the *aqueous ammonia* manufactured, processed, or otherwise used. The quantity reported when calculating the amount of ammonia that is released, transferred, or otherwise managed is 10 percent of the total quantity of *aqueous ammonia* released or transferred.

If a facility dissolves a water dissociable ammonium salt in water that facility has manufactured *aqueous ammonia* and 10 percent of the total *aqueous ammonia* manufactured from these salts is to be included in manufacturing threshold determinations under the ammonia listing.

If *aqueous ammonia* from water dissociable ammonium salts is processed or otherwise used, then 10 percent of the total *aqueous ammonia* is to be included in all processing and otherwise use threshold determinations under the ammonia listing.

Example 1: In a calendar year, a facility places 25,000 lbs of anhydrous ammonia in water for processing and processes 25,000 lbs of aqueous ammonia from an ammonium salt. The facility must include all of the 25,000 lbs of anhydrous ammonia in the determination of the processing threshold, but only 10 percent (or 2,500 lbs) of the aqueous ammonia from the ammonium salt in the processing threshold determination.

Total aqueous ammonia is the sum of the two forms of ammonia (un-ionized, NH_3, and ionized, NH_4^+) present in aqueous solutions. A precise calculation of the weight of total aqueous ammonia would require determining the ratio of the two forms of ammonia present using the pH and temperature of the solution. The weight of total aqueous ammonia can be more easily calculated by assuming that aqueous ammonia is comprised entirely of the NH_4^+ form or the NH_3 form. For the purpose of determining threshold and release quantities under EPCRA Section 313, EPA recommends that total aqueous ammonia be calculated in terms of NH_3 equivalents (i.e., for determining weights, assume total ammonia is comprised entirely of the NH_3 form). This method is simpler than using pH and temperature data to determine the ratio of the two forms present and is consistent with the presentation of total ammonia toxicity in a separate EPA document, *Ambient Water Quality Criteria for Ammonia* (EPA document #440/5-85-001, January 1985).

Section 2.2 Chemical Sources of Aqueous Ammonia

Aqueous ammonia may be generated in solution from a variety of sources that include the release of anhydrous ammonia to water and the dissociation of ammonium salts in water. Water dissociable ammonium salts are not reportable in their entirety under the ammonia listing; these salts are reportable to the extent that they dissociate in water, and only 10 percent of the total aqueous ammonia that results when these salts dissociate is reportable. If these salts are not placed in water, they are not reportable.

If these salts are purchased neat or as solids by a facility, then placed in water by that facility, the facility is *manufacturing* aqueous ammonia.

Section 2.2.1 Reporting Aqueous Ammonia Generated from Anhydrous Ammonia in Water

If the source of aqueous ammonia is anhydrous ammonia in water, total aqueous ammonia (calculated in terms of NH_3 equivalents) is equal to the quantity of anhydrous ammonia manufactured, processed, or otherwise used. A hypothetical scenario demonstrating the calculations involved in reporting aqueous ammonia generated from anhydrous ammonia in water is given in Example 2.

Example 2: In a calendar year, a facility uses 30,000 pounds of anhydrous ammonia to neutralize acids in a wastewater stream. The neutralized waste stream (containing aqueous ammonia from dissociated ammonium salts) is then transferred to a POTW. The quantity to be applied toward threshold determinations is the total quantity of anhydrous ammonia used in the waste stream neutralization, or 30,000 pounds. The quantity of ammonia reported as transferred is 10 percent of the total quantity of aqueous ammonia transferred, or 3,000 pounds.

Section 2.2.2 Reporting Aqueous Ammonia Generated from the Dissociation of Ammonium Salts (Other Than Ammonium Nitrate)

If the source of aqueous ammonia is the dissociation of ammonium salts in water, total aqueous ammonia (calculated in terms of NH_3 equivalents) is calculated from the weight percent (wt%) of the NH_3 equivalents of the ammonium salt. The NH_3 equivalent wt% of an ammonium salt is calculated using the following equation:

$$NH_3 \text{ equivalent wt\%} = (NH_3 \text{ equivalent weight})/(\text{MW ammonium salt}) \times 100$$

If the source of aqueous ammonia is a monovalent compound (such as ammonium chloride, NH_4Cl, ammonium nitrate, NH_4NO_3, or ammonium bicarbonate (NH_4HCO_3), the NH_3 equivalent weight is equal to the MW of NH_3 (17.03 kg/kmol). If divalent compounds are involved (such as ammonium carbonate, $(NH_4)_2CO_3$), then the NH_3 equivalent weight is equal to the MW of NH_3 multiplied by two. Similarly, if trivalent compound are involved, then the NH_3 equivalent weight is equal to the MW of NH_3 multiplied by three.

Example 3:

The NH_3 equivalent wt% of ammonium chloride is calculated as follows:

NH_3 equivalent wt% = (NH_3 equivalent weight)/(MW ammonium chloride) × 100
NH_3 equivalent wt% = (17.03)/(53.49) × 100
NH_3 equivalent wt% = 31.84%

The NH_3 equivalent wt% of ammonium carbonate is calculated as follows:

NH_3 equivalent wt% = 2 × (NH_3 equivalent weight)/(MW ammonium chloride) × 100
NH_3 equivalent wt% = 2 × (17.03)/(96.09) × 100
NH_3 equivalent wt% = 35.45%

To aid the regulated community in reporting under the ammonia listing for aqueous ammonia, the table of chemical sources of aqueous ammonium provided in Section 3 of this document includes, in addition to CAS number, chemical name, and molecular weight, the NH_3 equivalent wt% of the commonly used, water dissociable ammonium salts listed in this table.

Example 4: In a calendar year, a facility uses 100,000 pounds of ammonium chloride, NH_4Cl, *in aqueous solution* which is released to wastewater streams, then transferred to a POTW. The NH_3 equivalent wt% of ammonium chloride is 31.84% (taken from Table 1 in Section 3 below or calculated as in Example 3 above). The total quantity of aqueous ammonia present in solution is 31.84% of the 100,000 pounds of ammonia chloride used, or 31,840 pounds. The quantity applied towards threshold determinations for the ammonia listing is 10 percent of the total quantity of aqueous ammonia present in solution, or 3,184 pounds. The quantity of ammonia reported as released or transferred is 10 percent of the total quantity of aqueous ammonia released or transferred, or 3,184 pounds.

