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Prevention and Toxics
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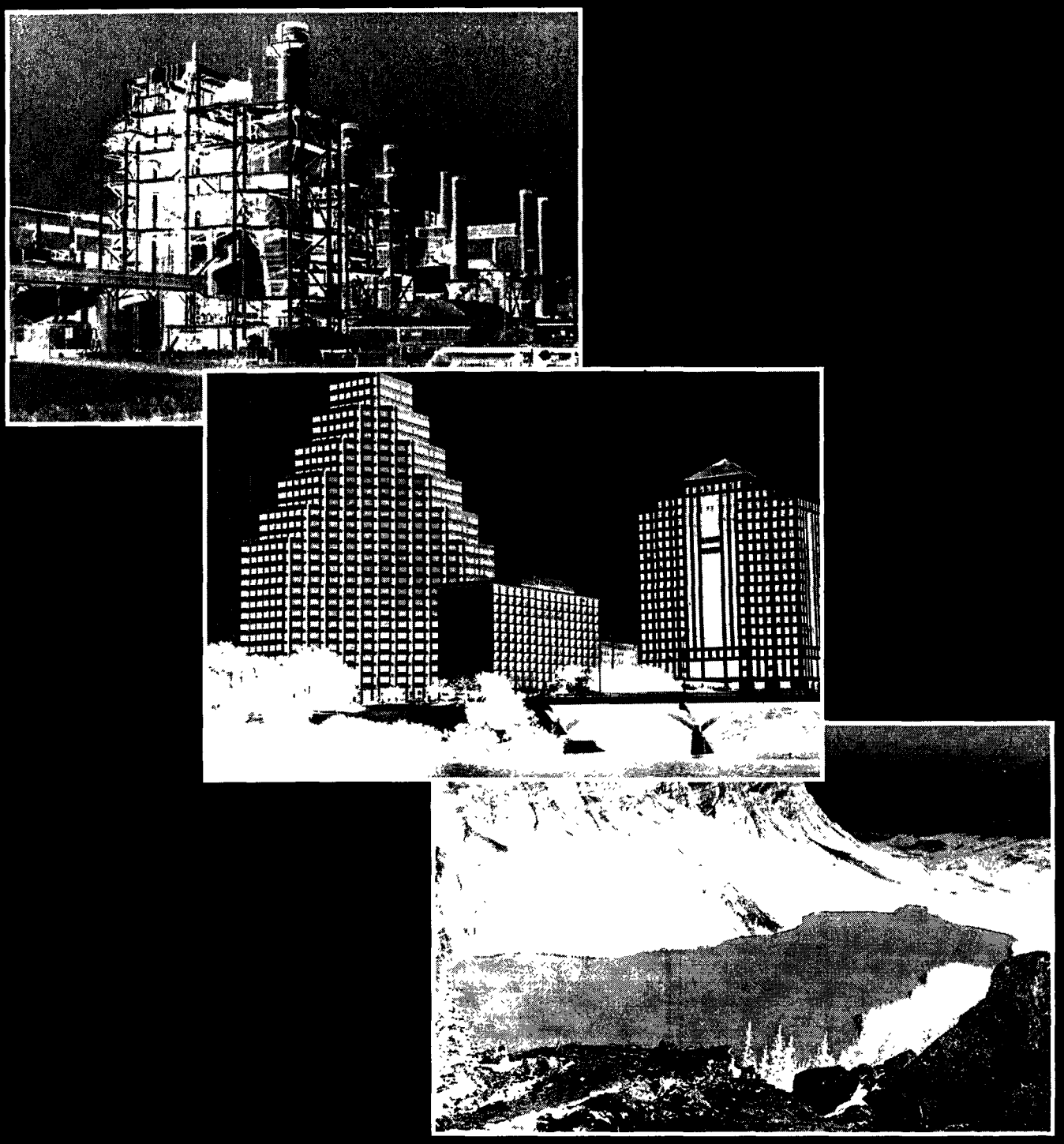
1994 and 1995 Toxic Release Inventory

Data Quality Report



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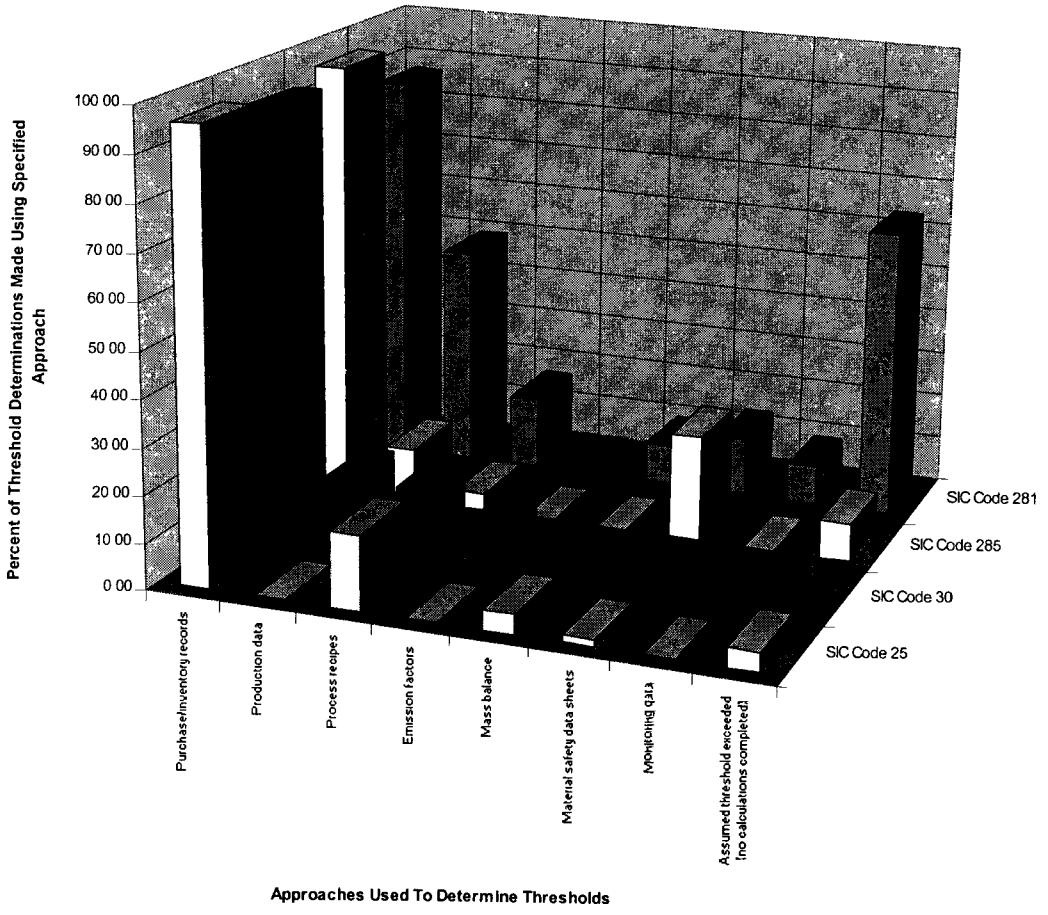
OVERVIEW

As part of a continuing effort to assess and to improve the quality of the data contained in the Toxic Release Inventory (TRI) database, the U.S. Environmental Protection Agency (EPA) conducted TRI data quality site surveys for the reporting years 1987, 1988, 1994, and 1995. The goals for these site 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. The figures in this overview present the significant findings from the site surveys conducted.

This report focuses on surveys completed for reporting years (RY) 1994 and 1995, as previous reports have presented findings from RY 1987 and RY 1988. Site surveys were completed at the following facilities:

- 25 facilities in SIC Code 25, furniture manufacturing, for RY 1994;
- 19 facilities in SIC Code 281, inorganic manufacturing, for RY 1994;
- 17 facilities in SIC Code 285, paint manufacturing, for RY 1994;
- 23 facilities in SIC Code 30, rubber and plastics manufacturing, for RY 1994;
- 10 facilities in SIC Code 26, pulp and paper manufacturing, for RY 1995; and
- 10 facilities in SIC Code 286, organic chemical manufacturing, for RY 1995.

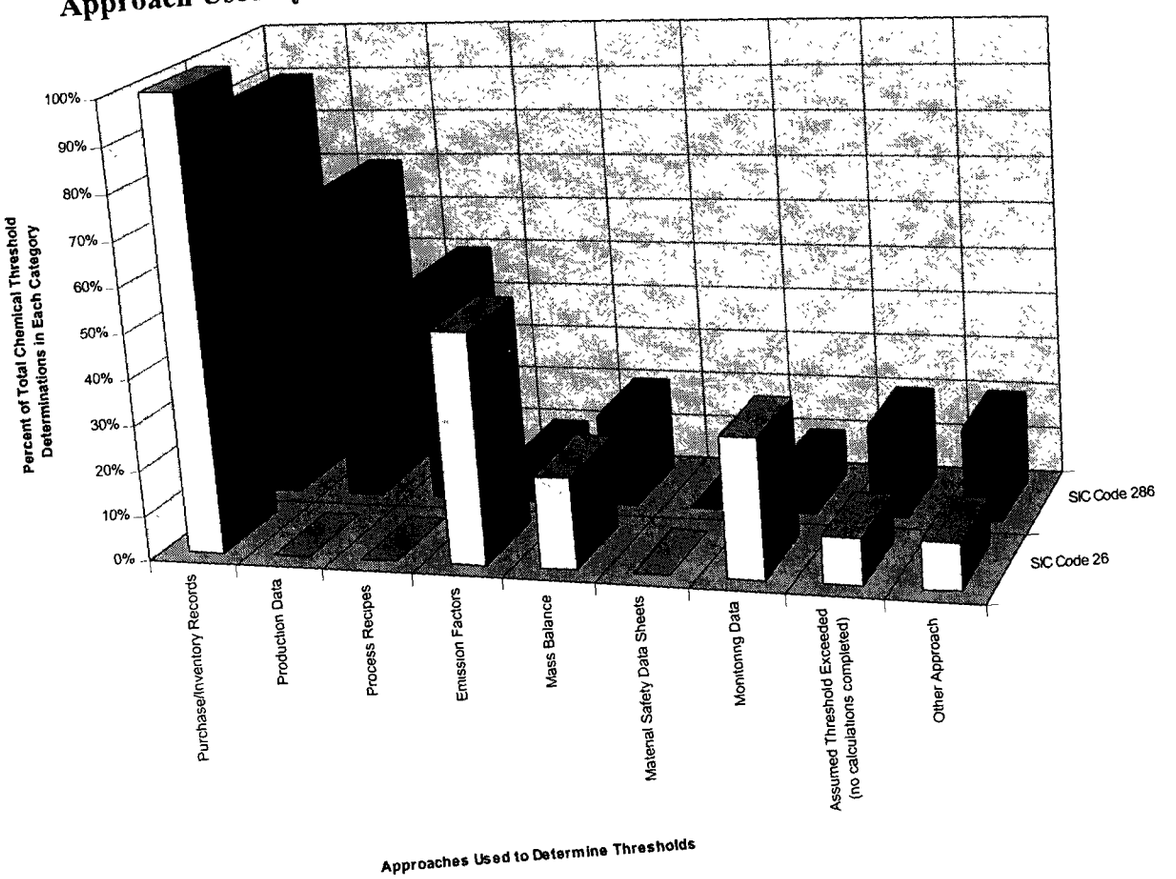
Approaches Used by Facilities to Make Threshold Determinations for RY 1994



Data for this figure can be found on Table 3-1

- Facilities primarily use purchasing records to make threshold determinations.
- Facilities in chemical manufacturing (SIC Code 281 - Inorganic Chemicals) use production data more frequently.
- Facilities in chemical manufacturing are more likely to assume thresholds are exceeded.

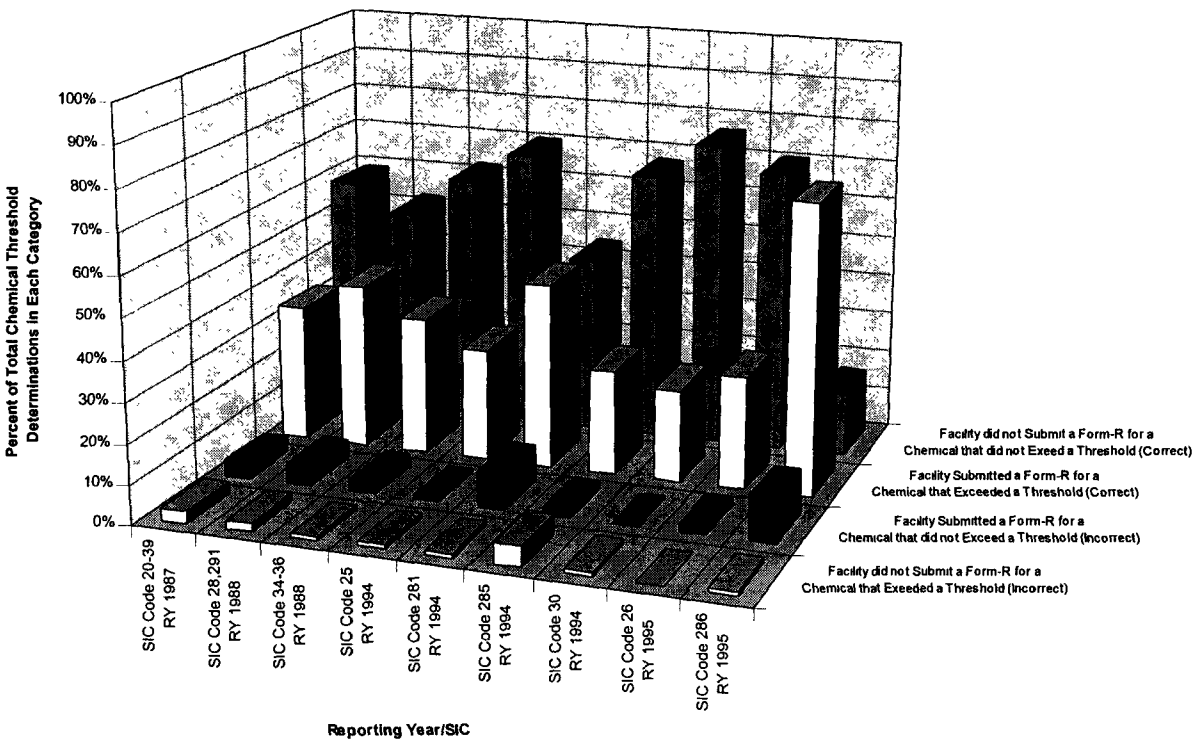
Approach Used by Facilities to Make Threshold Determinations for RY 1995



Data for this figure can be found on Table 3-1

- Facilities primarily use purchasing records to make threshold determinations.
- Facilities in chemical manufacturing (SIC Code 286 - Organic Chemicals) use production data more frequently.
- Facilities in chemical manufacturing are more likely to assume thresholds are exceeded.

Accuracy of Threshold Determinations by Reporting Year and SIC Code

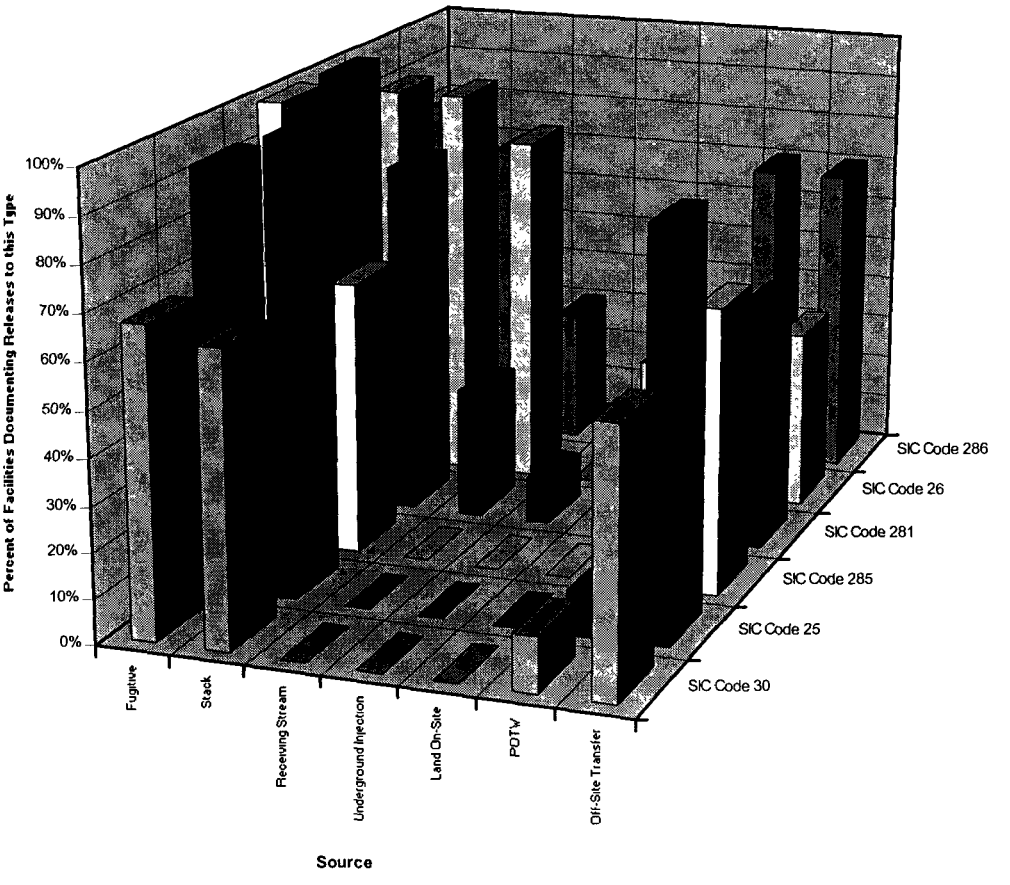


Note: The first two outcomes represent cases where facilities incorrectly determined thresholds, while the last two outcomes represent cases where facilities correctly determined thresholds. Figure 3-5 compares the correct and incorrect threshold determinations by reporting year and SIC Code.