Example 5: In a calendar year, a facility uses 500,000 pounds of ammonium carbonate, $(NH_4)_2CO_3$, and 400,000 pounds of ammonium bicarbonate, NH_4HCO_3, *in aqueous solution* which is released to wastewater streams, then transferred to a POTW. The NH_3 equivalent wt% of ammonium carbonate is 35.45%, and the NH_3 equivalent wt% of ammonium bicarbonate is 21.54% (taken from Table 1 in Section 3 below or calculated as in Example 3 above). The quantity of aqueous ammonia present in solution from ammonium carbonate is 35.45% of the 500,000 pounds of ammonia carbonate used, or 177,250 pounds. The quantity of aqueous ammonia present in solution from ammonium bicarbonate is 21.54% of the 400,000 pounds of ammonia bicarbonate used or 86,160 pounds. The total quantity of aqueous ammonia present in solution is 263,410 pounds. The quantity applied towards threshold determinations for the ammonia listing is 10 percent of the total quantity of aqueous ammonia present in solution, or 26,341 pounds. The quantity of ammonia reported as released or transferred is 10 percent of the total quantity of aqueous ammonia released or transferred, or 26,341 pounds.

Section 2.2.3 Reporting Aqueous Ammonia Generated from the Dissociation of Ammonium Nitrate

Some sources of aqueous ammonia may be reportable under other EPCRA Section 313 category listings. Ammonium nitrate (solution) is relevant to reporting under the ammonia listing to the extent that 10 percent of the total aqueous ammonia that results when ammonium nitrate dissociates is reported when determining thresholds and calculating releases. However, under the nitrate compound category listing, ammonium nitrate (and other mixed salts containing ammonium and nitrate) must be reported in its entirety. When reporting ammonium nitrate under this category listing, the total nitrate compound, including both the nitrate ion portion and the ammonium counterion, is included when determining threshold quantities. However, only the nitrate ion portion is included when determining the amount of ammonium nitrate that is released, transferred, or otherwise managed in wastes. The calculations involved in determining threshold and release quantities for reporting under the nitrate compound category listing are described in a separate directive, *List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting* (EPA document #745-R-95-002, February 1995). Note: reporting ammonium nitrate under the ammonia listing and nitrate compounds category listing is effective for the 1995 reporting year for reports due July 1, 1996.

Example 6: In a calendar year, a facility uses 1,250,000 pounds of ammonium nitrate, NH_4NO_3, *in aqueous solution* which is released to wastewater streams, then transferred to a POTW. The NH_3 equivalent wt% of ammonium nitrate is 21.28% (taken from Table 1 in Section 3 below or calculated as in Example 3 above). The total quantity of aqueous ammonia present in solution is 21.28% of the 1,250,000 pounds of ammonia chloride used, or 266,000 pounds. The quantity applied towards threshold determinations for the ammonia listing is 10 percent of the total quantity of aqueous ammonia present in solution, or 26,600 pounds. The quantity of ammonia reported as released or transferred is 10 percent of the total quantity of aqueous ammonia released or transferred, or 26,600 pounds. For determining thresholds and calculating releases under the nitrate compound category listing, see the separate directive, *List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting* (EPA document #745-R-95-002, February, 1995).

Example 7: In a calendar year, a facility transfers 100,000 pounds of nitric acid (HNO_3) to an on-site treatment facility. The nitric acid is neutralized with anhydrous ammonia, and treatment efficiency is 95 percent (the nitrate compound formed as a result of the treatment is ammonium nitrate, NH_4NO_3). The neutralized waste stream (containing aqueous ammonia from dissociated ammonium nitrate) is then transferred to a POTW. The quantity of nitric acid neutralized is 95 percent of 100,000 pounds or 95,000 pounds. The quantity of nitric acid neutralized is converted first to kilograms then to kilomoles using the following equations:

Kilograms HNO_3 neutralized = (lbs HNO_3 neutralized) × (0.4536 kg/lb)
Kilomoles HNO_3 neutralized = (kg HNO_3) ÷ (MW of HNO_3 in kg/kmol)

Substituting the appropriate values into the above equations yields:

Kilograms HNO_3 neutralized = 95,000 lbs × 0.4536 kg/lb = 43,092 kg
Kilomoles HNO_3 neutralized = 43,092 kg ÷ 63.01 kg/kmol = 683.9 kmol

The quantity of anhydrous ammonia used in kilomoles in the acid neutralization and the quantity of ammonium nitrate generated in kilomoles from the neutralization are equal to the quantity of nitric acid neutralized (683.9 kmol). The quantity of anhydrous ammonia used in kilograms and pounds in the acid neutralization is calculated as follows:

Kilograms NH_3 used = (kmol NH_3) × (MW of NH_3 in kg/kmol)
Pounds NH_3 used = (kg NH_3) × (2.205 lbs/kg)

Substituting the appropriate values into the above equation yields:

Kilograms NH_3 used = (683.9 kmol) × (17.03 kg/kmol) = 11,647 kmol
Pounds NH_3 used = (11,647 NH_3) × (2,205 lbs/kg) = 25,682 pounds

The quantity reported applied towards threshold determinations for the ammonia listing is the total quantity of anhydrous ammonia used in the acid neutralization, or 25,682 pounds. The quantity of ammonia reported as released or transferred is 10 percent of the total quantity of aqueous ammonia released or transferred, or 2,568 pounds. For determining thresholds and calculating releases under the nitrate compound category listing, see the separate directive, *List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting* (EPA document #745-R-95-002, February 1995).

Section 3. CAS Number and List of Some Chemical Sources of Aqueous Ammonia

EPA is providing the following table of CAS numbers and chemical names to aid the regulated community in determining whether they need to report under the ammonia listing for aqueous ammonia. If a facility manufactures, processes, or otherwise uses, *in aqueous solution*, a chemical which is listed below, they must report 10 percent of the total aqueous ammonia that is the result of the dissociation of this chemical. However, this list is not exhaustive. If a facility manufactures, processes, or otherwise uses, *in aqueous solution*, a water dissociable ammonium compound, they must report 10 percent of the total aqueous ammonia that is the result of the dissociation of the compound, even if the compound does not appear in the following table.

Table C-1
Listing by CAS Number and Molecular Weight of Some Chemical Sources of Aqueous Ammonia

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium acetate	77.08	22.09	631-61-8
Ammonium aluminum sulfate (Ammonium aluminum disulfate)	237.14	7.181	7784-25-0
Ammonium antimony fluoride (Diammonium pentafluoroantimonate)	252.82	13.47	32516-50-0
Ammonium arsenate (Ammonium arsenate, hydrogen) (Ammonium arsenate, dihydrogen)	158.97	10.71	13462-93-6
Ammonium arsenate (Diammonium arsenate) (Diammonium arsenate, hydrogen) (Diammonium arsenate, monohydrogen)	176.00	19.35	7784-44-3
Ammonium arsenite	124.96	13.63	13462-94-7
Ammonium azide	60.06	28.35	12164-94-2
Ammonium benzenesulfonate	175.20	9.720	19402-64-3
Ammonium benzoate	139.15	12.24	1863-63-4
Ammonium bromate	145.94	11.67	13843-59-9
Ammonium bromide	97.94	17.39	12124-97-9
Ammonium cadmium chloride (Ammonium cadmium trichloride)	236.81	7.191	18532-52-0
Ammonium carbamate	78.07	21.81	1111-78-0
Ammonium carbonate carbamate	157.13	21.68	8000-73-5

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium carbonate (Diammonium carbonate)	96.09	35.45	506-87-3
Ammonium carbonate, hydrogen (Ammonium bicarbonate)	79.06	21.54	1066-33-7
Ammonium cerium nitrate (Ammonium hexanitratocerate) (Ammonium hexanitratocerate (IV)) (Diammonium cerium hexanitrate)	548.23	6.213	16774-21-3
Ammonium cerous nitrate (Ammonium cerous nitrate, tetrahydrate)	486.22	7.005	13083-04-0
Ammonium chlorate	101.49	16.78	10192-29-7
Ammonium perchlorate	117.49	14.49	7790-98-9
Ammonium chloride	53.49	31.84	12125-02-9
Ammonium chromate (Ammonium chromate (VI)) (Diammonium chromate)	152.07	22.40	7788-98-9
Ammonium chromate (Ammonium dichromate) (Ammonium dichromate (VI)) (Ammonium bichromate) (Diammonium dichromate)	252.06	13.51	7789-09-5
Ammonium chromium sulfate (Ammonium chromic sulfate)	265.17	6.422	13548-43-1
Ammonium citrate (Ammonium citrate, monohydrogen) (Ammonium citrate, dibasic) (Diammonium citrate) (Diammonium citrate, hydrogen)	226.19	15.06	3012-65-5
Ammonium citrate (Ammonium citrate, tribasic) (Triammonium citrate)	243.22	21.01	3458-72-8
Ammonium cobalt sulfate (Ammonium cobaltous sulfate)	289.14	11.78	13596-46-8
Ammonium cupric chloride (Ammonium chlorocuprate (II)) (Diammonium copper tetrachloride) (Diammonium tetrachlorocuprate)	241.43	14.11	15610-76-1
Ammonium cyanate (Ammonium isocyanate)	60.06	28.35	22981-32-4

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium cyanide	44.06	38.65	12211-52-8
Ammonium cyanoaurate, monohydrate (Ammonium tetracyanoaurate, monohydrate)	319.07	5.337	14323-26-3
Ammonium cyanoaurate (Ammonium dicyanoaurate)	267.04	6.377	31096-40-9
Ammonium ferricyanide (Ammonium hexacyanoferrate (III)) (Triammonium hexacyanoferrate)	266.07	19.20	14221-48-8
Ammonium ferrocyanide (Ammonium hexacyanoferrate (II)) (Tetraammonium ferrocyanide) (Tetraammonium hexacyanoferrate)	284.11	23.98	14481-29-9
Ammonium fluoride	37.04	45.98	12125-01-8
Ammonium fluoride (Ammonium difluoride) (Ammonium bifluoride) (Ammonium fluoride, hydrogen) (Ammonium difluoride, hydrogen) (Ammonium bifluoride, hydrogen)	57.04	29.86	1341-49-7
Ammonium fluoroborate (Ammonium tetrafluoroborate)	104.84	16.24	13826-83-0
Ammonium fluorogermanate (IV) (Ammonium hexafluorogermanate (IV)) (Diammonium hexafluorogermanate)	222.66	15.30	16962-47-3
Ammonium fluorophosphate (Ammonium hexafluorophosphate)	163.00	10.45	16941-11-0
Ammonium fluorosulfate (Ammonium fluorosulfonate)	117.10	14.54	13446-08-7
Ammonium formate	63.06	27.01	540-69-2
Ammonium gallium sulfate	282.90	6.020	15335-98-5
Ammonium hydroxide	35.05	48.59	1336-21-6
Ammonium iodide	144.94	11.75	12027-06-4
Ammonium iridium chloride (Ammonium chloroiridate (III)) (Ammonium hexachloroiridate) (Triammonium hexachloroiridate)	459.05	11.13	15752-05-3