Data for this figure can be found on Table 3-2.

- Facilities generally determine thresholds correctly over 90 percent of the time.
- Errors are generally evenly split between failing to report chemicals that exceed thresholds, and reporting on those that do not.
- Facilities in inorganic and organic chemical manufacturing (SIC Code 281 and 286) had the highest error rate, primarily for reporting for chemicals that don't exceed thresholds. This may be related to tendency in these industries to assume thresholds are exceeded.

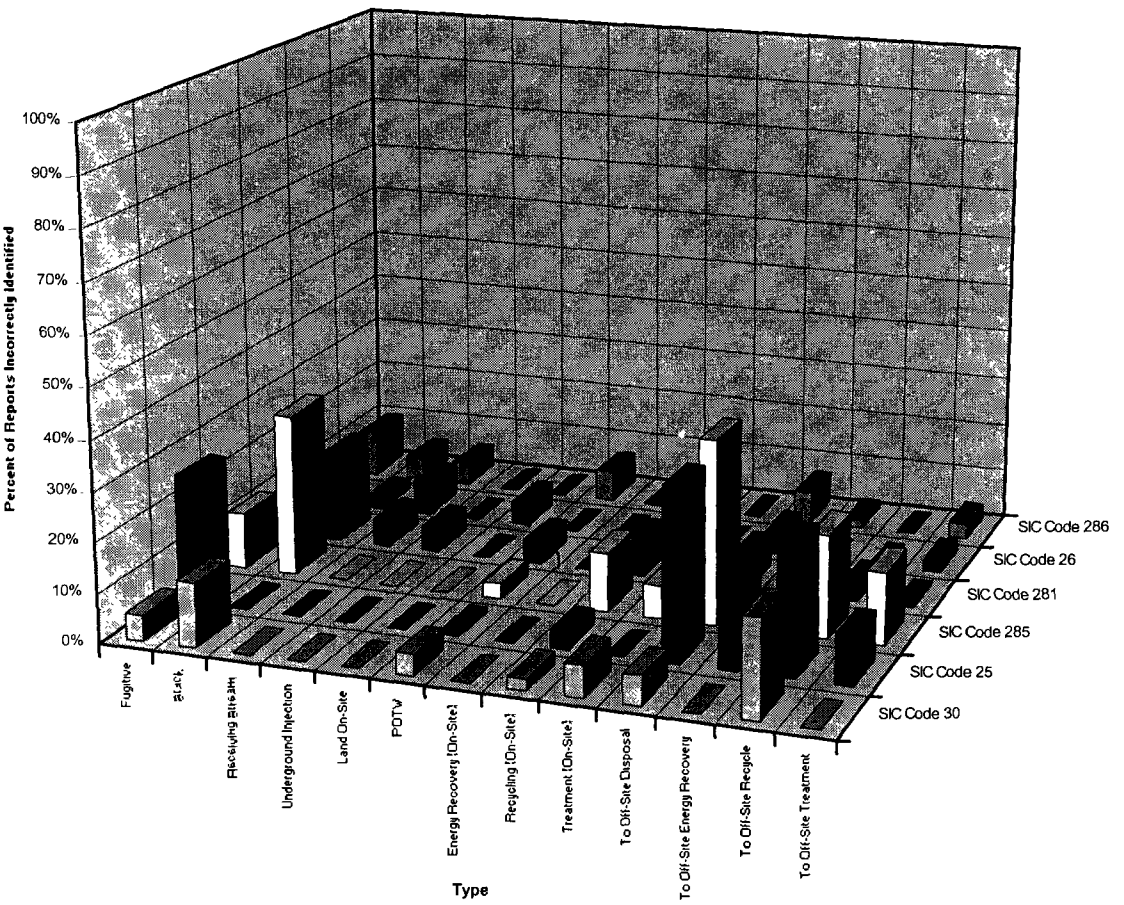
Distribution of Release and Other Waste Management Activity Types, RY 1994 and RY 1995



Data for this figure can be found on Table 4-1.

- Fugitive and stack releases and off-site transfers were observed at most facilities in all industry sectors.
- Some facilities in all industry sectors reported releases to POTWs.
- Most facilities in pulp and paper manufacturing reported releases to receiving streams.

Incorrectly Identified Release and Other Waste Management Activity Types for RY 1994 and RY 1995



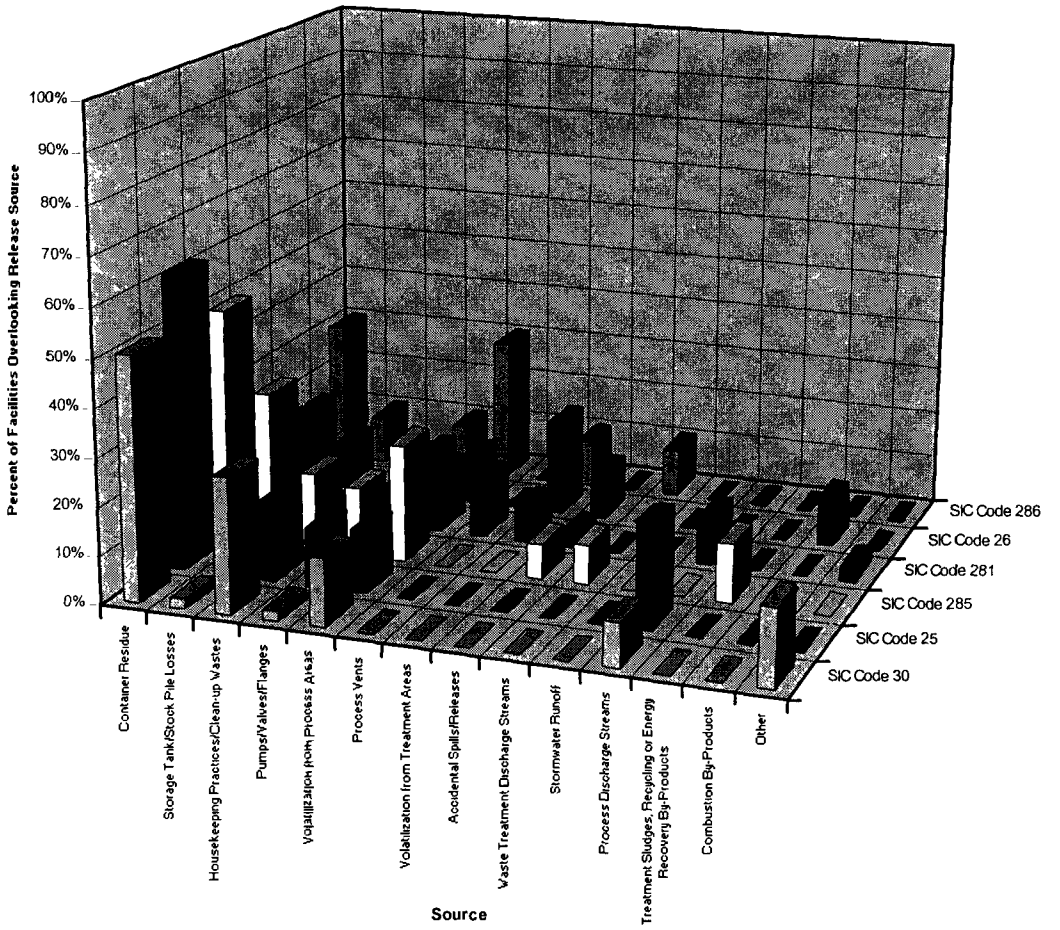
Data for this figure can be found in Table 4-2.

- Facilities often correctly identified releases and other waste management activities, but reported them to the wrong type (particularly between stack vs fugitive and between various off-site transfers).

- Quantities transferred to POTWs were correctly identified by most facilities.

- Releases to receiving streams and underground injection wells, and on-site waste management activities were rarely observed; therefore, they were rarely reported incorrectly.

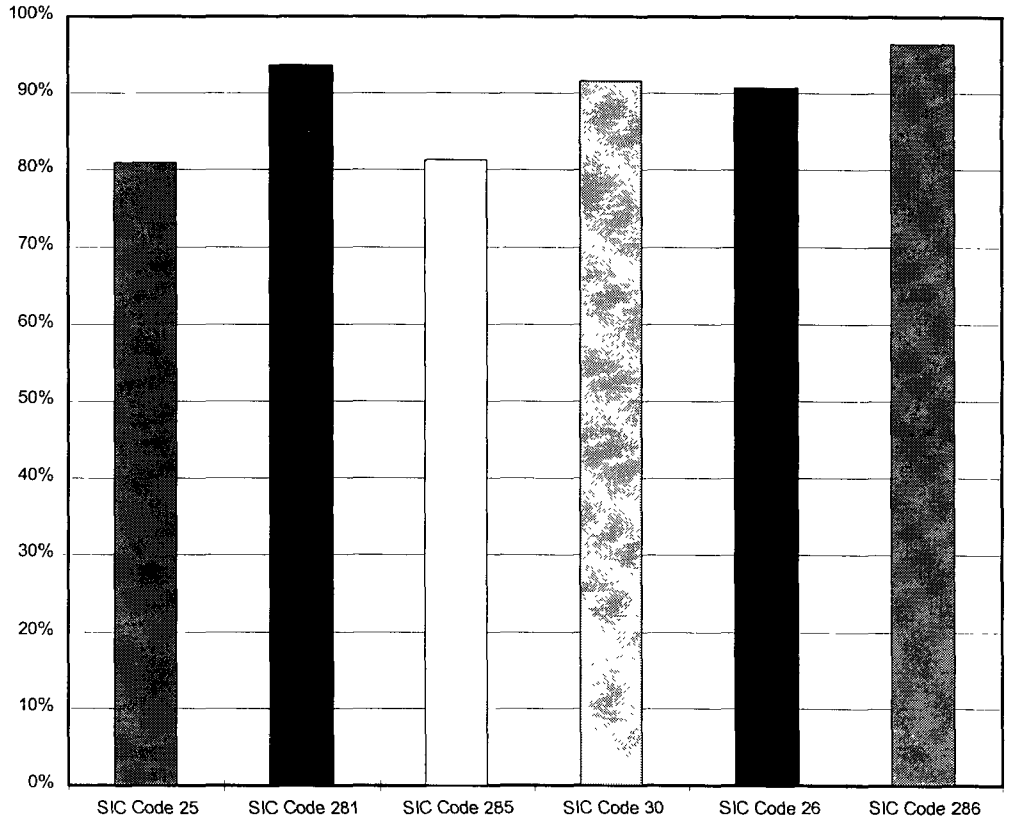
Overlooked Releases and Other Waste Management Activity Sources for RY 1994 and RY 1995



Data for this figure can be found on Table 4-3.

- Container residue was the most commonly overlooked release source.
- Some facilities in all industry sectors overlooked releases from container residue; pumps, valves, and flanges; and volatilization from process areas.
- A significant number of facilities also overlooked releases from storage tanks.

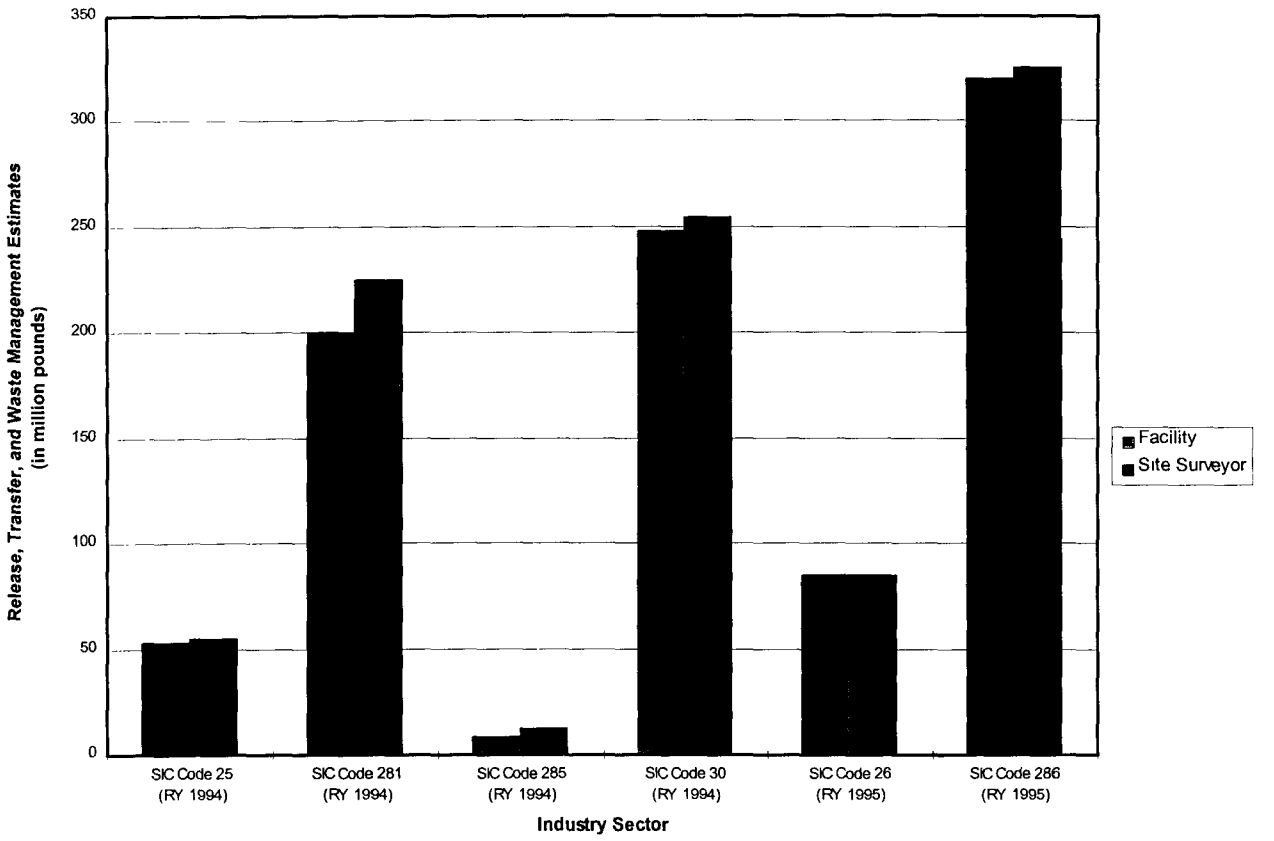
Frequency the Facility Used the Best Available Methodology to Estimate Releases and Other Waste Management Activities



- Most facilities in all industry sectors (greater than 80%) used an appropriate methodology to most accurately estimate releases.

- Note that this chart presents data on methodologies, and does not represent errors made in quantifying the releases.

Comparison of Facility and Site Surveyor Estimates of Total Releases and Other Waste Management Activities

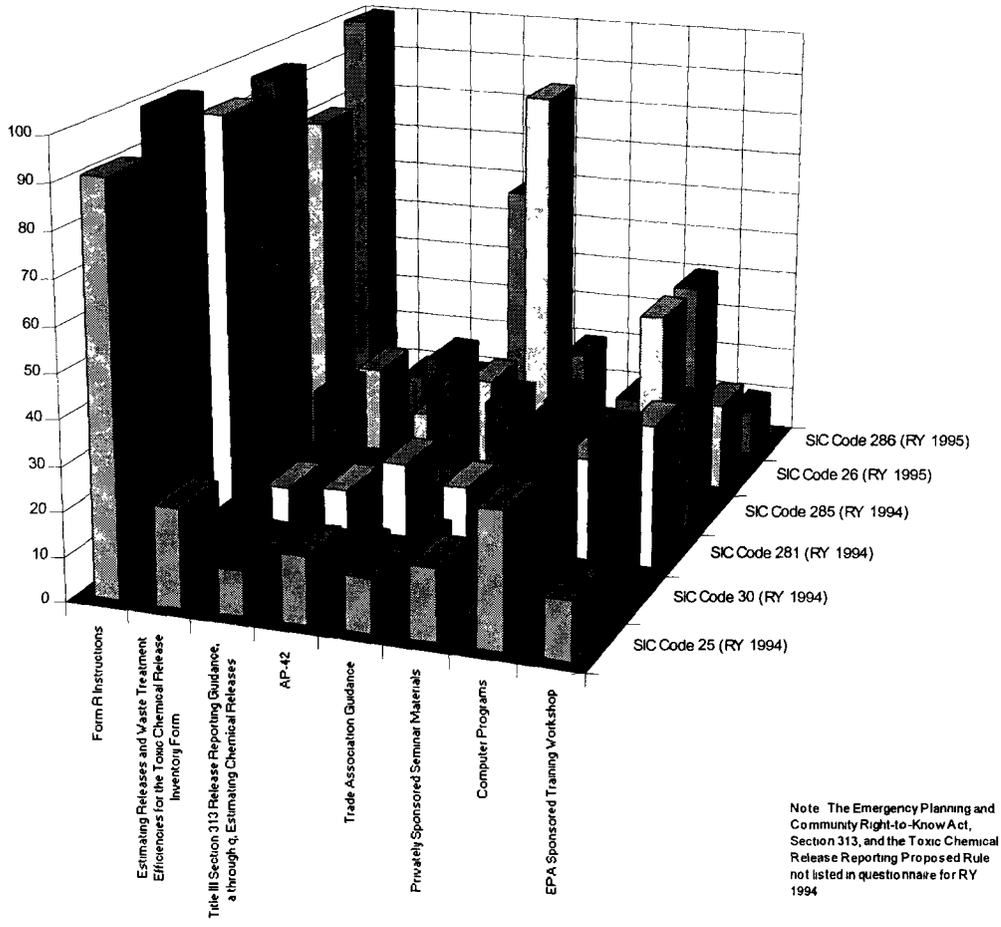


Data for this figure can be found on Tables 5-1 through 5-12

- Facility and site surveyor release estimates were in good agreement, calculated to be within ±3% for most SIC Codes.