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium iron sulfate (Ammonium ferric sulfate) (Ammonium iron disulfate)	269.02	6.330	10138-04-2
Ammonium iron sulfate (Ammonium ferrous sulfate) (Diammonium iron disulfate) (Diammonium ferrous disulfate)	286.05	11.91	10045-89-3
Ammonium lactate (Ammonium 2-hydroxypropionate)	107.11	15.90	515-98-0
Ammonium laurate (Ammonium dodecanoate)	217.35	7.835	2437-23-2
Ammonium magnesium sulfate	252.50	13.49	14727-95-8
Ammonium malate	168.15	20.26	6283-27-8
Ammonium malate, hydrogen (Ammonium bimalate)	151.12	11.27	5972-71-4
Ammonium molybdate (Diammonium molybdate)	196.01	17.38	13106-76-8
Ammonium molybdate (Ammonium heptamolybdate) (Ammonium molybdate, hydrate) (Ammonium molybdate, tetrahydrate) (Ammonium *para*molybdate, tetrahydrate)	1,163.8	8.780	12054-85-2
Ammonium nickel chloride, hexahydrate	183.09	9.301	16122-03-5
Ammonium nickel sulfate (Ammonium nickel sulfate, hexahydrate) (Ammonium nickel disulfate, hexahydrate) (Diammonium nickel disulfate, hexahydrate)	286.88	11.87	7785-20-8
Ammonium nitrate	80.04	21.28	6484-52-2
Ammonium nitrate sulfate	212.18	24.08	12436-94-1
Ammonium nitrite	64.04	26.59	13446-48-5
Ammonium oleate	299.50	5.686	544-60-5
Ammonium oxalate	124.10	27.45	1113-38-8
Ammonium palladium chloride (Ammonium chloropalladate (II)) (Ammonium tetrachloropalladte (II)) (Diammonium tetrachloropalladate)	284.31	11.98	13820-40-1
Ammonium phosphate (Ammonium orthophosphate)	149.09	34.27	10124-31-9

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium phosphate (Ammonium biphosphate) (Ammonium phosphate, hydrogen) (Ammonium phosphate, dihydrogen) (Ammonium orthophosphate, dihydrogen) (Ammonium phosphate, monobasic)	115.03	14.80	7722-76-1
Ammonium phosphate (Ammonium phosphate, hydrogen) (Ammonium orthophosphate, monohydrogen) (Ammonium phosphate, dibasic) (Ammonium orthophosphate, dibasic) (Diammonium phosphate) (Diammonium orthophosphate) (Diammonium phosphate, hydrogen) (Diammonium phosphate, monohydrogen) (Diammonium orthophosphate, hydrogen)	132.06	25.79	7783-28-0
Ammonium phosphinate (Ammonium hypophosphite)	83.03	20.51	7803-65-8
Ammonium phosphite (Ammonium biphosphite) (Ammonium phosphite, dihydrogen)	99.03	17.20	13446-12-3
Ammonium picramate	216.15	7.879	1134-85-6
Ammonium propionate	91.11	18.69	17496-08-1
Ammonium rhodium chloride (Ammonium chlororhodate (III)) (Ammonium hexachlororhodate (III)) (Triammonium rhodium hexachloride) (Triammonium hexachlororhodate)	369.74	13.82	15336-18-2
Ammonium salicylate (Ammonium 2-hydroxybenzoate)	155.15	10.98	528-94-9
Ammonium selenide	115.04	29.61	66455-76-3
Ammonium silicon fluoride (Ammonium fluorosilicate) (Ammonium hexafluorosilicate) (Diammonium silicon hexafluoride) (Diammonium fluorosilicate) (Diammonium hexafluorosilicate)	178.15	19.12	16919-19-0
Ammonium stearate (Ammonium octadecanoate)	301.51	5.648	1002-89-7
Ammonium succinate (Diammonium succinate)	152.15	22.39	2226-88-2

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium sulfamate (Ammonium amidosulfate) (Ammonium amidosulfonate)	114.12	14.92	7773-06-0
Ammonium sulfate (Diammonium sulfate)	132.13	25.78	7783-20-2
Ammonium sulfate (Ammonium bisulfate) (Ammonium sulfate, hydrogen) (Ammonium sulfate, monohydrogen)	115.10	14.80	7803-63-6
Ammonium *per*sulfate (Ammonium peroxysulfate) (Ammonium peroxydisulfate) (Diammonium persulfate) (Diammonium peroxydifulsite)	228.19	14.93	7727-54-0
Ammonium sulfide (Ammonium bisulfide) (Ammonium sulfide, hydrogen)	51.11	33.32	12124-99-1
Ammonium sulfide (Ammonium monosulfide) (Diammonium sulfide)	68.14	49.99	12135-76-1
Ammonium sulfide (Diammonium pentasulfide)	196.39	17.34	12135-77-2
Ammonium sulfite, monohydrate (Diammonium sulfite, monohydrate)	116.13	29.33	7783-11-1
Ammonium sulfite (Ammonium bisulfite) (Ammonium sulfite, hydrogen)	99.10	17.18	10192-30-0
Ammonium tetrachloroaurate (III), hydrate	356.82	4.772	13874-04-9
Ammonium thiocarbamate	94.13	18.09	16687-42-6
Ammonium thiocarbonate (Diammonium trithiocarbonate)	144.27	23.61	13453-08-2
Ammonium thiocyanate (Ammonium isothiocyanate) (Ammonium sulfocyanate) (Ammonium rhodanate) (Rhodanid)	76.12	22.37	1762-95-4
Ammonium dithionate	196.19	17.36	60816-52-6
Ammonium thiosulfate (Ammonium hyposulfite) (Diammonium thiosulfate)	148.20	22.98	7783-18-8

Table C-1 (Continued)

Chemical Name	Molecular Weight*	NH_3 Equivalent Wt%	CAS Number
Ammonium tin bromide (Ammonium bromostannate (IV)) (Ammonium hexabromostannate (IV)) (Diammonium hexabromostannate)	634.19	5.371	16925-34-1
Ammonium tin chloride (Ammonium chlorostannate (IV)) (Ammonium hexachlorostannate (IV)) (Diammonium tin hexachloride) (Diammonium hexachlorostannate)	367.48	9.269	16960-53-5
Ammonium titanium fluoride (Ammonium fluorotitanate (IV)) (Ammonium hexafluorotitanate (IV)) (Diammonium titanium hexafluoride) (Diammonium hexafluorotitanate)	197.95	17.21	16962-40-6
Ammonium titanium oxalate, monohydrate (Diammonium dioxalatooxotitanate, monohydrate)	276.00	12.34	10580-03-7
Ammonium tungstate (Ammonium tungstate (VI)) (Ammonium *para*tungstate) (Hexaammonium tungstate)	1,779.2	5.743	12028-06-7
Ammonium tungstate (Ammonium tungstate (VI)) (Ammonium *para*tungstate) (Decaammonium tungstate)	3,058.6	5.568	11120-25-5
Ammonium valerate (Ammonium pentoate)	119.16	14.29	42739-38-8
Ammonium zinc chloride (Ammonium chlorozincate) (Ammonium tetrachlorozincate) (Diammonium tetrachlorozincate)	243.27	14.00	14639-97-5

*For hydrated compounds, e.g., ammonium sulfite, monohydrate, the molecular weight excludes the weight of the hydrate portion.

Appendix D

LIST OF TOXIC CHEMICALS WITHIN THE WATER DISSOCIABLE NITRATE COMPOUNDS CATEGORY AND GUIDANCE FOR REPORTING

United States Environmental Protection Agency | Office of Pollution Prevention and Toxics Washington, DC 20460 | Revised May 1996 EPA 745-R-96-004

TOXICS RELEASE INVENTORY

List of Toxic Chemicals Within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting

EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) requires certain facilities manufacturing, processing, or otherwise using listed toxic chemicals to report their environmental releases of such chemicals annually. Beginning with the 1991 reporting year, such facilities also must report pollution prevention and recycling data for such chemicals, pursuant to section 6607 of the Pollution Prevention Act, 42 U.S.C. 13106. When enacted, EPCRA Section 313 established an initial list of toxic chemicals that was comprised of more than 300 chemicals and 20 chemical categories. EPCRA Section 313(d) authorizes EPA to add chemicals to or delete chemicals from the list, and sets forth criteria for these actions.

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Seciton 1. Introduction

On November 30, 1994 EPA added 286 chemicals and chemical categories, which include 39 chemicals as part of two delineated categories, to the list of toxic chemicals subject to reporting under EPCRA Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), 42 U.S.C. 11001. These additions are described at 59 FR 61432, and are effective January 1, 1995 for reports due July 1, 1996. Six chemical categories (nicotine and salts, strychnine and salts, polycyclic aromatic compounds, water dissociable nitrate compounds, diisocyanates, and polychlorinated alkanes) are included in these additions. At the time of the addition, EPA indicated that the Agency would develop, as appropriate, interpretations and guidance that the Agency determines are necessary to facilitate accurate reporting for these categories. This document constitutes such guidance for the water dissociable nitrate compounds category.

Section 1.1 Who Must Report

A plant, factory, or other facility is subject to the provisions of EPCRA Section 313, if it meets all three of the following criteria:

- It conducts manufacturing operations (is included in Standard Industrial Classification (SIC) codes 20 through 39); and
- It has 10 or more full-time employees (or the equivalent 20,000 hours per year); and
- It manufactures, imports, processes, or otherwise uses any of the toxic chemicals listed on the EPCRA Section 313 list in amounts greater than the "threshold" quantities specified below.

Section 1.2 Thresholds

Thresholds are specified amounts of toxic chemicals used during the calendar year that trigger reporting requirements.

If a facility *manufactures* or *imports* any of the listed toxic chemicals, the thresholds quantity will be:

- 25,000 pounds per toxic chemical or category over the calendar year.

If a facility *processes* any of the listed toxic chemicals, the threshold quantity will be:

- 25,000 pounds per toxic chemical or category over the calendar year.

If a facility *otherwise uses* any of the listed toxic chemicals (without incorporating it into any product or producing it at the facility), the threshold quantity is:

- 10,000 pounds per toxic chemical or category over the calendar year.

EPCRA Section 313 requires threshold determinations for chemical categories to be based on the total of all chemicals in the category manufactured, processed or otherwise used. For example, a facility that manufactures three members of a chemical category would count the total amount of all three chemicals manufactured towards the manufacturing threshold for that category. When filing reports for chemical categories, the releases are determined in the same manner as the thresholds. One report is filed for the category and all releases are reported on this form.

Section 1.3 Chemicals Within the Water Dissociable Nitrate Compounds Category

EPA is providing a list of CAS numbers and chemical names to aid the regulated community in determining whether they need to report for the water dissociable nitrate compounds category. The list includes individual chemicals within the water dissociable nitrate compounds category. If a facility is manufacturing, processing, or otherwise using a chemical which is on this list, they must report this chemical. However, this list is not exhaustive. If a facility is manufacturing, processing, or otherwise using a water dissociable nitrate compound, they must report the chemical, even if it does not appear on the list.

Section 1.4 *De Minimis* Concentrations

The water dissociable nitrate compounds category is subject to the one percent *de minimis* concentration. Thus, mixtures that contain members of this category in excess of the *de minimis* should be factored into threshold and release determinations.

Section 2. Guidance for Reporting Chemicals within the Water Dissociable Nitrate Compounds Category

Note: for the purposes of reporting under the nitrate compounds category, water dissociable means that the nitrate ion dissociates from its counterion when in solution.

Section 2.1 Chemicals within the Water Dissociable Nitrate Compounds Category

Chemicals within the nitrate compounds category are only reportable when in aqueous solution. All water dissociable nitrate compounds are included in the nitrate compounds category, including ammonium nitrate. Specifically listed EPCRA Section 313 chemicals *are not* included in threshold determinations for chemical categories such as the water dissociable nitrate compounds category. Specifically listed toxic chemicals are subject to their own individual threshold determinations. As of December 1, 1994, ammonium nitrate (solution) is not an individually listed chemical on the EPCRA Section 313 list. However, ammonium nitrate is still subject to reporting under the nitrate compounds category. In addition, the aqueous ammonia from the dissociation of ammonium nitrate when in aqueous solution is subject to reporting under the ammonia listing.

Section 2.2 Determining Threshold and Release Quantities for Nitrate Compounds

The total nitrate compound, including both the nitrate ion portion and the counterion, is included in the nitrate compounds category. When determining threshold amounts, the total weight of the nitrate compound is to be included in all calculations. However, only the nitrate ion portion is to be included when determining the amount of the chemicals within the nitrate compounds category that is released, transferred, or otherwise managed in wastes.