- Facilities in SIC Code 286, the organic chemical manufacturing industry, tended to be larger than those in the other SIC Codes surveyed, and had more quantities released and other waste management activities.

Common References Used to Compile From Rs for RY 1994 and RY 1995



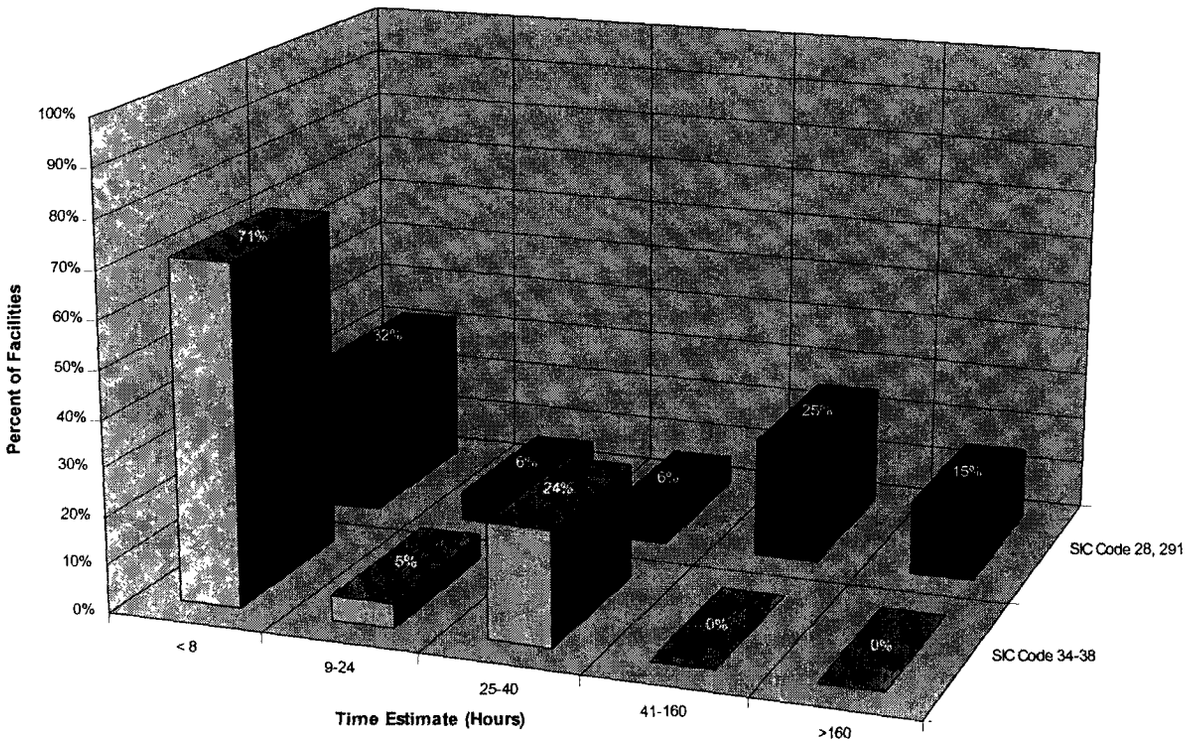
Data for this figure can be found on Table 6-3.

- Most facilities surveyed for RY 1994 and RY 1995 use the "Toxic Chemical Release Inventory Reporting Form R and Instructions" as their main reference in compiling Form Rs.

- Most facilities in SIC Code 26, the pulp and paper manufacturing industry, use trade association and NCASI guidance to complete Form Rs. Trade association guidance for this SIC Code is readily available and more detailed than the guidance generally available for facilities in other SIC Codes.

- Many facilities in SIC Code 286, organic chemical manufacturing, use AP-42 to estimate fugitive and stack releases.

Time Needed to Complete all Form Rs in RY 1988 for SIC Codes 28 and 291, and 34 - 38



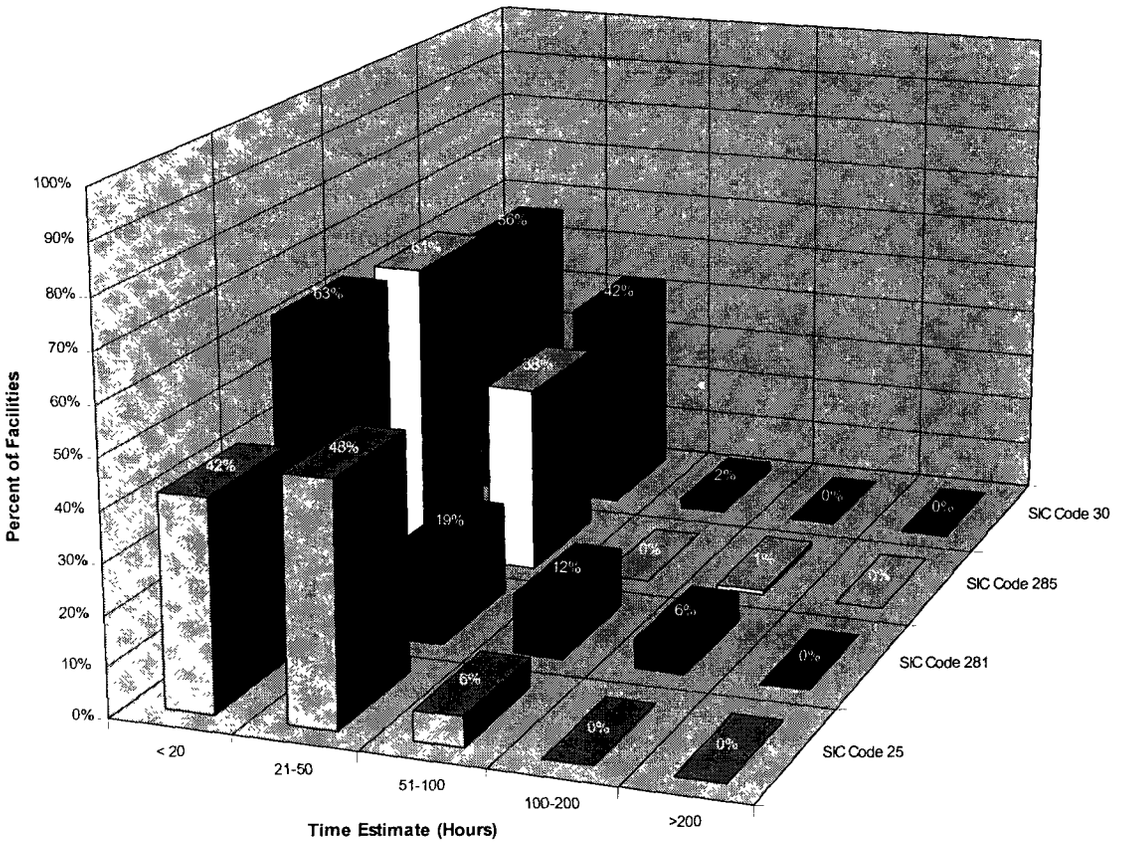
May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 6-4

- The majority of the facilities in SIC Codes 34-38 take less than 24 hours to complete all Form Rs.

- Many facilities in SIC Code 28 are large and have many Form Rs to complete. Thus, the total time to complete all Form Rs at these facilities is more than that of other SIC Codes.

Time Needed to Complete all Form Rs in RY 1994 for SIC Codes 25, 281, 285, and 30



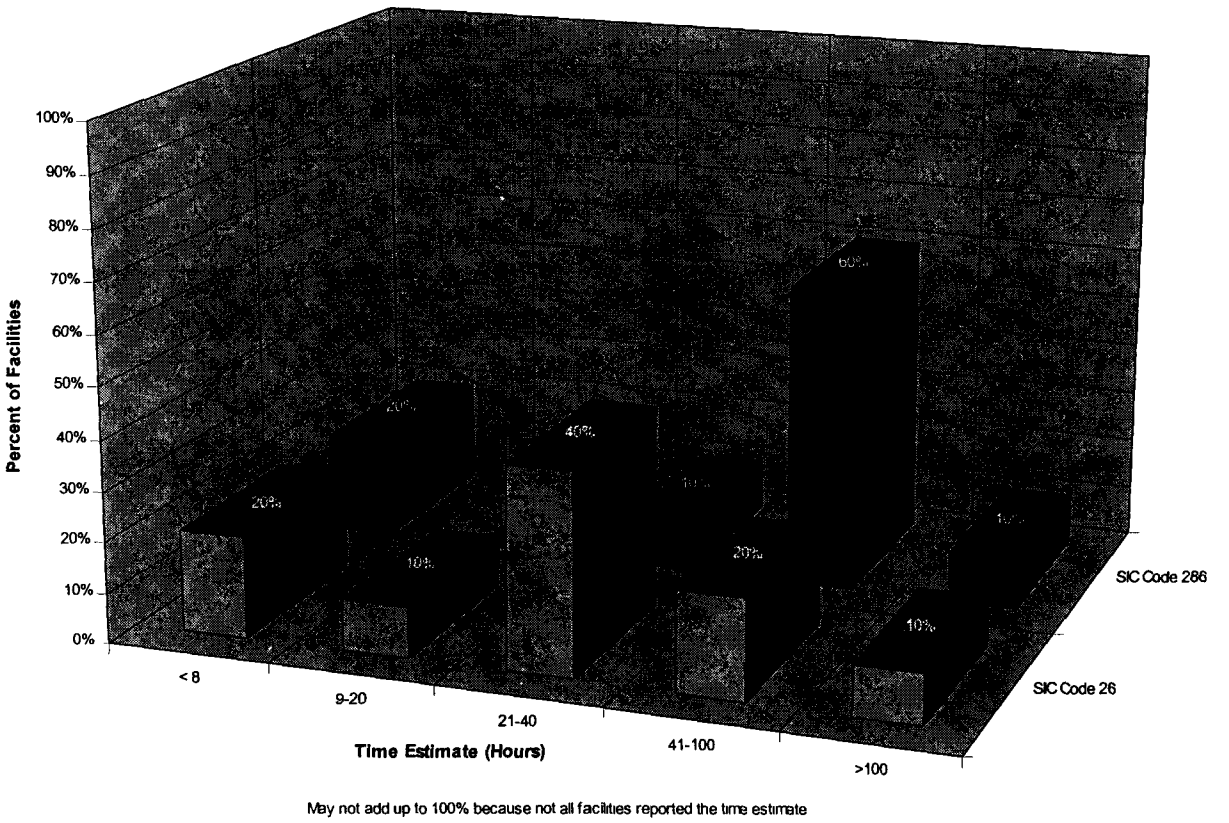
May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 6-5

- The majority of the facilities in SIC Codes 25, 281, 285, and 30 take less than 50 hours to complete all Form Rs.

- Using the maximum of hours in the lowest range checked, the average number of hours needed to complete each Form R in RY 1994 is 11.7 hours.

Time Needed to Complete all Form Rs in RY 1995 for SIC Codes 26 and 286

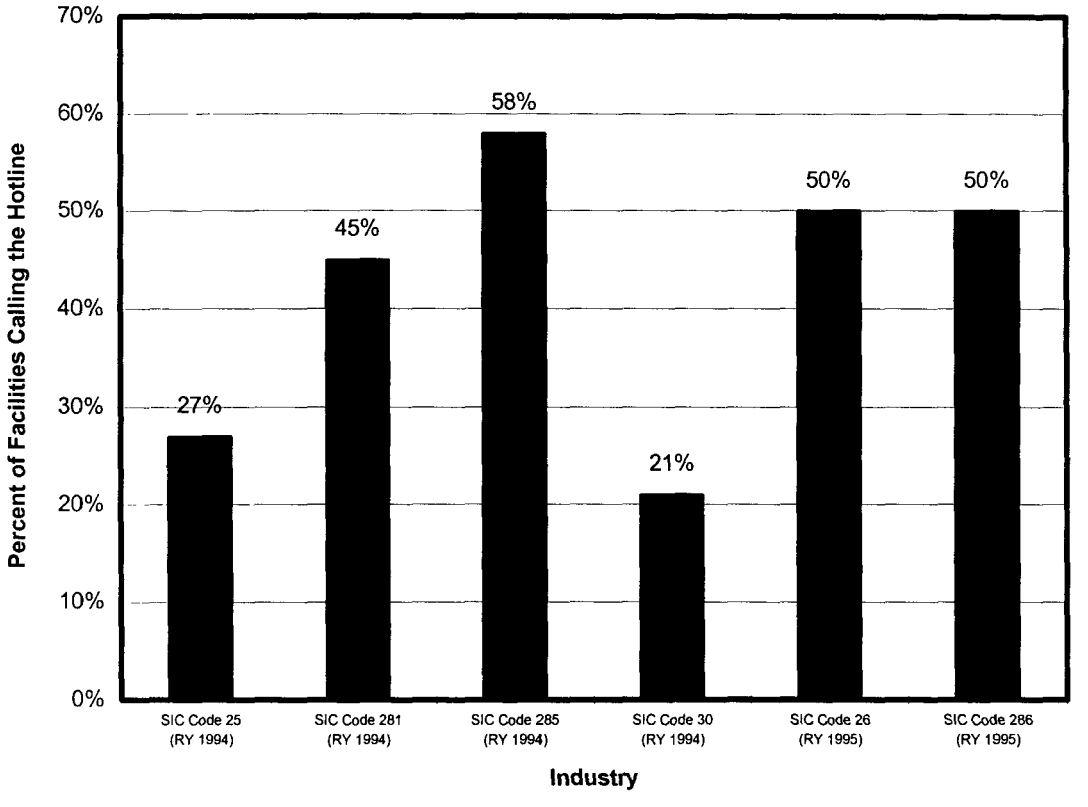


Data for this figure can be found in Table 6-6.

- Facilities in SIC Code 26 tended to be smaller in size and had fewer chemicals, and thus, took less time filling out Form Rs for all chemicals than those facilities in SIC Code 286.

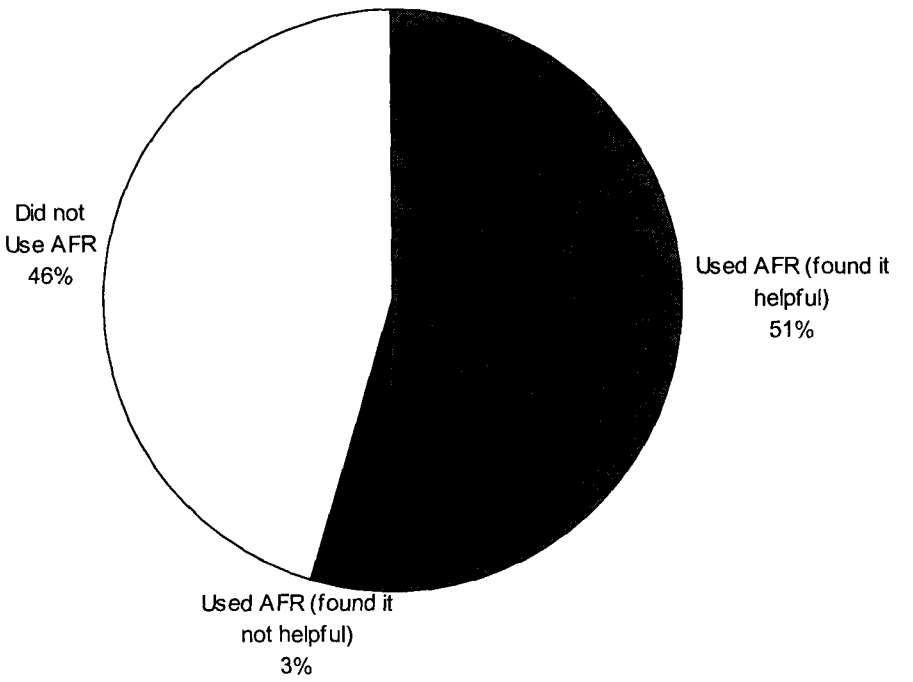
- Using the maximum number of hours in the lowest range checked, the average number of hours needed to complete each Form R in RY 1995 is 9.0 hours.

Percent of Facilities Calling the EPCRA Hotline by Industry for RY 1994 and RY 1995



- Facilities in SIC Code 25, the furniture manufacturing industry, and in SIC Code 30, the rubber and plastics industry, called the hotline less than facilities in the other SIC Codes surveyed.

Percent of Facilities Using the Automated Form R for RY 1994 and RY 1995



- Approximately half of the facilities surveyed used the automated Form R.
- Of the facilities who used the automated Form R, most found it helped to reduce reporting errors.