Example 1: In a calendar year, a facility processes 100,000 pounds of ammonium nitrate (NH_4NO_3), *in aqueous solution*, which is released to wastewater streams then transferred to a POTW. The quantity applied towards threshold calculations for the nitrate compounds category is the total quantity of the nitrate compound or 100,000 pounds. Since this quantity exceeds the 25,000 pound processing threshold, the facility is required to report for the nitrate compounds category. Under the nitrate compounds category, only the weight of the nitrate ion portion of ammonium nitrate is included in release transfer calculations. The molecular weight of the ammonium nitrate is 80.04 and the weight of the nitrate ion portion is 62.01 or 77.47 percent of the molecular weight of ammonium nitrate. Therefore, the amount of nitrate ion reported as transferred to the POTW is 77.47 percent of 100,000 pounds or 77,470 pounds (reported as 77,000 pounds). The aqueous ammonia from ammonium nitrate is reportable under the EPCRA Section 313 listing for ammonia. For determining thresholds and calculating releases under the ammonia listing, see the separate directive, *Guidance for Reporting Aqueous Ammonia* (EPA document #745-R-95-0003, July 1995).

Example 2: In a calendar year, a facility manufactures as by-products 20,000 pounds of sodium nitrate ($NaNO_3$) and 10,000 pounds of calcium nitrate ($Ca(NO_3)_2$), both in aqueous solutions, and releases these solutions to wastewater streams. The total quantity of nitrate compounds manufactured by the facility is the sum of the two chemicals, or 30,000 pounds, which exceeds the manufacturing threshold quantity of 25,000 pounds. The facility therefore is required to report for the nitrate compounds category. By weight, the nitrate ion portion is 72.96 percent of sodium nitrate and is 75.57 percent of calcium nitrate. Of the 20,000 pounds of the sodium nitrate in solution, 72.96 percent or 14,592 pounds is nitrate ion, and similarly, of the 10,000 pounds of the calcium nitrate in solution, 75.57 percent or 7,557 pounds is nitrate ion. The total nitrate ion in aqueous solution released by the facility is the sum of the nitrate ion in the two solutions or 22,149 pounds (reported as 22,000 pounds).

Section 2.3 Reporting Nitrate Compounds Generated from the Partial or Complete Neutralization of Nitric Acid

Nitric acid is an individually listed chemical on the original EPCRA Section 313 list and is reported as a separate chemical if the manufacture, process, or otherwise use thresholds are exceeded. The partial or complete neutralization of nitric acid results in the formation of nitrate compounds which are reported as chemicals within the nitrate compounds category if their manufacture, process, or otherwise use thresholds are exceeded.

Mineral acids such as nitric acid may be present in aqueous waste streams that are sent to on-site neutralization or are discharged to a publicly owned treatment works (POTW) or other off-site treatment facility. As stated in the *Toxic Chemical Release Inventory Reporting Form R and Instructions* document (revised 1993 version, EPA 745-K-94-001), on-site acid neutralization and its efficiency must be reported in Part II, section 7A of Form R (waste treatment methods and efficiency section). For purposes of reporting on Form R, EPA considers a waste mineral acid at a pH 6 or higher to be 100 percent neutralized (water discharges to receiving streams or POTWs are reported as zero). The nitrate compounds produced from the complete neutralization (pH 6.0 or above) of nitric acid are reportable under the nitrate compounds category and should be included in all threshold and release calculations. Two Form R reports would be required if the manufacture, process or otherwise use thresholds are exceeded for nitric acid and for the nitrate compounds category.

If the nitric acid treatment efficiency is not equal to 100 percent (pH is less than 6), the amount of the acid remaining in the waste stream which is released to the environment on-site or off-site must be reported in Part II of Form R. The nitrate compounds produced from the partial neutralization of nitric acid are reportable under the nitrate compounds category and should be included in all threshold and release calculations. Two reports would again be required if the manufacture, process or otherwise use thresholds are exceeded for nitric acid and for the nitrate compounds category.

Section 2.3.1 Estimating Nitric Acid Releases

The pH of the waste stream can be used to calculate the amount of nitric acid in the stream and the efficiency of neutralization. The pH is a measure of the acidity or alkalinity of a waste stream and can be obtained readily using a pH meter or pH sensitive paper. The pH scale itself varies from 0 to 14.

The total nitric acid concentration (ionized and un-ionized) in pounds per gallon can be calculated by using the pH value of the solution, the molecular weight and ionization constant of the acid, and appropriate conversion factors. The total acid concentration for nitric acid for different pH values is listed in Table 1. The calculation of mineral acid concentrations and the derivation of Table 1 are discussed in a separate directive, *Estimating Releases for Mineral Acid Discharges Using pH Measurements*, and an addendum to this directive.

The procedure outlined in this guidance document for calculating the quantity of nitrate compounds formed from the complete or partial neutralization of nitric acid can be used if nitric acid is the only mineral acid in a solution. In addition, the calculation of nitric acid releases using only pH measurements is a rough estimate. The subsequent calculation of nitrate compound releases is therefore also only a rough estimate. The estimates can be made for a waste stream with a steady pH below 6 or for one whose pH temporarily drops to below pH 6. Facilities should use their best engineering judgement and knowledge of the solution to evaluate how reasonable the estimates are.

Example 3: In a calendar year, a facility transfers 1.0 million gallons of a solution containing nitric acid (HNO_3), at pH 4, to a POTW. Using Table 1 (next page), a pH of 4 corresponds to a concentration of 0.0000520 lbs HNO_3/gallon of solution. The weight of HNO_3 transferred can be estimated using the equation:

$$\text{Transfer of } HNO_3 = (\text{Concentration of } HNO_3) \times (\text{effluent flow rate})$$

Substituting the example values into the above equation yields:

$$\text{Transfer of } HNO_3 = 0.0000520 \text{ lbs/gal } HNO_3 \times 1{,}000{,}000 \text{ gal solution/year} = 52 \text{ lbs/year}$$

Example 4: A facility had an episodic release of nitric acid (HNO_3) in which the waste stream was temporarily below pH 6. During the episode, the wastewater (pH 2.0) was discharged to a river for 20 minutes at a rate of 100 gallons per minute. Using Table 1, a pH of 2.0 for HNO_3 represents a concentration of 0.0052000 lbs HNO_3/gallon of solution. The amount of the HNO_3 released can be estimated using the following equation:

$$\text{Release of } HNO_3 = (\text{concentration of } HNO_3) \times (\text{effluent flow rate})$$