1.0 INTRODUCTION

Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) required the U.S. Environmental Protection Agency (EPA) to collect information concerning releases and other waste management activities of toxic chemicals to the environment from manufacturers, processors, and users of listed toxic chemicals. In order to collect such information, EPA implements a yearly reporting requirement from such facilities. Reports referred to as Form R chemical reports are due to EPA by July 1 each year to fulfill the reporting requirement for the previous calendar year. The reporting requirement was first implemented for the 1987 calendar year. The study discussed in this report reviewed data from the 1994 and 1995 reporting years (RY 1994 and RY 1995, respectively). Data for Standard Industrial Classification (SIC) Codes 25, 281, 285, and 30 were reviewed for RY 1994 and data for SIC Codes 286 and 26 were reviewed for RY 1995. SIC Codes 25, 281, 285, 30, 286, and 26 represent furniture manufacturing, inorganic chemical manufacturing, paint manufacturing, rubber and plastics manufacturing, organic chemical manufacturing, and pulp and paper manufacturing, respectively. This report also compares data for RY 1994 and RY 1995 to data from similar studies completed for the 1987 and 1988 reporting years. The data from the Form R chemical reports are compiled in EPA's Toxics Release Inventory database (TRIS) for future analysis, distribution, and evaluation. The information collected under EPCRA, Section 313 is useful for informing the general public and the communities surrounding affected facilities of releases and other waste management activities of toxic chemicals, assisting in focusing the Agency's research into the effects and control of toxic substances, and aiding in the development of regulations, guidelines, and standards.

For 1994, a total of approximately 76,500 Form R reports covering all SIC Codes required to report toxic chemicals were submitted to EPA by approximately 23,000 facilities and entered into the TRIS database. At the time the site surveys for RY 1994 were conducted, 12,896 Form Rs had been submitted and incorporated in the TRIS database for 3,764 facilities in SIC Codes 25, 281, 285, and 30. For RY 1995, a total of approximately 74,500 Form R reports covering all SIC Code codes required to report toxic chemicals were submitted to EPA by approximately 22,000 facilities. At the time the site surveys for RY 1995 were conducted, 402

facilities had been identified in the TRIS database as SIC Code 286 submitters and 165 facilities had been identified as SIC Code 26 submitters.

1.1 EPA's Overall Quality Assurance Program

Because of the wide audience and many intended uses of the Toxics Release Inventory database, EPA designed and implemented a program to assess the quality of the data collected under Section 313 and to identify areas where improved guidance would be useful for improving the accuracy of future reported data. The site surveys described in this report are a component of EPA's overall quality assurance program.

1.2 Site Survey Objectives

EPA's site surveys were designed to provide a quantitative assessment of the accuracy of the data submitted for a calendar year by identifying the frequency and the magnitude of errors in the Form R data and the reasons these errors occurred. EPA believed that on-site review of industrial processes, pollution control technologies, and documentation supporting the Form R reports would reveal errors in the database not obvious from review of a facility's Form R submissions. Expected error types included overlooked chemicals, incorrectly included chemicals, and errors in the release and other waste management quantity estimate calculations. The goal of the surveys was to obtain information that could be used to improve the Form R reporting instructions and definitions, and thus improve the quality of data in the TRIS database in future years.

Users of the results of the site survey program, as well as the TRI database itself, should be aware of a basic limitation of the Emergency Planning and Community Right-to-Know Act (EPCRA) reporting process. Under EPCRA (Title III of the Superfund Amendments and Reauthorization Act), facilities are not required to perform any additional monitoring or measurement of the quantity of toxic chemicals released to the environment to calculate Form R release estimates. Therefore, the methods selected by facilities to estimate releases and other waste management quantities depend on the nature of the data available to facility personnel, and the quality of these release and other waste management quantity estimates in turn depends on both the proper application of the estimation methods and on the quality of available data. At

facilities where supporting data were available, surveyors carefully examined the estimation calculations and data sources and then recalculated the estimates. In many instances, the site surveyors were able to identify data sources overlooked by facility personnel, and these new data were used to recalculate release and other waste management quantity estimates during the site visits. However, site surveyors did not conduct any monitoring or measurements during the site visits. Site surveyors also assessed the quality of the estimation methods by recalculating releases and other waste management quantities using alternative approaches where more accurate estimation methods were appropriate and where available data warranted.

1.3 EPA Site Surveys

EPA has conducted four sets of quality assurance site surveys since the first submittal of Form Rs from industry. The RY 1987 site surveys covered all SIC Codes affected by the EPCRA Section 313 (SARA Title III) requirements. The RY 1988 site surveys covered SIC Codes 28, 291, and 34 - 38. These SIC Codes were targeted because data for the 1987 reporting year showed that facilities in these SIC Codes accounted for a substantial portion of the total releases from all reporting facilities in 1987.[1]

The approach used for the RY 1994 and RY 1995 site surveys was similar to that used for the RY 1987 and RY 1988 programs. Training of site surveyors, the contents of the survey instrument, and activities conducted on site for RY 1994 and RY 1995 were similar to the previous programs. However, the SIC Codes included in the site visits differed slightly from those studied in previous years. The RY 1994 site surveys focused on facilities in SIC Codes 25, 281, 285, and 30; and the RY 1995 site surveys focused on facilities in SIC Codes 26 and 286. These SIC Codes were targeted because previous reporting years showed that facilities in these SIC Codes account for a substantial portion of the total releases and other waste management quantities. The results of the RY 1994 and RY 1995 site surveys will help EPA identify ways additional guidance can be structured to improve the overall quality of the data generated under EPCRA (SARA Title III, Section 313) reporting.

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[1]The results of these surveys are provided in Radian reports entitled Assessment of Data Quality in the 1987 Toxic Release Inventory: Site Visit Program (March 1990), and Site Visit Program to Assess 1988 Toxic Release Inventory Data Quality (July 1991).

2.0 APPROACH

A very structured approach was established for the site surveys to ensure consistency in conducting site surveys and accuracy of the results. The approach was orginially established for the RY 1987 and RY 1988 site surveys and was improved for the RY 1994 and RY 1995 site surveys based on experience from the previous programs.

The approach for performing the RY 1994 and RY 1995 site surveys, shown schematically in Figure 2-1, consisted of the following steps:

(1) Revising the Survey Instrument;

(2) Selecting facilities to be visited (Sample Selection);

(3) Training site surveyors (Training);

(4) Arranging Site Visits;

(5) Performing site visits (Site Visit Methodology);

(6) Data Management and Data Quality Assurance; and

(7) Data analysis and Reporting.

Each of these steps is discussed in the following subsections.

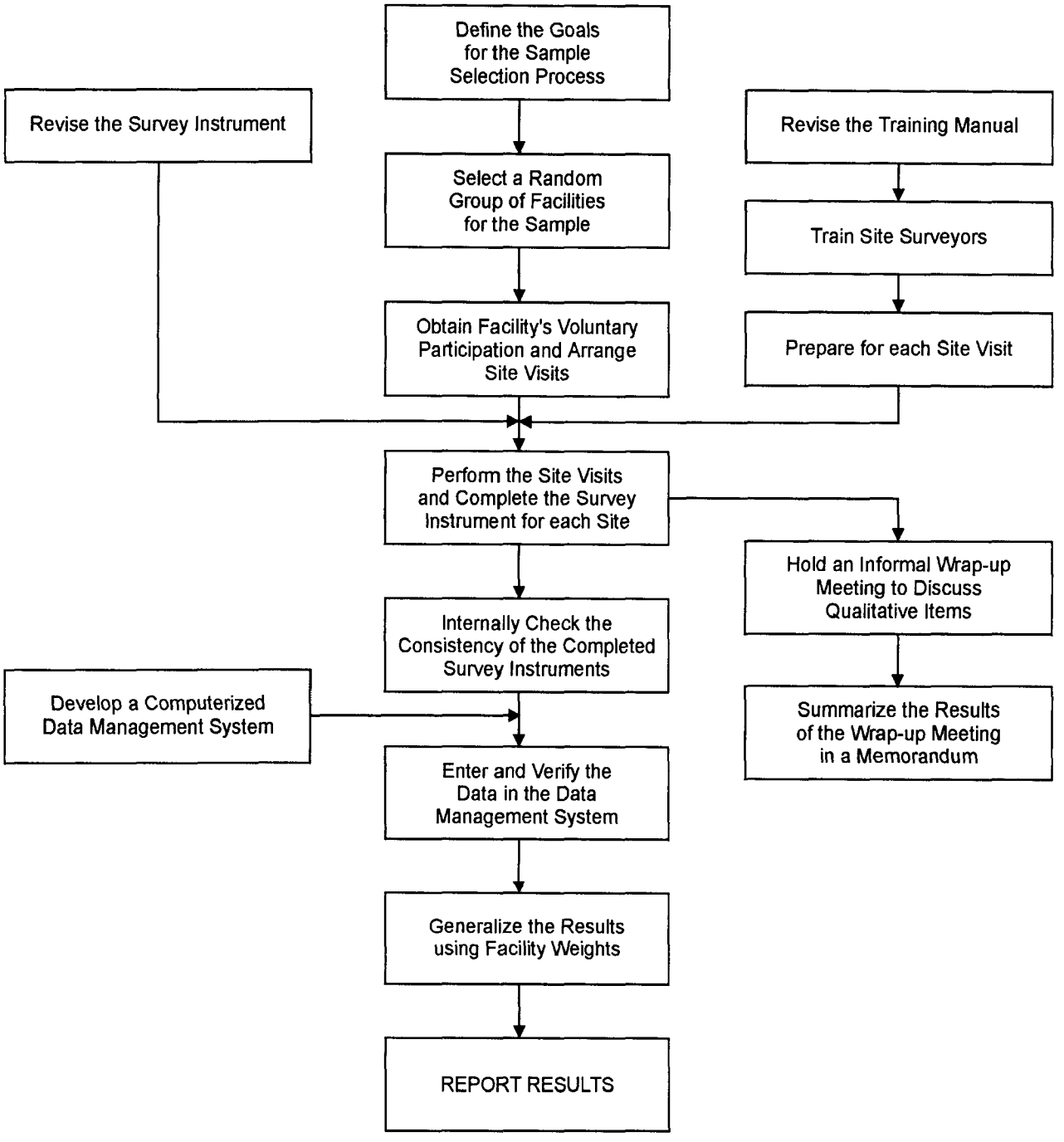


Figure 2-1. Approach used to Perform the EPCRA Section 313 Site Visit Program

2.1 Survey Instrument

The survey instrument, shown in Appendix A, was designed to standardize and facilitate the review of threshold determinations, release estimate calculations, and calculations used to assess other waste management activities at facilities. The engineers and scientists who performed the site surveys used the survey instrument as a detailed checklist to ensure that all pertinent items were reviewed, and also as a consistent format for recording both the data collected during site surveys and the errors made by facility personnel on their Form R reports. In addition to its primary focus on chemical-specific information, the survey instrument contains questions regarding the usefulness of the reporting instructions, EPCRA Section 313 hotline, and the other published guidance materials. A question on the usefulness of the Toxic Chemical Release Inventory Form A (Form A) was added for the visits conducted for RY 1995. Each section of the survey instrument focuses on identifying specific types of errors made by facility personnel on their Form R submittals.

The survey instrument used in the RY 1994 and RY 1995 data quality site visits was a revised version of the survey instrument used in the RY 1987 and RY 1988 programs. Most of the questions remained the same, but some additional questions concerning documentation available, possible sources for threshold determinations, source reduction activities, pollution prevention technology, and use of the Form A (for RY 1995) were added to clarify information received during the site visits and to assess the usefulness of the new guidance and materials available. The time increments for amount of time needed to complete all Form Rs at the facility were adjusted slightly in the RY 1995 survey instrument to obtain a more precise estimate of time needed. The format was also revised to make the survey instrument easier for the site surveyors to use.

2.2 Sample Selection

The primary objective of sample selection was to obtain a random group of facilities from the key industry groups within specific SIC Codes which were being surveyed to appropriately scale up the results to reflect the reporting of the entire SIC Code group. This

sample selection approach was used for Reporting Year 1987, 1988, 1994, and 1995 survey programs.

2.2.1 RY 1987 and RY 1988 Sample Selection

All industry groups required to report toxic chemicals under the EPCRA Section 313 program were first surveyed for Reporting Year (RY) 1987. Table 2-1 presents the distribution of facilities sampled among the SIC Codes for each year of the data quality site visits.

A target of 150 facilities was selected as the number of facilities needed to ensure the statistical validity of the data collected during the site visit program for RY 1987. Appendix B provides a detailed discussion of the procedure used to select the sample group of facilities, and also provides a description of the weighting system (i.e., the number of facilities in the TRI database represented by each sample point). Briefly, facilities submitting 15 or fewer Form R reports were divided into geographic clusters on the basis of the first three digits in their zip codes. A sample of geographic clusters was then selected according to a sampling scheme in which probability of selection is proportional to cluster size. The cluster size measure was the total number of facilities in the SIC Code group sampled. The clustering approach was used to minimize costs by reducing travel costs and travel time for site survey teams. A stratified random sample of facilities was drawn from each of the sample geographic clusters, based on the desired number of site visits in each SIC Code. This general procedure was used for sample selection for site surveys conducted for RY 1987 and RY 1988.

Facilities with 15 or fewer Form Rs were selected due to the limited time and budget available. Only a few facilities have 16 or more Form Rs and site visits to those facilities would have taken considerable time, limiting the number of facilities that could be visited. Since the same facility personnel may complete multiple reports at a given facility, visiting more facilities presents a better representation of the range of reporting practices.

Table 2-1

Distribution of Facilities Among the SIC Codes For Each Year of the Data Quality Site Visits

SIC Code	Number of Facilities Visited			
	RY 1987	RY 1988	RY 1994	RY 1995
20	16			
22	5			
23	1			
24	2			
25	2		25	
26	14			10
27	3			
28	44	43	37[a]	10
29	0	1		
30	7		23	
32	2			
33	16			
34	16	8		
35	5	10		
36	11	14		
37	7	10		
38	2	3		
39	3			
Total	156	89	85	20

[a]One of the facilities visited was in SIC Code 282. The results of this survey are not included in the analysis of data for SIC Code 281 and 285.

A target sample size of 90 completed site visits was the goal of the site visit program for RY 1988. Details of the sample design and weighting methodology are described in Appendix B (and follow the same general procedure as RY 1987). For RY 1988 facilities submitting 30 or fewer Form R reports were targeted, rather than facilities with 15 or fewer Form Rs as in other years.

2.2.2 RY 1994 and RY 1995 Sample Selection

The key industries sampled for the RY 1994 Toxic Release Inventory (TRI) data quality site survey were furniture manufacturing, paint manufacturing, chemical manufacturing, and rubber and plastics manufacturing. Key industries sampled for the RY 1995 TRI data quality site survey were the organic chemicals manufacturing and pulp and paper industries. Facilities in these industry groups were selected because they accounted for a substantial portion (approximately half) of the total releases reported by facilities for the 1994 and 1995 reporting years. The sample does not include facilities outside the above listed industry groups and therefore does not represent the entire population of facilities that reported to the TRI.

Facilities engaged in furniture manufacturing were defined as those having a two-digit SIC Code of 25. Facilities engaged in chemical manufacturing (SIC Code 28) were ultimately refined to include only those facilities engaged in inorganic chemical manufacturing with an SIC Code of 281, and paint manufacturing with an SIC Code of 285. Rubber and plastics manufacturing facilities have an SIC Code of 30.

A target sample size of 40 completed site visits, divided evenly between SIC Codes 281 and 285, was established for the first part of the RY 1994 site visit program. A target sample size of 50 completed visits, divided evenly between SIC Codes 25 and 30, was the goal of the second part of the RY 1994 site visit program. As discussed in Section 2.2.1, a stratified random sample of facilities was drawn from a set of geographic clusters. The 1995 site visit program targeted 20 completed site visits at facilities in SIC Codes 286 and 26 (10 visits each). The geographic clustering approach was not used for RY 1995 because the sample set in the SIC Codes chosen was small. A total random sampling was done for RY 1995. Details of the sample design and weighting methodology are described in Appendix B.

2.3 Site Surveyor Selection and Training

To complete the site visit program as efficiently as possible, the engineers and scientists staffing the program were selected on the basis of their experience in performing environmental audits of industrial processing facilities, and were required to have a thorough understanding of chemistry, technical calculations, multimedia environmental concerns, and pollution control technologies. The quality assurance reviewers for the site surveys were all from one office and remained consistent throughout the program.

A surveyor training program was developed to ensure consistency and high quality work among all site surveyors. The training program consisted of three steps:

1) Compiling a comprehensive training manual, including copies of EPA guidance documents and other references;

2) Holding training sessions to familiarize project personnel with program requirements; and

3) Review of the completed survey instruments with the site surveyor by the reviewer to maintain a consistent approach among the surveyors.

2.4 Arranging Site Visits

The goal in arranging site visits was to provide each facility in the sample with an equal opportunity to participate in the site visit program, thus ensuring the statistical validity of the approach. Participation was voluntary; the facilities were not legally required to participate. A key factor encouraging voluntary participation was the assurance of anonymity to the facilities. Names, location, and all other facility identification data are shielded from the Agency. Upon facility request, a written confidentiality agreement was signed by the contractors.

As a first step, introduction letters (copies of these letters are provided in Appendix C) were sent to each facility's technical contact, and where appropriate, to each facility's senior management official. These letters contained explanations of the purpose of the quality assessment program and the anticipated burden on and benefits to the facility, and

assurance to the facility that all facility-specific data would be treated as confidential. ERG followed these letters with telephone calls to the technical contacts at the facilities to solicit their participation, and for those facilities agreeing to participate, to arrange a date for the site visit and to review a preliminary agenda for the site visit.