Substituting the example values in the above equation:

$$\text{Release of } HNO_3 = 0.0052000 \text{ lbs/gal} \times 100 \text{ gal/min} \times 20 \text{ min}$$
$$= 10 \text{ lbs}$$

Table D-1
Nitric Acid Concentration Versus pH

pH	Nitric Acid Concentration (lbs/gallon)	pH	Nitric Acid Concentration (lbs/gallon)
0.0	0.5200000	3.0	0.0005200
0.2	0.3300000	3.2	0.0003300
0.4	0.2100000	3.4	0.0002100
0.6	0.1300000	3.6	0.0001300
0.8	0.0830000	3.8	0.0000830
1.0	0.0520000	4.0	0.0000520
1.2	0.0330000	4.2	0.0000330
1.4	0.0210000	4.4	0.0000210
1.6	0.0130000	4.6	0.0000130
1.8	0.0083000	4.8	0.0000083
2.0	0.0052000	5.0	0.0000052
2.2	0.0033000	5.2	0.0000033
2.4	0.0021000	5.4	0.0000021
2.6	0.0013000	5.6	0.0000013
2.8	0.0008300	5.8	0.0000008
		6.0	0.0000005

Section 2.3.2 Estimating Treatment Efficiencies for Nitric Acid Neutralization

Nitric acid solutions that are neutralized to a pH of 6 or above have a treatment efficiency of 100 percent. If nitric acid is neutralized to a pH less than 6, then the reportable treatment efficiency is somewhere between 0 and 100 percent. It is possible to estimate the neutralization treatment efficiency using nitric acid concentration values directly from Table 1 in the equation given below. The concentrations correspond to the pH values before and after treatment.

$$\text{Treatment efficiency} = \frac{(I - E)}{I} \times 100$$

where:

I = Acid concentration before treatment; and
E = Acid concentration after treatment.

Example 5: A nitric acid (HNO_3) waste stream of pH 2.4 is neutralized to pH 4.6. Using Table 1, the initial nitric acid concentration is 0.0021000 mol/liter and the final concentration is 0.0000130 mol/liter. Substituting these values into the equation for treatment efficiency:

$$\text{Treatment Efficiency} = \frac{(0.0021000 - 0.0000130)}{0.0021000} \times 100$$

$$= 99.4 \text{ percent}$$

For strong acids only (including nitric acid), the net difference in pH before and after treatment can be used to estimate the treatment efficiency since pH is directly proportional to the acid concentration. For example, a pH change of one unit results in a treatment efficiency of 90 percent, whether the pH change is from pH 1 to pH 2 or from pH 4 to pH 5. Table 2 summarizes treatment efficiencies for various pH changes (the pH change is the difference between the initial pH and the pH after neutralization). In the table, some pH changes result in the same treatment efficiency values due to rounding to one decimal place.

Table D-2
Nitric Acid Treatment Efficiencies for Various pH Changes

pH Unit Change	Treatment Efficiency (%)	pH Unit Change	Treatment Efficiency (%)
1.0	90.0	2.0	99.0
1.1	92.1	2.1	99.2
1.2	93.7	2.2	99.4
1.3	95.0	2.3	99.5
1.4	96.0	2.4	99.6
1.5	96.8	2.5	99.7
1.6	97.5	2.6	99.8
1.7	98.0	2.7	99.8
1.8	98.4	2.8	99.8
1.9	98.7	2.9	99.9
		3.0	99.9

Example 6: If a nitric acid (HNO_3) waste stream of pH 2 is treated to pH 4, the pH change is 2 units. Using Table 2 above, the treatment efficiency is given as 99.0 percent.

Section 2.3.3 Estimating Releases of Nitrate Compounds Generated from the Neutralization of Nitric Acid

The nitrate compounds produced from the complete neutralization (pH 6.0 or above) or partial neutralization (pH less than 6) or nitric acid are reportable under the nitrate compounds category if the appropriate threshold is met and should be included in all threshold and release calculations. In order to determine the quantity of a nitrate compound generated and released, the quantity of nitric acid released must be known (or calculated from the equations used in Examples 3 and 4 above) as well as the nitric acid treatment efficiency (calculated from the equations used in Examples 5 and 6 above).

The neutralization of nitric acid will most likely result in the generation of monovalent nitrate compounds (such as sodium nitrate and potassium nitrate). The quantity of these compounds formed in kilomoles will be equal to the quantity of the nitric acid neutralized in kilomoles. If divalent nitrate compounds are formed (such as calcium nitrate), the quantity of these compounds formed in kilomoles will be equal to one-half the quantity of the nitric acid neutralized in kilomoles. Similarly, if trivalent nitrate compounds are formed (such as iron (III) nitrate), the quantity formed of these compounds in kilomoles will be equal to one-third the quantity of the nitric acid neutralized in kilomoles. Note: to calculate the releases of nitrate compounds generated from the neutralization of nitric acid, the molecular weight of the nitrate

compound formed must be used. Molecular weights of some of the individual chemicals within the water dissociable nitrate compounds category are given in Table 3.

Example 7: In a calendar year, a facility transfers 50,000 pounds of nitric acid (HNO_3) to an on-site treatment facility. The nitric acid treatment efficiency is 95 percent, and the nitrate compound formed as a result of the treatment is sodium nitrate ($NaNO_3$). The quantity of nitric acid transferred that is neutralized (generating sodium nitrate) is 95 percent of 50,000 pounds or 47,500 pounds. The molecular weight of nitric acid is 63.01 kg/kmol, and the molecular weight of sodium nitrate is 84.99 kg/kmol. The quantity of nitric acid neutralized is converted first to kilograms then to kilomoles using the following equations:

Kilograms HNO_3 neutralized = (lbs HNO_3 neutralized) × (0.4536 kg/lb)
Kilomoles HNO_3 neutralized = (kg HNO_3) ÷ (MW of HNO_3 in kg/kmol)

Substituting the example values into the above equation yields:

Kilograms HNO_3 neutralized = 47,500 lbs × 0.4536 kg/lb = 21.546 kg

Kilomoles HNO_3 neutralized = 21,546 kg ÷ 63.01 kg/kmol = 341.9 kmol

The quantity of sodium nitrate generated in kilomoles is equal to the quantity of nitric acid neutralized (341.9 kmol). The quantity of sodium nitrate generated in kilomoles is converted first to kilograms then to pounds using the following equations:

Kilograms $NaNO_3$ generated = (kmol $NaNO_3$) × (MW of $NaNO_3$ in kg/kmol)
Pounds $NaNO_3$ generated = (kg $NaNO_3$) × (2.205 lbs/kg)

Substituting the values into the above equation yields:

Kilograms $NaNO_3$ generated = 341.9 kmol × 84.99 kg/kmol = 29,058 kg
Pounds $NaNO_3$ generated = 29,058 kg × 2.205 lbs/kg = 64,073 pounds (reported as 64,000 pounds)

The 64,000 pounds of sodium nitrate generated is the quantity used to determine whether thresholds have been met or exceeded. The quantity of nitrate ion released is calculated as in Example 1 above.

Section 2.4 Generation of Nitrate Compounds from Biological Wastewater Treatment

If a facility treats wastewater on-site biologically, using the activated sludge process, for example, the facility may be generating nitrate compounds as by-products of this biological process. The nitrate ion generated from this process will be associated with various counterions (e.g., sodium ion, potassium ion). In the absence of information on the identity of the counterion, a facility should assume for the purposes of EPCRA Section 313 threshold determinations that the counterion is sodium ion.

Section 3. CAS Number List of Some of the Individual Chemicals within the Water Dissociable Nitrate Compounds Category

EPA is providing the following table of CAS numbers and chemical names to aid the regulated community in determining whether they need to report for the water dissociable nitrate compounds category. If a facility is manufacturing, processing, or otherwise using a chemical which is listed below, they must report this chemical. However, this list is not exhaustive. If a facility is manufacturing, processing, or otherwise using a water dissociable nitrate compound, they must report this chemical, even if it does not appear on the following list.

Table D-3
Listing by CAS Number and Molecular Weight of Some of the Individual Chemicals within the Water Dissociable Nitrate Compounds Category

Chemical Name	Molecular Weight*	CAS Number
Aluminum nitrate, nonahydrate	213.00	7784-27-2
Ammonium nitrate	80.04	6484-52-2
Cerium (III) ammonium nitrate, tetrahydrate	486.22	13083-04-0
Cerium (IV) ammonium nitrate	548.23	10139-51-2
Barium nitrate	261.34	10022-31-8
Beryllium nitrate, trihydrate	133.02	7787-55-5
Cadmium nitrate	236.42	10325-94-7
Cadmium nitrate, tetrahydrate	236.42	10022-68-1
Calcium nitrate	164.09	10124-37-5
Calcium nitrate, tetrahydrate	164.09	13477-34-4
Cerium (III) nitrate, hexahydrate	326.13	10294-41-4
Cesium nitrate	194.91	7789-18-6
Chromium (III) nitrate, nonahydrate	238.01	7789-02-8
Cobalt (II) nitrate, hexahydrate	182.94	10026-22-9
Copper (II) nitrate, trihydrate	187.56	10031-43-3
Copper (II) nitrate, hexahydrate	187.56	13478-38-1
Dysprosium (III) nitrate, pentahydrate	348.51	10031-49-9
Erbium (III) nitrate, pentahydrate	353.27	10031-51-3
Gadolinium (III) nitrate, hexahydrate	343.26	19598-90-4
Gallium nitrate, hydrate	255.73	69365-72-6
Iron (III) nitrate, hexahydrate	241.86	13476-08-9
Iron (III) nitrate, nonahydrate	241.86	7782-61-8

Table D-3 (Continued)

Chemical Name	Molecular Weight*	CAS Number
Lanthanum (III) nitrate, hexahydrate	324.92	10277-43-7
Lead (II) nitrate	331.21	10099-74-8
Lithium nitrate	68.95	7790-69-4
Lithium nitrate, trihydrate	68.95	13453-76-4
Magnesium nitrate, dihydrate	148.31	15750-45-5
Magnesium nitrate, hexahydrate	148.31	13446-18-9
Manganese (II) nitrate, tetrahydrate	178.95	20694-39-7
Neodymium (III) nitrate, hexahydrate	330.25	16454-60-7
Nickel (II) nitrate, hexahydrate	182.70	13478-00-7
Potassium nitrate	101.10	7757-79-1
Rhodium (III) nitrate, dihydrate	288.92	13465-43-5
Rubidium nitrate	147.47	13126-12-0
Samarium (III) nitrate, hexahydrate	336.37	13759-83-6
Scandium (III) nitrate	230.97	13465-60-6
Scandium (III) nitrate, tetrahydrate	230.97	16999-44-3
Silver nitrate	169.87	7761-88-8
Sodium nitrate	84.99	7631-99-4
Strontium nitrate	211.63	10042-76-9
Strontium nitrate, tetrahydrate	211.63	13470-05-8
Terbium (III) nitrate, hexahydrate	344.94	13451-19-9
Thorium (IV) nitrate	480.06	13823-29-5
Thorium (IV) nitrate, tetrahydrate	480.06	13470-07-0
Yttrium (III) nitrate, hexahydrate	274.92	13494-98-9
Yttrium (III) nitrate, tetrahydrate	274.92	13773-69-8
Zinc nitrate, trihydrate	189.39	131446-84-9
Zinc nitrate, hexahydrate	189.39	10196-18-6
Zirconium (IV) nitrate, pentahydrate	339.24	13986-27-1

*For hydrated compounds, e.g., aluminum nitrate, nonahydrate, the molecular weight excludes the weight of the hydrate portion. For example, the same molecular weight is provided for aluminum nitrate, nonahydrate and aluminum nitrate.

INDEX

The pages listed in bold text in the index correspond to the primary uses or definitions of the associated term. Additionally, this index includes a list of primary purposes for examples and common errors that are presented throughout the document.

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