2.5 Conducting Site Visits

The goal of the site visit was to collect all the information needed to complete the survey instrument accurately, while minimizing burdens on facility staff. On-site survey activities included tours of the facilities, which focused on material storage areas, industrial processing operations, and pollution control equipment; careful review of all readily available documentation, which could include MSDSs, production data, monitoring data, purchasing records, and facility spreadsheets or computer software with this information; and interviews with appropriate facility employees regarding documentation materials. Site surveyors did not perform any monitoring or measurements during the site visits.

The site visits were designed to determine:

1) Overlooked chemicals;
2) Releases and other waste management activities;
3) Errors in the Form R reports submitted to EPA; and
4) Whether more accurate release estimation methods could have been used, based on information available to the facilities.

Releases and other waste management estimates were either recalculated or recreated by site surveyors from available documentation during the visit. Site surveyors recorded these results on the survey instrument and reviewed the results with facility personnel before leaving the site. A wrap-up meeting at the facility with the person who filled out the Form R reports was held at the end of the visit to discuss any issues or questions that the facility contact had and to go over the conclusions and recommendations of the site surveyor. Follow up with the facility contact after the on-site visit occurred when regulatory issues which needed EPA clarification or additional research was required.

2.5.1 Data Collection

Site surveyors reviewed 295 Form R chemical reports and 728 additional chemicals with amounts used or activities which did not meet the reporting criteria at the 85 facilities visited for RY 1994, and 139 Form R chemical reports and 171 additional chemicals with amounts used for activities which did not meet the reporting criteria at the 20 facilities visited for RY 1995. Threshold determinations, releases, and other waste management estimates were reviewed separately to identify the frequency, magnitude, and sources of errors in these areas. Site surveyors followed the stepwise approach described in the Form R reporting instructions for completing threshold determinations, releases, and other waste management estimates. In following the Form R reporting instructions, facilities must first assess which chemicals are manufactured, processed, or otherwise used in excess of appropriate thresholds. Facilities must then estimate and report all releases to the environment and other quantities of listed chemicals exceeding a threshold managed as waste.

2.5.2 Threshold Determinations

The following types of errors may be made by facilities in determining which chemicals at their site meet a EPCRA Section 313 thresholds:

- Overlooking a chemical;
- Incorrectly calculating a threshold amount;
- Incorrectly applying an exemption; and
- Misclassifying a chemical activity.

To identify errors in threshold determinations, site surveyors looked for problems in a facility's documentation and, on the plant tour, site surveyors looked for evidence of chemicals that were reported but should not have been reported, and for evidence of chemicals that were not reported but should have been reported. Each facility's documentation was reviewed to track the decision process used to determine whether a chemical should have been reported. Furthermore, site surveyors used all available documentation to recalculate threshold

estimates for reported chemicals and for chemicals present but not reported to verify the accuracy of facility calculations.

2.5.3 Release and Other Waste Management Estimates

The following types of errors may be made by facilities in calculating release estimates for EPCRA Section 313 chemicals:

- Overlooking a chemical;
- Overlooking a source of data;
- Incorrectly calculating a release or other waste management quantity; and
- Incorrectly interpreting the reporting instructions.

A two-part approach was used for identifying errors in releases and other waste management activity estimates. First, site surveyors always recalculated releases and other waste management quantities using the same technical approach used by the facility. Second, whenever the site surveyor's experience and training indicated that a calculation approach different than that used by the facility was appropriate, the surveyor attempted to obtain the data needed to calculate releases and other waste management quantities using the more appropriate approach. In many such instances, data were not readily available during the site visit to recalculate these amounts using the alternative approach. In the cases where site surveyors were able to recalculate releases and other waste management amounts using alternative approaches, they were able to assess the reasonableness of the estimation techniques used by facility personnel.

The surveyors quantified all numerical differences between the facility's estimates and the recalculated values, even in instances where surveyors identified only small differences. As discussed later, these numerical differences were used to assess quantitatively the accuracy of the total aggregate releases and other waste management quantities contained in the TRI database.

2.6 Data Management/Data Quality Assurance

Many steps were taken to ensure the data quality of the surveyor's estimates and the verification of the data in the database. This section outlines the procedures taken to review the Survey Instruments after they have been completed by the site surveyor, the database system, and the data entry into the master database; the verification procedures for the data entered into the database; the weighting of the data to apply the results to the entire population of facilities for each SIC Code surveyed; and potential sources of error in the site survey program.

2.6.1 Quality Review of Survey Instrument and Data Entry

All survey instruments were reviewed twice by a consistent set of reviewers to ensure the calculations and methodologies used were correct and consistent for all site surveys. The data entry for all site surveys was also done twice. These database entries were compared to each other, and then verified with the actual survey if an inconsistency was found. Project staff also reviewed the database entries for internal consistency and completeness by comparing responses to various questions as appropriate.

2.6.2 Data Weighting

To allow EPA to assess the impact of the site survey program results on the TRI database for the SIC Codes surveyed, weighting factors were applied to the site visit data. These factors or "weights" represent the number of facilities in the TRI database represented by each of the surveyed facilities. The weights of each surveyed facility are based on the measure of size of the geographic cluster in which the facility is located, and the systematic probability of selecting that facility proportional to that measure of size.

The weights for the sample facilities in each SIC Code group are summed up to represent the total population of facilities included on the TRI for that SIC Code group. A total population of 535 facilities for SIC Code 25, 1872 facilities for SIC Code 30, 662 facilities for SIC Code 285, and 695 facilities for SIC Code 281 is represented for RY 1994. A population of

402 facilities for SIC Code 286 and 165 facilities for SIC Code 26 is represented for RY 1995. The weights used for facilities in SIC Codes 25, 281, 285, and 30 are presented in Appendix B.

2.6.3 Limitations of the Analysis

The design and implementation of the survey may have introduced unavoidable inaccuracies in the study results. The three primary sources of error are:

- sample selection bias;
- survey implementation; and
- data reduction and analysis.

The relatively small number of facilities sampled clearly introduced a sample selection bias -- the smaller the number of facilities sampled the greater the likelihood that these facilities do not accurately represent the universe of reporting facilities. For the selected sample size of 40 facilities in SIC Code 28, the 90 percent confidence interval is plus or minus thirteen percent. That is to say, if 50 percent of the facilities visited reported accurate data there is a 90 percent probability that between 37 percent and 63 percent of the facilities in the national database reported accurate data. Counting the SIC Code groups separately, there is a 90 percent confidence level of plus or minus 18 percent for each group. For the selected sample size of 50 facilities in SIC Codes 25 and 30, the 90 percent confidence interval is plus or minus 17 percent. Counting the SIC Code groups separately, there is a 90 percent confidence level of plus or minus 24 percent for each group. Thus, the confidence levels are based on the survey size and the total number of facilities in the SIC Code group.

Another possible source of error concerns the fact that approximately 15 different surveyors performed the survey. This source of inaccuracy was controlled to the extent possible by the use of a carefully designed survey instrument and extensive quality assurance provisions. Nevertheless, it is possible that different surveyors made different judgments in the course of the site surveys.

Finally, certain assumptions were made to simplify data analysis. The key assumption was that the facilities and Form Rs examined in the site visits accurately represent all facilities in their SIC Code group in terms of the accuracy of the data submitted. Aside from possible errors introduced by the relatively small size of the sample, the sampled facilities may not fully represent their SIC Code group because:

- The sampled facilities excluded any facility with more than 16 Form Rs for budgetary reasons. To the extent that facilities submitting more than 16 Form Rs report more (or less) accurate data than the sampled facilities, the latter facilities do not fully reflect the universe of facilities in the database.

- Many facilities surveyed processed or manufactured some kind of specialty chemical. These facilities may not accurately portray the "typical" facility within the SIC Code group. This may overestimate a specific chemical produced and released within the SIC Code group due to scaling and weighting factors.

2.7 Data Analysis and Reporting

Once the results of the site surveys were loaded into a database and the database was validated through the quality assurance process described above, the data were evaluated to discern trends in the quality of data in the TRI forms. This report presents the results of that analysis.

3.0 THRESHOLD DETERMINATIONS

This section reviews how accurately facilities determined whether Section 313 chemicals exceeded TRI reporting thresholds. Errors in threshold determinations can cause facilities to submit Form Rs for chemicals that do not exceed applicable reporting thresholds and also can cause facilities to fail to submit Form Rs for chemicals that exceed these thresholds. These two scenarios may lead facilities to understate or overstate emissions reported to the TRI database, respectively. Using the following topics, this section discusses the extent to which erroneous threshold determinations impact the quality of TRI data:

- Approaches commonly used to calculate thresholds
- Errors made when calculating thresholds
- Reasons for making erroneous threshold determinations

The section concludes with a review of key findings and offers several recommendations to help facilities improve reporting practices in the future.

It should be noted that this section does not differentiate facilities that submitted Form As from those that submitted Form Rs. Because the magnitude of the total annual reportable amount (the sum of Sections 8.1 - 8.7 on the Form R) ultimately determines when facilities can use Form As, Sections 5 and 6 of this report provide specific details on the frequency with which facilities use short reporting forms.

3.1 Approaches Used for Determining Thresholds

The following discussion considers how the approaches that facilities use to calculate thresholds affect the quality of TRI data. Although the TRI reporting instructions include specific criteria for determining when chemicals exceed reporting thresholds, the instructions do not require facilities to use specific approaches for conducting threshold determinations. Accordingly, facilities use many different approaches to determine whether Section 313 chemicals exceed activity thresholds. The most appropriate approach depends

largely on information available to the facility and specific uses of a chemical. For example, purchasing and inventory data may be the best data source for evaluating thresholds for certain raw materials, while process recipes or production data may be more appropriate data sources for evaluating thresholds for products. During each site audit, surveyors identified approaches used for determining thresholds from information available in the facility's supporting documentation. In cases where facilities did not estimate thresholds, site surveyors identified an approach that could reasonably have been used to estimate thresholds.

Figures 3-1, 3-2, and 3-3 summarize the approaches most commonly used by facilities (or that could reasonably have been used by facilities) to estimate thresholds for TRI reporting years 1987, 1994, and 1995, respectively. The quantitative data for RY 1988 were not available. For quick reference, Table 3-1 presents the same data for all reporting years considered. This table and these figures illustrate several trends:

- For RY 1987, 1994, and 1995, and for all industries considered, facilities primarily used purchasing data to determine whether chemicals exceeded appropriate thresholds. By this approach, facilities typically determine annual usage by calculating total purchases during a calendar year and correcting these quantities for changing levels of inventory. For reference, Appendix D includes an example threshold calculation using this approach.

- Facilities in the inorganic and organic chemical manufacturing industries (SIC Codes 281 and 286) use production data to calculate thresholds more frequently than facilities in other industries. These industries typically use production data to determine thresholds for Section 313 chemicals that are produced on-site by chemical reactions. Facilities in the furniture (25), paper (26), paint (285), and plastics (30) manufacturing industries generally do not have reactions that produce large quantities of Section 313 chemicals and therefore rarely use production data to calculate thresholds.

- Facilities in the inorganic and organic chemical manufacturing industries also are more likely to assume that chemical usage exceeds reporting thresholds, rather than calculate annual usage directly. Making such assumptions is only advised in cases where facilities clearly produce or consume extremely large quantities of Section 313 chemicals, a scenario common to large chemical manufacturing plants. As noted in Section

Table 3-1

Approaches Used by Facilities to Make Threshold Determinations

Approach Used to Make Threshold Determination	Percent of Facilities Using Specific Approach for Threshold Determinations						
	RY 1987	RY 1994				RY 1995	
	SIC Code 20-39	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Purchase/Inventory records	85	96	87	96	93	100	90
Production data	1	0	49	12	15	0	70
Process recipes	3	16	16	4	15	0	50
Emission factors [a]	4	0	0	0	6	50	10
Mass balance	3	4	9	0	0	20	20
Material safety data sheets	0	1	13	23	4	0	0
Monitoring data	1	0	8	0	0	30	10
Assumed threshold exceeded (no calculations completed)	2	4	63	8	0	10	20
Other approach	0	12	4	1	0	10	20

Note: Because some facilities used multiple approaches to calculate thresholds for a given chemical, the sum of the percents for a given SIC Code may exceed 100.

[a] "Emission Factors" in this table refers to any factors supplied by EPA or a trade association which are technically supported and used to determine the amount of any given chemical manufactured, processed, or otherwise used at the facility.

Figure 3-1. Approaches Used By Facilities To Make Threshold Determinations for RY 1987

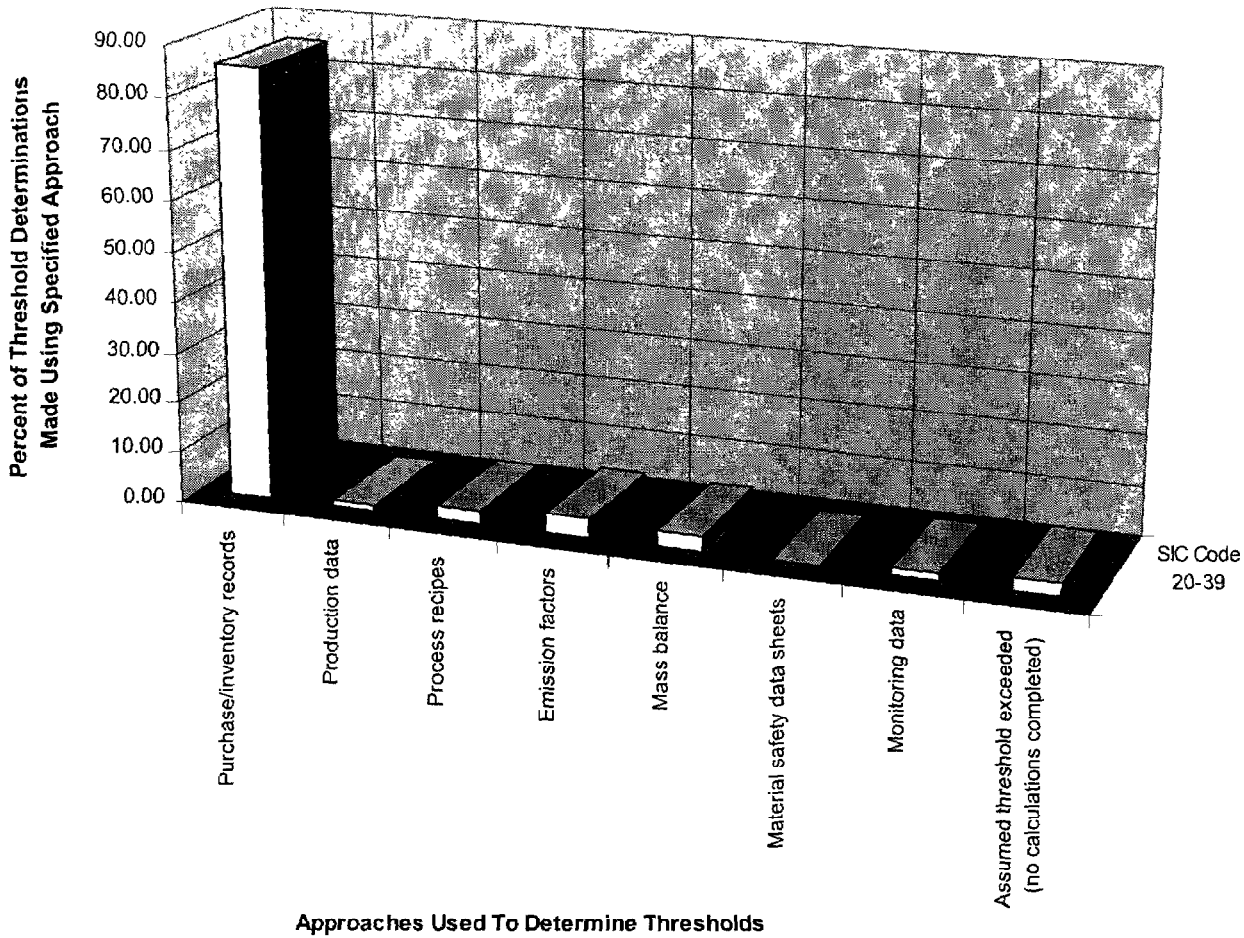
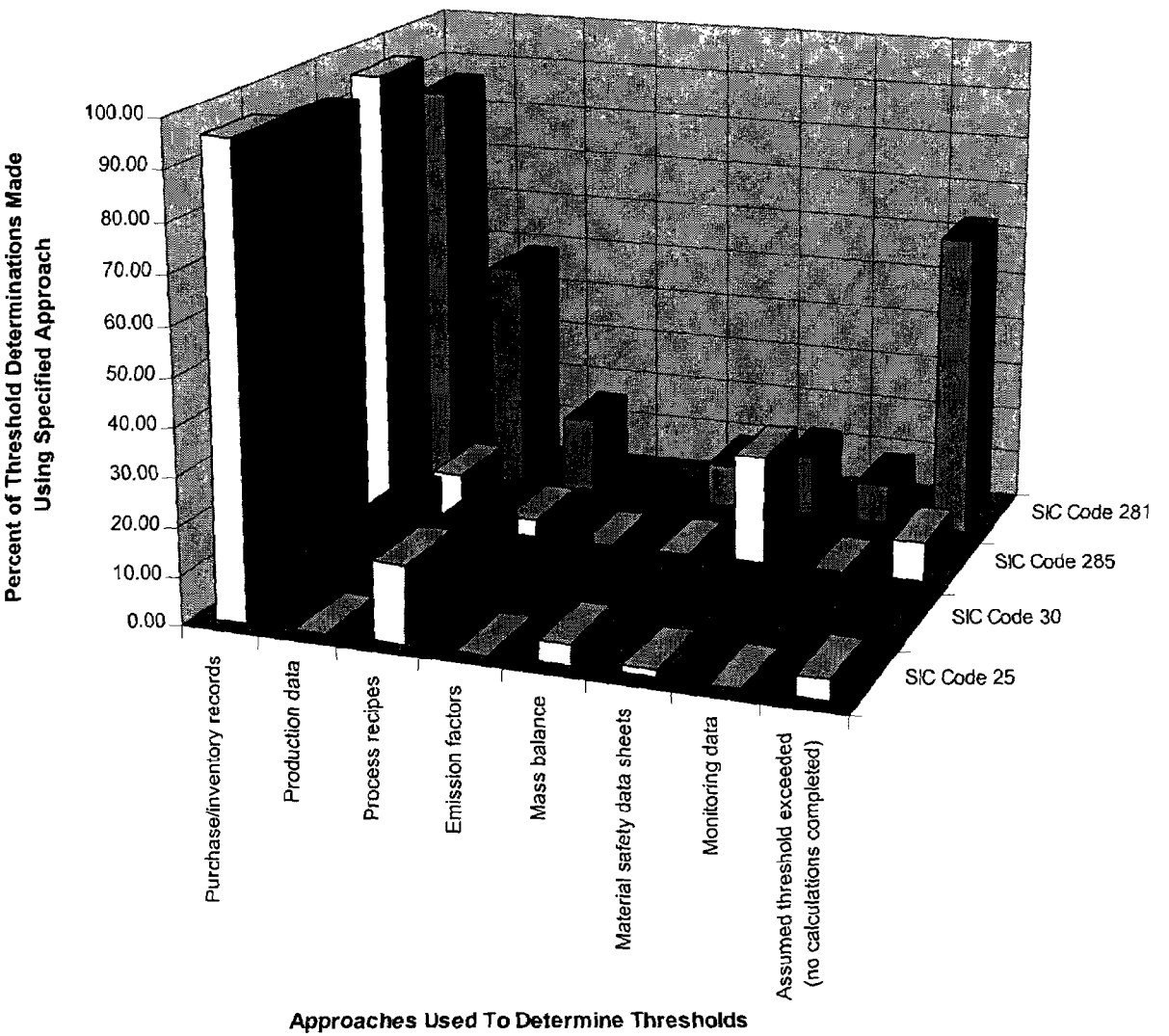
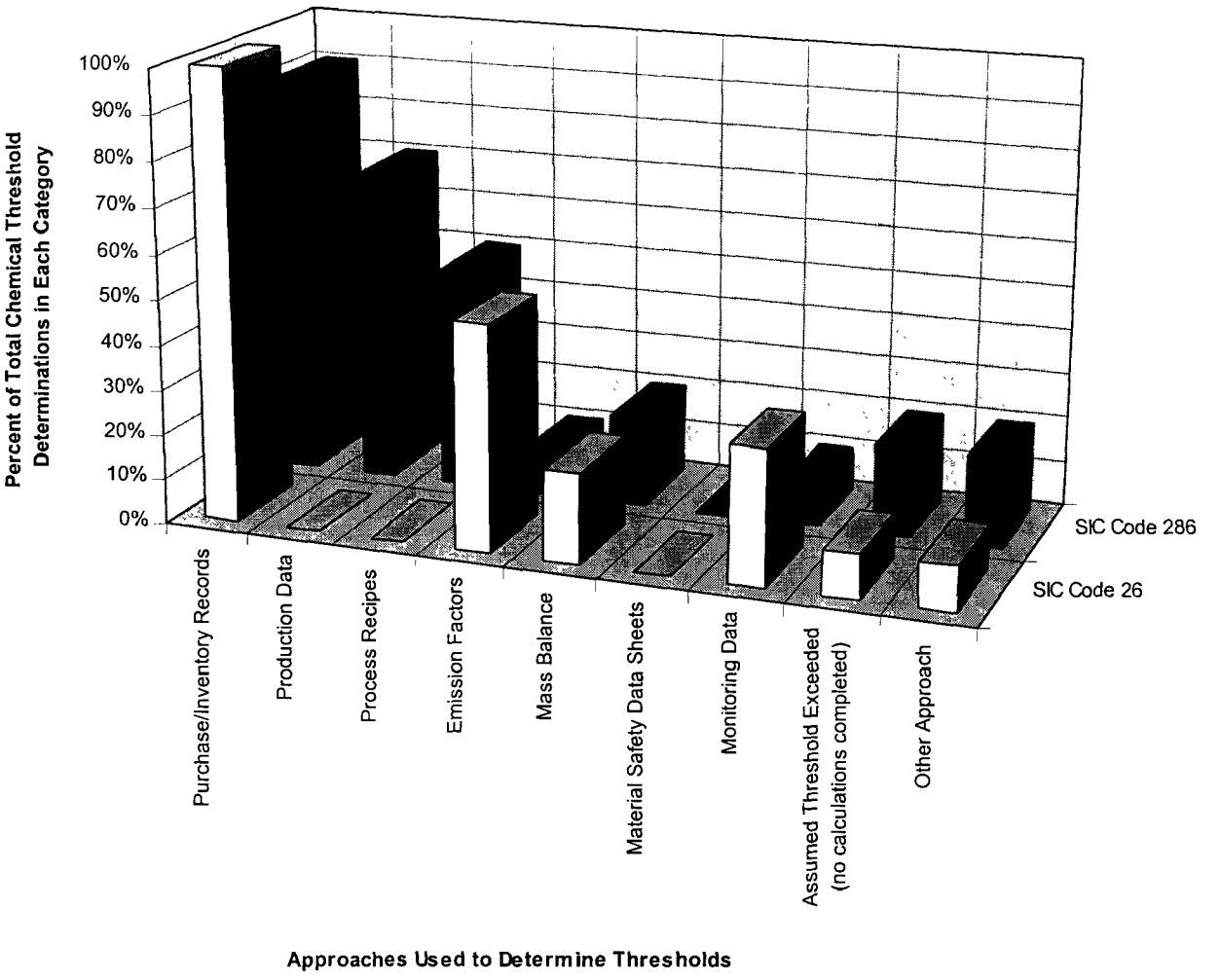


Figure 3-2. Approaches Used By Facilities To Make Threshold Determinations for RY 1994



Data for this figure can be found on Table 3-1

Figure 3-3. Approaches Used by Facilities to Make Threshold Determinations for RY 1995



Data for this figure can be found on Table 3-1.

3.3.4, however, facilities that assume thresholds are exceeded tend to make more errors in threshold determinations than facilities that calculate actual quantities manufactured, processed or otherwise used.

To evaluate how approaches for determining thresholds might affect the quality of TRI data, the remainder of this section considers how these approaches may have caused facilities to make incorrect threshold determinations.

3.2 Frequency of Errors Made When Determining Thresholds

The following analyses indicate the frequency and type of errors made by facilities when determining thresholds and comment on how these errors may affect the overall quality of TRI data. During site visits, surveyors used information provided by facility contacts to calculate thresholds for Section 313 chemicals. For reference, Attachment F includes several examples of how site surveyors calculated thresholds. Based on these threshold calculations, surveyors then listed chemicals for which facilities should have submitted Form Rs. Errors in threshold determinations were identified by comparing lists of chemicals that exceeded thresholds, as determined by the site surveyor, to chemicals for which facilities submitted Form R reports. These comparisons yielded four possible outcomes:

- The facility submitted a Form R for a chemical that exceeded a threshold.
- The facility did not submit a Form R for a chemical that did not exceed a threshold.
- The facility submitted a Form R for a chemical that did not exceed a threshold.
- The facility did not submit a Form R for a chemical that exceeded a threshold.

The first two outcomes represent cases where facilities correctly determined thresholds, while the last two outcomes represent two general types of errors made when calculating thresholds. The last two errors can cause facilities to overstate or understate, respectively, the releases and other quantities managed as waste reported to TRI. Using these

outcomes, Figure 3-4 and Table 3-2 summarize the frequency of errors that facilities made when determining thresholds during reporting years 1987, 1988, 1994, and 1995. As a summary, Figures 3-5 and 3-6 indicate the frequency with which facilities made correct and incorrect threshold determinations. Several important observations can be made from these data:

- Over all industries and reporting years considered, Figures 3-5 and 3-6 indicate that facilities consistently determined thresholds correctly for over 90 percent of the Section 313 chemicals used at their respective plants. The errors made when determining thresholds were almost evenly split between failing to submit Form-Rs for chemicals that exceeded thresholds and submitting Form Rs for chemicals that did not exceed thresholds.

- For roughly 5 percent of the Section 313 chemicals used in the industries considered, facilities submitted Form Rs when thresholds were not exceeded. Facilities in the inorganic and organic chemical manufacturing industries (SIC Codes 281 and 286) made this error more frequently than facilities in other industries. The errors made by inorganic and organic chemical manufacturers may be caused by these facilities assuming that thresholds were exceeded (see Figures 3-2 and 3-3) rather than actually calculating annual quantities manufactured, processed or otherwise used. Section 3.3 provides additional insight into the sources of these errors.

- Also for roughly 5 percent of the Section 313 chemicals used in the industries considered, facilities failed to submit Form Rs when thresholds were exceeded. Again, this tendency was greatest for facilities in the inorganic chemical manufacturing industry (SIC Code 281). Section 3.3 examines the sources of these errors in greater detail.

In summary, the frequency of errors suggest that industries incorrectly compute thresholds for between 5 and 10 percent of the Section 313 chemicals used at their corresponding facilities. These errors included a nearly even number of cases in which facilities submitted Form Rs for chemicals that did not exceed thresholds as cases in which facilities did not submit Form Rs for chemicals that exceeded thresholds.

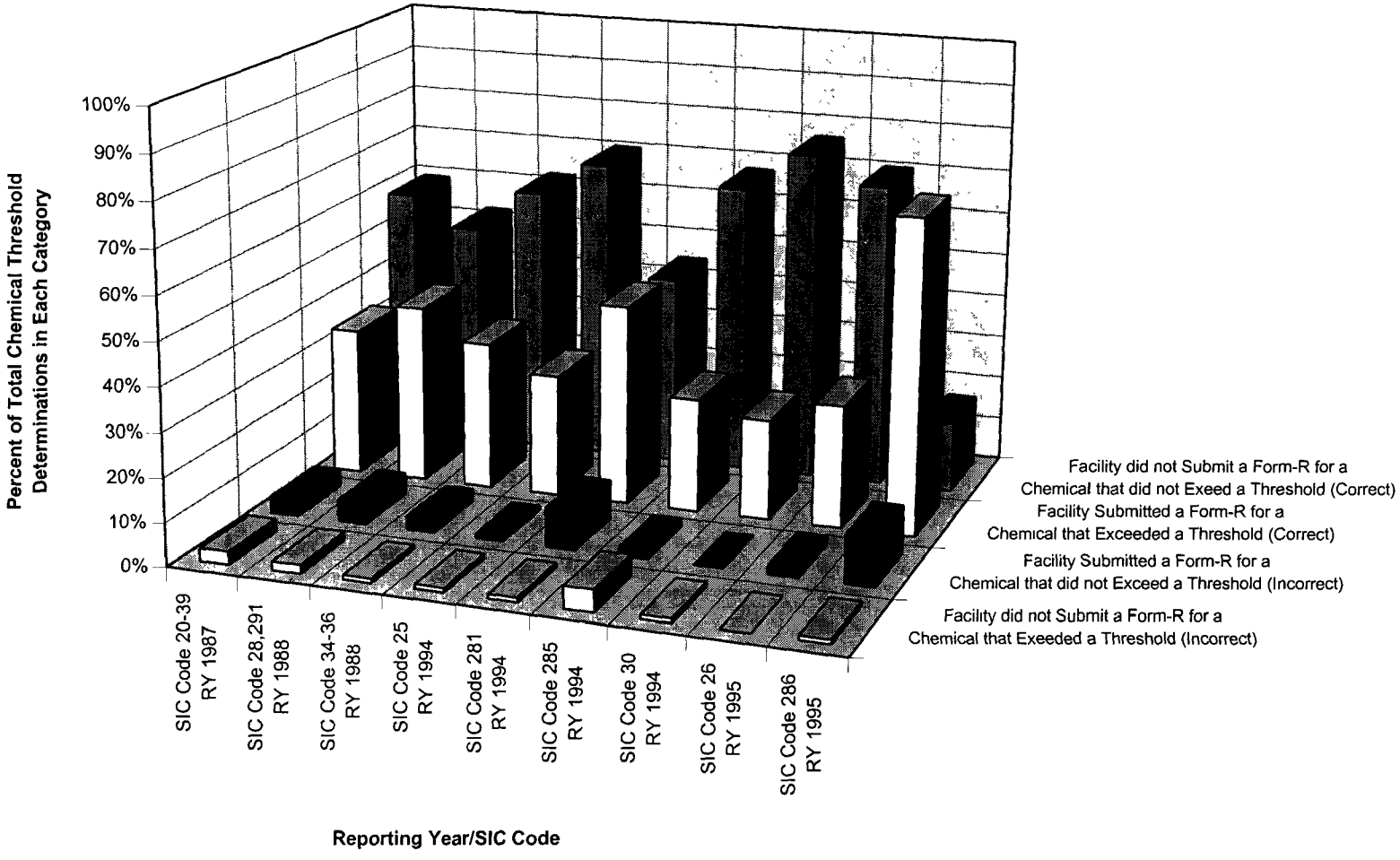
Table 3-2

Accuracy of Threshold Determinations by Reporting Year and SIC Code

Outcome	Percent of Section 313 Chemicals Broken Down by Threshold Determination Outcome								
	RY 1987	RY 1988		RY 1994				RY 1995	
	SIC Code 20-39	SIC Code 28, 291	SIC Code 34-36	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Facility did not submit a Form R for a chemical that did not exceed a threshold	59	52	62	70	41	66	76	70	16
Facility submitted a Form R for a chemical that exceeded a threshold	34	41	34	28	43	26	23	28	72
Facility did not submit a Form R for a chemical that exceeded a threshold	3	2	1	1	8	5	2	0	1
Facility submitted a Form R for a chemical that did not exceed a threshold	4	5	3	1	8	2	0	2	11

Note: The first two outcomes represent cases where facilities correctly determined thresholds, while the last two outcomes represent cases where facilities incorrectly determined thresholds. Figure 3-5 compares the correct and incorrect threshold determinations by reporting year and SIC Code.

Figure 3-4. Accuracy of Threshold Determinations by Reporting Year and SIC Code



Note: The first two outcomes represent cases where facilities incorrectly determined thresholds, while the last two outcomes represent cases where facilities correctly determined thresholds. Figure 3-5 compares the correct and incorrect threshold determinations by reporting year and SIC Code.

Data for this figure can be found on Table 3-2.

Figure 3-5. Accuracy of Threshold Determinations by Reporting Year and SIC Code for RY 1987 and RY 1988

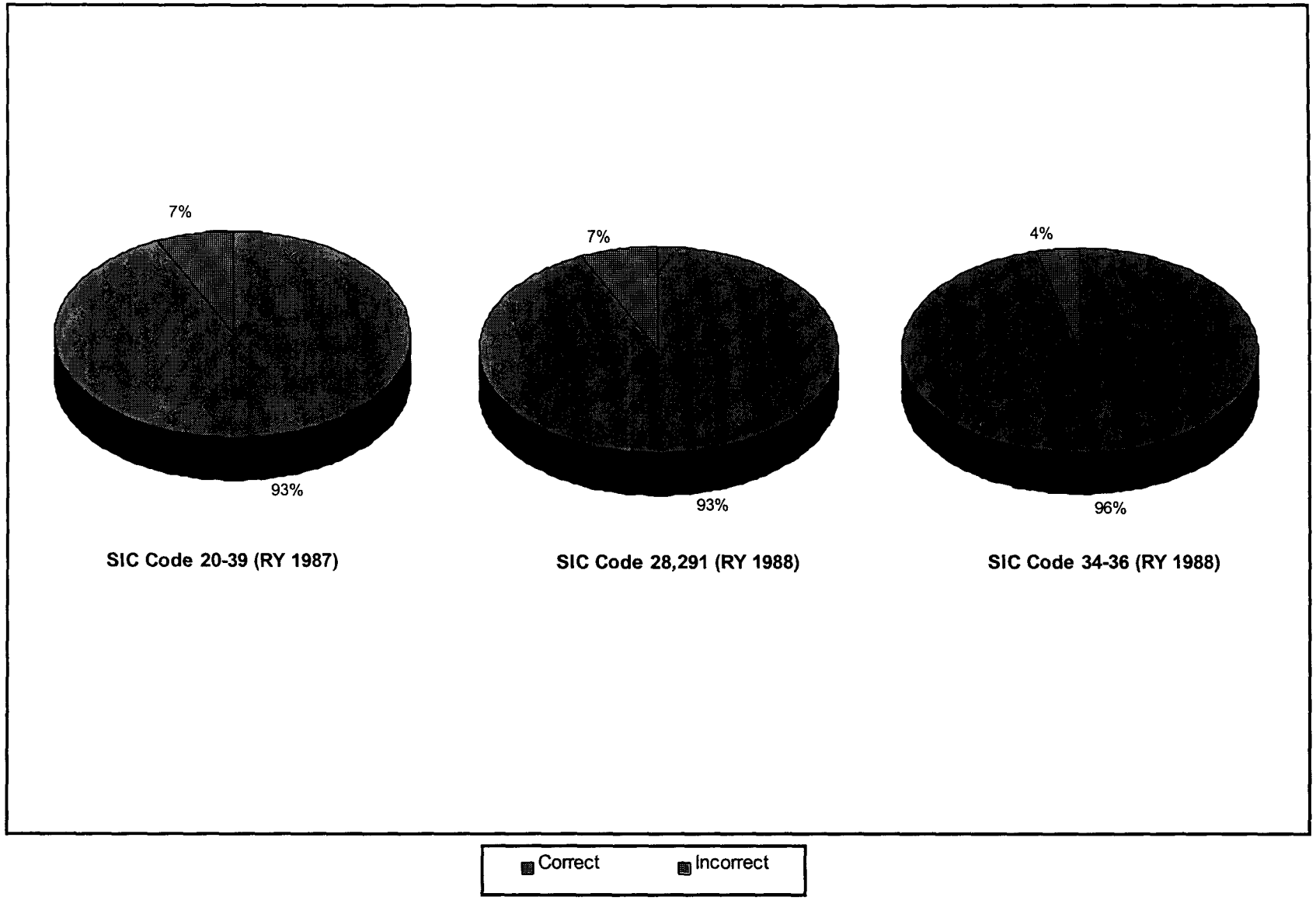
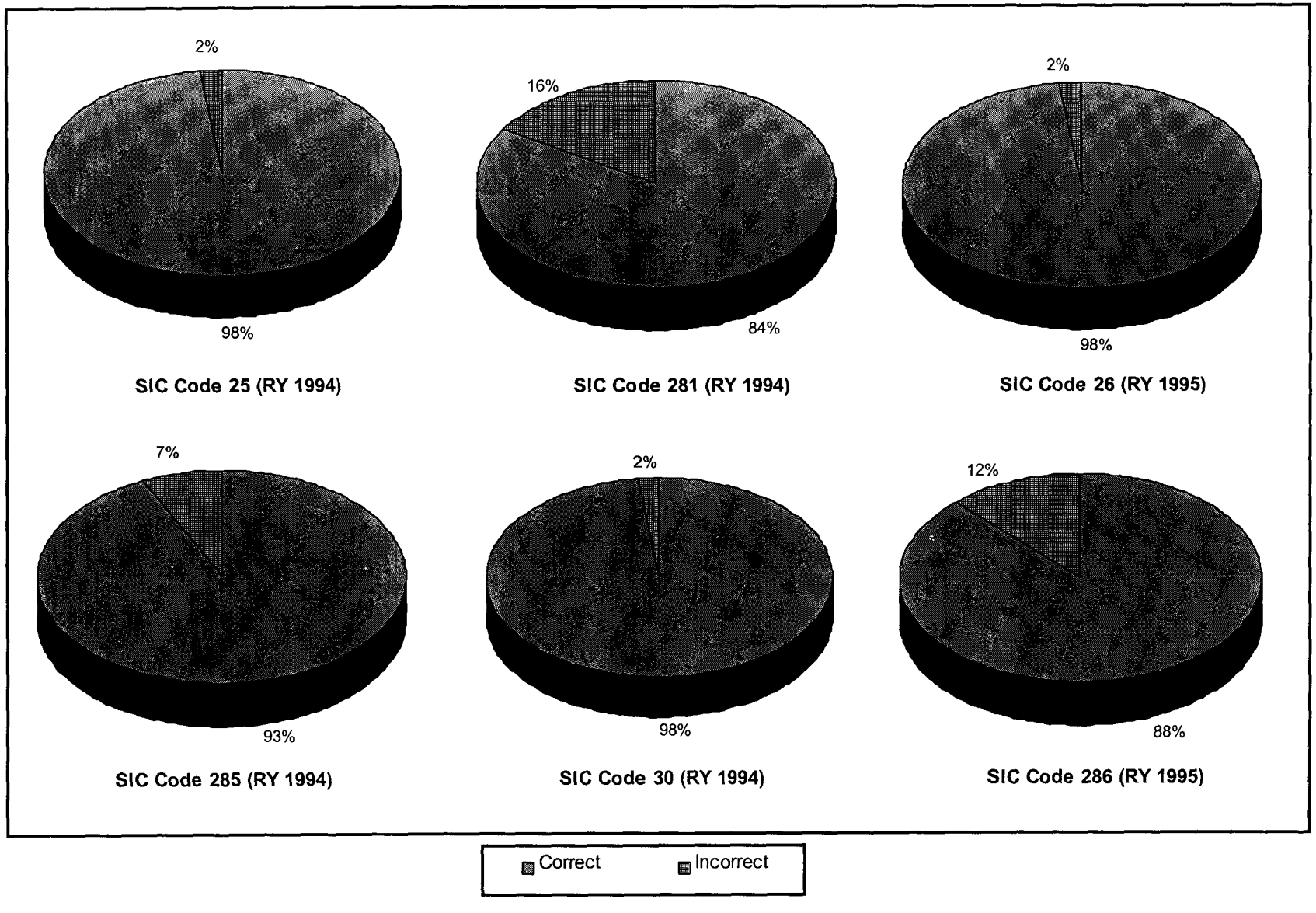


Figure 3-6. Accuracy of Threshold Determinations by Reporting Year and SIC Code for RY 1994 and RY 1995



3.3 Sources of Errors Made When Determining Thresholds

This section summarizes reasons why facilities made errors when determining thresholds. During site visits, surveyors identified these reasons from discussions with facility contacts and from data in the facility's supporting documentation. The following subsections examine the sources of errors from the most recent round of site surveys. To help industrial facilities minimize errors made in threshold determinations, Section 3.4 offers several recommendations for avoiding such errors in future reporting years.

3.3.1 Reasons Why Facilities Failed to Submit Form Rs for Chemicals That Exceeded Thresholds

Table 3-3 summarizes reasons why facilities failed to submit Form Rs for chemicals that exceeded thresholds during TRI reporting years 1994 and 1995. The data are not classified by SIC Code, because not enough errors were observed for these reporting years to make statistically significant conclusions for each industry. Further, the data are not compared to those for previous reporting years, because the previous studies used slightly different sets of categories to classify errors. As shown in the table, the most common reasons why facilities did not identify chemicals used at reportable levels was because facilities either overlooked the use of Section 313 chemicals or facilities miscalculated annual thresholds. These general reasons include a wide range of different errors, including cases where facilities assumed thresholds were not exceeded, cases where facilities were unaware that chemicals could have exceeded reportable quantities, and cases where facilities miscalculated total usage. The following lists indicate specific examples of errors documented during site visits:

Overlooking a chemical activity:

- For each TRI reporting year, a consultant for a plastic manufacturer prepared Form Rs for the same set of chemicals, without first calculating thresholds for all Section 313 chemicals used at the facility. The consultant failed to notice that toluene should have been reported in 1995 due to increased use of certain solvents.

Table 3-3

Reasons Why Facilities Failed to Submit Form Rs for Chemicals That Exceeded Thresholds

Reason for not submitting a Form R for chemicals that exceeded thresholds	RY 1994		RY 1995	
	Number of Observations	Percent of Total Errors	Number of Observations	Percent of Total Errors
Chemical activity was overlooked	9	53	1	100
Chemical activity was misclassified	0	0	0	0
Threshold quantity was miscalculated	7	39	0	0
Chemical was incorrectly reported as a chemical category	1	6	0	0

Note: Due to the limited number of errors identified during the site visits, the percents listed in this table may not necessarily represent the actual distribution of reasons why facilities make errors on their Form Rs.

- A paint manufacturer did not examine the Material Safety Data Sheet (MSDS) for "commercial grade" xylene, which indicated that the mixture contained 15 percent ethylbenzene. Although the facility correctly reported for xylene, the facility failed to report for ethylbenzene.

- A furniture manufacturer failed to notice that a pigment used to coat metal products contained several metal compounds on the TRI reporting list. The MSDS for this pigment and the annual usage of the pigments suggest that the facility should have reported for the metal compounds.

- A paint manufacturer used a solvent containing glycol ethers to thin several paint products but assumed that the limited usage could not possibly have exceeded threshold quantities. Review of purchasing data indicated that total annual usage was significantly greater than threshold amounts.

- A chemical manufacturer correctly reported for all Section 313 chemicals that were in reactants and products but did not consider Section 313 chemicals that were components of wastewater treatment mixtures and catalysts. The site surveyor noted that some of these chemicals that were not used directly for production exceeded reporting thresholds.

Miscalculating a threshold:

- A furniture manufacturer did not report for xylene (mixed isomers), but made several calculation errors when determining annual quantities otherwise used from individual purchasing invoices. The site surveyor loaded the purchasing data into a spreadsheet and calculated an annual quantity otherwise used exceeding corresponding threshold quantities.

- A chemical manufacturer used the lower bound of a concentration range to make a threshold determination for a Section 313 chemical. Using the midpoint of the concentration range (as required by the TRI reporting instructions), the site surveyor found the chemical exceeded threshold amounts.

3.3.2 Reasons Why Facilities Submitted Form Rs for Chemicals That Did Not Exceed Thresholds

Table 3-4 summarizes why facilities submitted Form Rs for chemicals that did not exceed thresholds during TRI reporting years 1994 and 1995. For the same reasons as given in the previous section, the data are not classified by SIC Code and are not compared to previous

Table 3-4

Reasons Why Facilities Submitted Form Rs for Chemicals That Did Not Exceed Thresholds

Reason for submitting a Form R for chemicals that did not exceed thresholds	RY 1994		RY 1995	
	Number of Observations	Percent of Total Errors	Number of Observations	Percent of Total Errors
Facility reported despite noting that threshold was not exceeded	4	18	2	14
Facility assumed threshold was exceeded	2	9	3	21
Chemical activity was misclassified	1	5	2	14
Threshold quantity was miscalculated	2	9	2	14
Chemical was exempt	0	0	1	7
Facility misinterpreted revised reporting guidelines	11	50	3	21
Other	2	9	1	7

Note: Due to the limited number of errors identified during the site visits, the percents listed in this table may not necessarily represent the actual distribution of reasons why facilities make errors on their Form Rs.

reporting years. As shown in the table, approximately two thirds of the incorrectly submitted Form Rs resulted from facilities misinterpreting revised reporting threshold guidance or from facilities submitting Form Rs despite calculating annual usages below threshold quantities. The following list describes specific instances when site surveyors classified threshold determination errors in these two categories.

Facility misinterpreted revised reporting guidelines:

- A paint manufacturing facility submitted a Form R for acetone in reporting year 1994 even though EPA removed acetone from the list of reportable chemicals. The site surveyor noted that acetone was delisted and that the form should be withdrawn.

- A paper manufacturing facility used aqueous ammonia in several process areas but did not account for the revised reporting guidance indicating that only 10 percent of aqueous ammonia should be counted towards threshold determinations. Using this guidance, the site surveyor determined that the quantities of ammonia used did not exceed reporting thresholds. For reference, Appendix F includes a specific example of computing thresholds for aqueous ammonia solutions.

- A chemical manufacturing facility submitted a Form R for aqueous sulfuric acid used to neutralize wastewater, without considering the sulfuric acid activity qualifier for "acid aerosols." The site surveyor noted that insignificant quantities of the sulfuric acid existed as aerosols and concluded that the chemical should not have been reported.

Facility reported for the chemical, despite calculating a manufacture, process, or otherwise use quantity below threshold quantities:

- An organic chemical manufacturing facility submitted a Form R for xylene in every reporting year since 1987. In reporting year 1995, however, the facility noted that usage of xylene was below the corresponding thresholds. Fearing that not submitting a Form R for a chemical that was previously reported might somehow trigger an audit or enforcement response, the facility reported for xylene anyway.

- A paper manufacturing facility correctly determined that 9,700 pounds of chlorine were "otherwise used" during reporting year 1995. The facility submitted a Form R for chlorine anyway, noting that it would be better to report a chemical that may not have exceeded a threshold than to not report a chemical that exceeded a threshold.

3.3.3 Chemical Activity Classification

Because appropriate TRI reporting thresholds (i.e., 10,000 or 25,000 pounds) depend on how facilities use Section 313 chemicals, it is important that facilities correctly classify chemical activities as either "manufacture," "process," or "otherwise use." For instance, Table 3-4 indicates that several facilities submitted Form Rs for chemicals that did not exceed thresholds due to incorrect chemical activity classifications. To evaluate how accurately facilities classify chemicals, site surveyors documented during each site visit activities for all Section 313 chemicals based on information provided by facility contacts and on observations made during facility tours. Table 3-5 compares chemical activity classifications made by facilities to those made by site surveyors for reporting years 1994 and 1995, respectively; Figure 3-7 also displays this data but in bar chart format. Similar data are not available for previous reporting years. Based on these data, site surveyors note that:

- Facilities in all industries made errors when classifying chemical activities, with rubber and plastic manufacturers (SIC Code 30) making the fewest and paint manufacturers (SIC Code 285) making the most.

- Of the three chemical activities, facilities made most errors determining whether chemicals were "processed" or "otherwise used." These particular errors resulted to a great extent from facilities misclassifying chemical activities for solvents. Part of this confusion may originate from text in the TRI Reporting Instructions handbook which correctly lists solvents as an example of a formulation component (under "processed") as well as an example of a chemical processing aid (under "otherwise used"). Some facilities did not understand the distinction between these two activities.

- Some classification errors resulted from facilities being unaware that a chemical with multiple uses could be classified under more than one chemical activity.

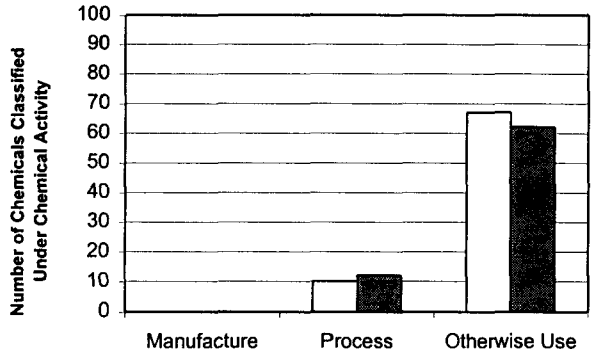
Table 3-5

Comparison of Chemical Activity Classifications Made by Reviewers to Those Made by Facilities, by Reporting Year and SIC Code

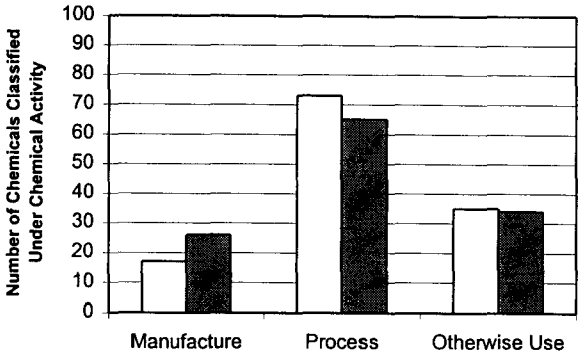
Chemical Activity	Number of Chemicals Used at Selected Facilities, Classified by Activity											
	Reporting Year 1994								Reporting Year 1995			
	SIC Code 25		SIC Code 281		SIC Code 285		SIC Code 30		SIC Code 26		SIC Code 286	
	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer	Facility	Reviewer
Manufacture	0	0	26	17	1	0	0	0	56	64	77	56
Process	12	10	65	73	67	83	30	31	4	3	46	58
Otherwise Use	62	67	34	35	15	25	26	26	37	29	26	29

Note: Reviewers and facilities may have classified selected Section 313 chemicals under multiple chemical activity categories. Therefore, the total number of chemicals classified under "facility" for a given SIC Code does not necessarily equal the total classified under "reviewer."

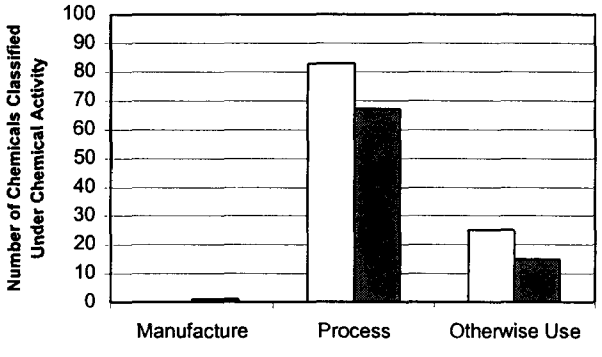
Figure 3-7. Comparison of Chemical Activity Classifications made by Facilities to those made by Reviewers



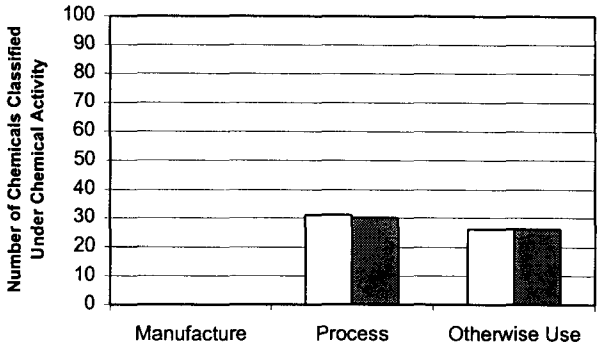
SIC Code 25 (RY 1994)



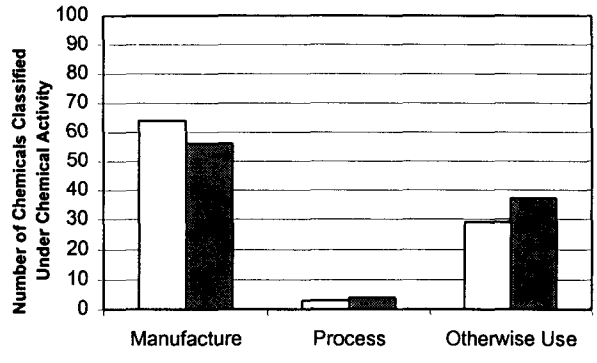
SIC Code 281 (RY 1994)



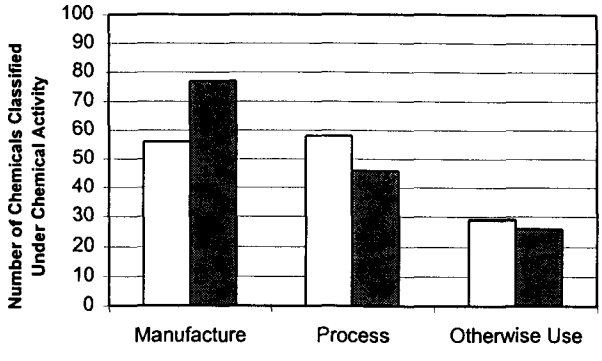
SIC Code 285 (RY 1994)



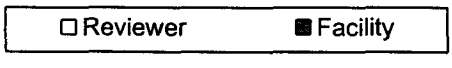
SIC Code 30 (RY 1994)



SIC Code 26 (RY 1995)



SIC Code 286 (RY 1995)



Data for this figure can be found on Table 3-5.

Although misclassified chemical activities account for only a small fraction of errors in threshold determinations (see Table 3-3 and 3-4), EPA can help minimize these errors in future reporting years by informing facilities of common mistakes and of correct classifications for chemicals that are frequently misclassified, such as solvents.

3.3.4 Impact of Not Calculating Thresholds

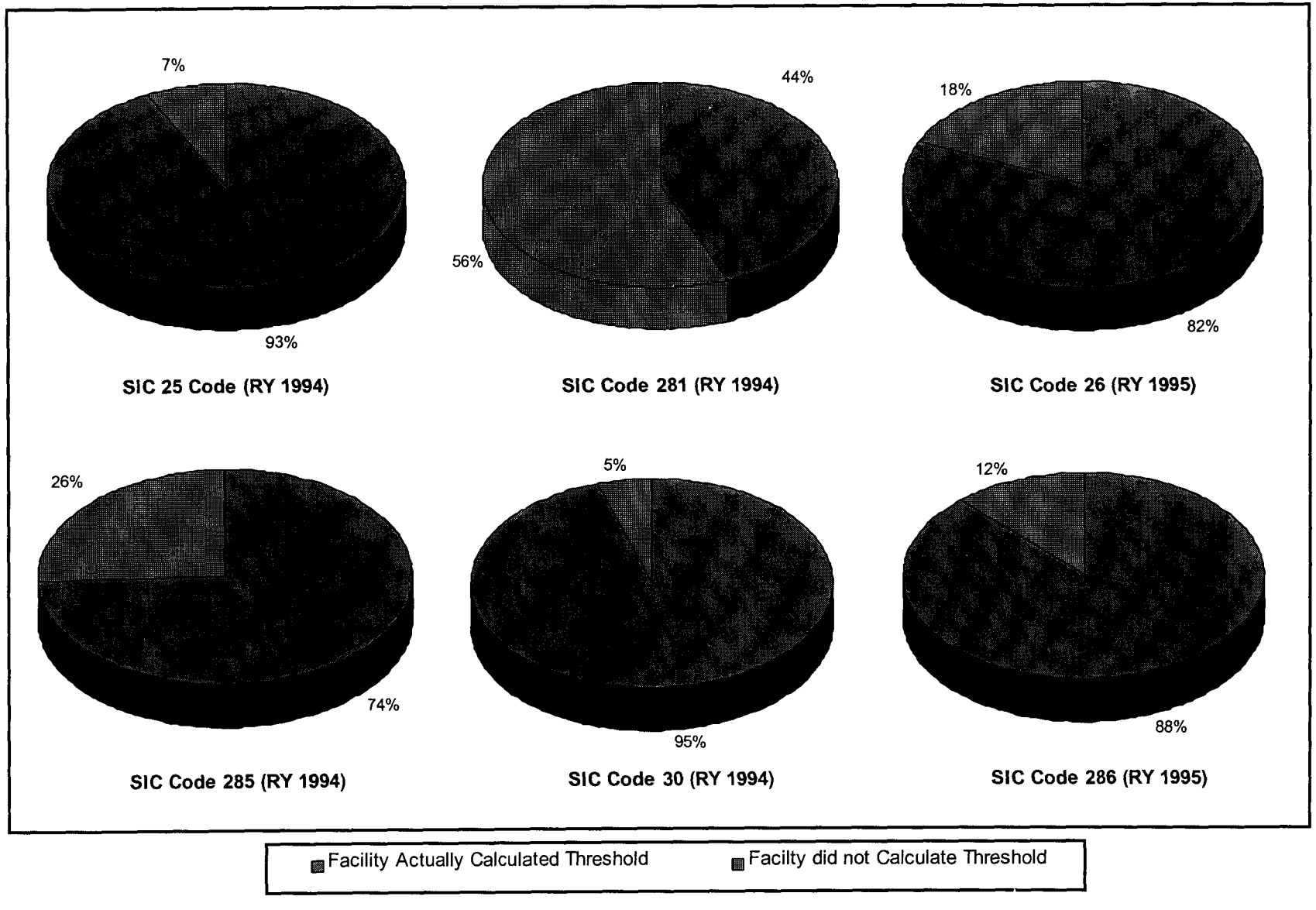
An important factor to consider in the accuracy of threshold determinations is whether facilities actually calculated threshold levels for Section 313 chemicals or assumed that thresholds were, or were not, exceeded. At each facility visited, site surveyors used feedback from facility contacts and data in supporting documentation to determine which method was adopted to make threshold determinations. For Section 313 chemicals found to exceed reporting thresholds, Figure 3-8 summarizes the frequency with which facilities in the selected industries actually calculated annual usages. The data in Figure 3-8 may, at first, seem to contradict the data in Table 3-1 (approaches used for determining thresholds). The reader should note, however, that Table 3-1 indicated approaches that facilities actually used to determine thresholds for each chemical reported. Figure 3-8 counts thresholds calculated at least once (for any chemical) at a given facility.

Not surprisingly, facilities in the industries that calculated thresholds most often (SIC Code 25 and SIC Code 30) made fewer errors when determining thresholds than facilities in the industries that calculated thresholds less frequently (SIC Code 281 and SIC Code 285). This observation suggests that errors in threshold determinations may be significantly reduced if facilities actually calculate annual usages for Section 313 chemicals, as opposed to assuming that chemicals are below or above reporting thresholds.

3.4 Lessons Learned

In summary, site surveyors found that facilities in the furniture, rubber, paper, and plastic manufacturing industries (SIC Codes 25, 26, and 30) determined thresholds more accurately than facilities in the inorganic, paint, and organic chemical manufacturing industries

Figure 3-8. Frequency with which Facilities Calculated Thresholds for EPCRA Section 313 Chemicals



(SIC Codes 281, 285, and 286). Further, facilities as a whole correctly calculated thresholds for over 90 percent of the Section 313 chemicals used at the selected industries. For nearly 5 percent of the Section 313 chemicals, however, facilities failed to submit Form Rs in cases where thresholds were exceeded; and, for the remaining 5 percent of chemicals, facilities submitted Form Rs when quantities manufactured, processed or otherwise used did not exceed thresholds. Therefore, according to the most recent site surveys, a small fraction of the Form Rs currently logged in the TRI database need not have been filed, but facilities failed to submit a nearly equal amount of Form Rs for chemicals that exceeded threshold levels. Although this observation may suggest that the total number of Form Rs in the TRI database is highly representative of the actual amount of Section 313 chemicals that exceed thresholds, it must be noted that the site survey data may be influenced by limitations posed by sample selection (see Section 2.2).

4.0 SOURCES AND TYPES OF RELEASES, OFF-SITE TRANSFERS, AND ON-SITE WASTE MANAGEMENT ACTIVITIES

This section provides an overview of the sources of releases, off-site transfers for further waste management, and on-site waste management activities as well as the release types that were both claimed and observed at each facility visited during the site surveys. Statistically weighted percentages of data are presented to show the distribution of release sources and release types within each SIC Code (see Section 2 for a discussion of statistical weighting). Additionally, percentages of incorrectly reported data and overlooked data are presented. Trends and corresponding discussions regarding observations made during the site visits are presented, as applicable.

For the purposes of this report, "sources" are defined as the streams or units that generate the release, off-site transfer, or on-site waste management activity (such as process vents, container residue, or spills) and "release types" are defined as the environmental media corresponding to elements in Sections 5 through 7 of the Form R (such as releases to fugitive air, releases to stack air, releases to water, releases to land, and transfers to off site disposal). In most cases, data has been presented both in a tabular form for quantitative analysis and in a graphical format for qualitative trend analyses.

Data is presented for RY 1994 and RY 1995. A trend analysis has been conducted whenever applicable between the six SIC Codes visited for RY 1994 and RY 1995.

4.1 Observed On-Site Releases, Off-Site Transfers, and On-Site Waste Management Activities

Table 4-1 presents the distribution (weighted) of sources and the corresponding release type, off-site transfer, or on-site waste management activity that was observed during the site visits for each SIC Code. It also lists a "total" row for each of these activities. This represents the number of facilities that reported at least one release or other waste management activity from any source to that activity or release type. Figure 4-1a presents the "total" by release type or other waste management activity and Figure 4-1b through 4-1h present the data

Table 4-1

Distribution of Release Sources and Off-Site Waste Management Activities RY 1994 and RY 1995

Release or Waste Management Activity Type	Source	Percent of Facilities Documenting Releases or Waste Management Activity (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Fugitive	Volatilization from Process Areas	76.0%	81.8%	100.0%	63.4%	70.0%	80.0%
	Pumps/Valves/Flanges	43.0%	70.7%	50.1%	23.3%	30.0%	60.0%
	Storage Tank/Stock Pile Losses	14.5%	30.5%	53.1%	14.4%	30.0%	10.0%
	Housekeeping Practices/Clean-up Wastes	29.0%	20.0%	22.5%	8.8%	0.0%	30.0%
	Accidental Spills/Releases	0.0%	44.3%	22.5%	0.0%	10.0%	10.0%
	Process Vents	0.0%	23.4%	12.9%	0.0%	0.0%	0.0%
	Volatilization from Treatment Areas	0.0%	39.2%	8.2%	0.0%	80.0%	30.0%
	Container Residue	0.0%	5.5%	0.0%	0.0%	0.0%	0.0%
	Other[2]	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%
	TOTAL: Reporting from at Least One Source[1]:	**92.8%**	**100.0%**	**100.0%**	**67.4%**	**90.0%**	**80.0%**
Stack	Volatilization from Process Areas	100.0%	65.7%	29.9%	50.9%	80.0%	70.0%
	Pumps/Valves/Flanges	1.0%	21.7%	0.0%	6.0%	0.0%	10.0%
	Storage Tank/Stock Pile Losses	27.9%	60.0%	57.9%	12.8%	30.0%	60.0%
	Housekeeping Practices/Clean-up Wastes	20.5%	0.0%	14.6%	0.0%	0.0%	10.0%
	Accidental Spills/Releases	4.0%	8.3%	0.0%	0.0%	0.0%	0.0%
	Process Vents	0.0%	71.2%	38.1%	0.0%	0.0%	0.0%
	Volatilization from Treatment Areas	4.0%	5.5%	0.0%	5.4%	30.0%	30.0%

Table 4-1 (Continued)

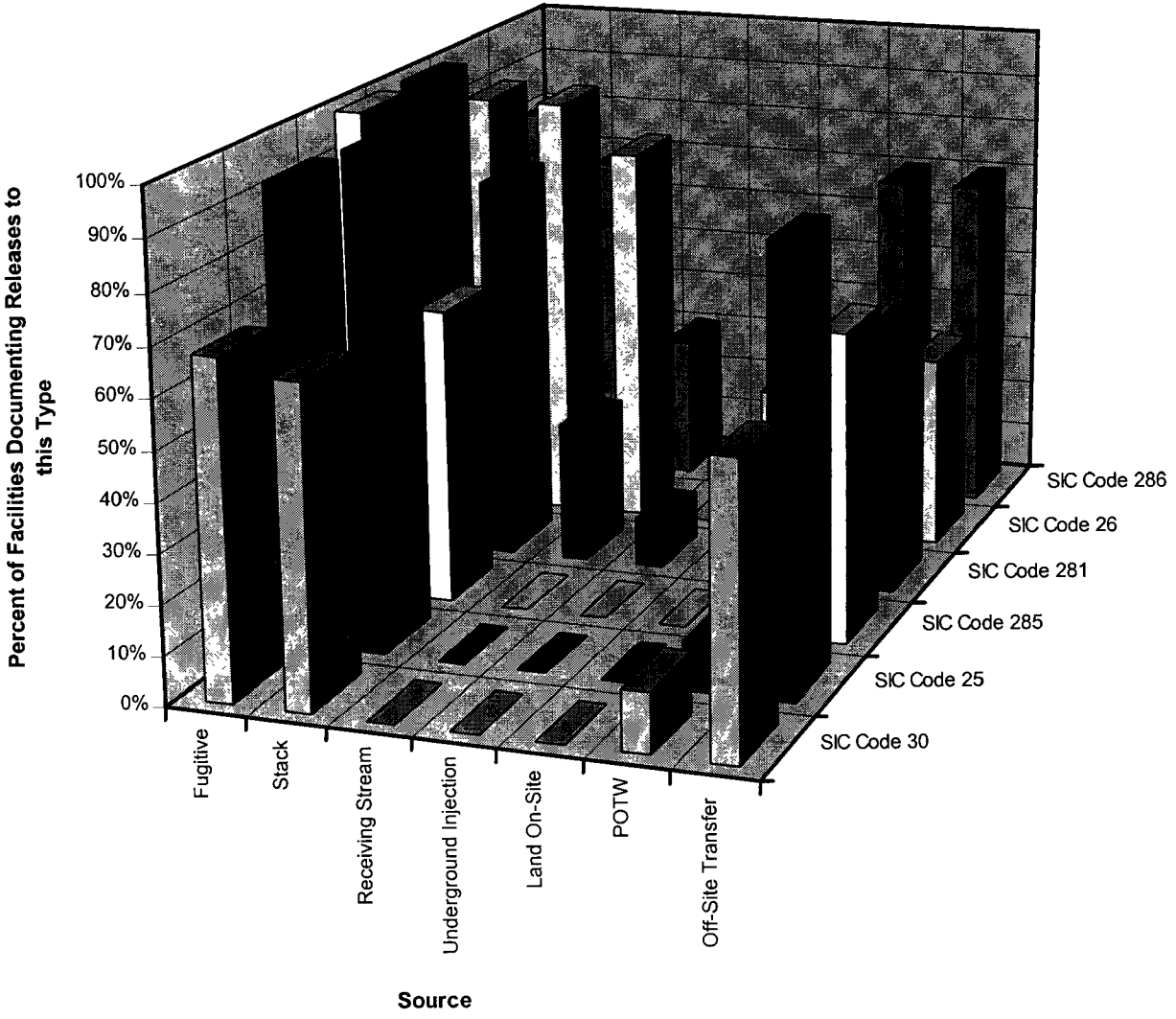
Release or Waste Management Activity Type	Source	Percent of Facilities Documenting Releases or Waste Management Activity (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Stack (Cont.)	Process Discharge Streams	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%
	Combustion By-Products	0.0%	0.0%	0.0%	0.0%	50.0%	10.0%
	Other[2]	0.0%	0.0%	0.0%	6.8%	0.0%	0.0%
	TOTAL: Reporting from at Least One Source[1]:	**100.0%**	**79.6%**	**60.7%**	**64.1%**	**90.0%**	**70.0%**
Receiving Stream	Accidental Spills/Releases	0.0%	7.9%	0.0%	0.0%	0.0%	10.0%
	Waste Treatment Discharge Streams	0.0%	7.9%	0.0%	0.0%	80.0%	10.0%
	Stormwater Runoff	0.0%	21.1%	0.0%	0.0%	20.0%	20.0%
	Process Discharge Streams	0.0%	11.5%	0.0%	0.0%	0.0%	10.0%
	Other[2]	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
	TOTAL: Reporting from at Least One Source[1]	**0.0%**	**28.8%**	**0.0%**	**0.0%**	**80.0%**	**30.0%**
Underground Injection	Process Discharge Streams	0.0%	10.1%	0.0%	0.0%	0.0%	0.0%
	Other[2]	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%
	TOTAL: Reporting from at Least One Source[1]	**0.0%**	**10.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Land On-Site	Accidental Spills/Releases	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%
	Container Residue	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
	Treatment Sludges, Recycling or Energy Recovery By-Product	0.0%	0.0%	0.0%	0.0%	30.0%	0.0%
	TOTAL: Reporting from at Least One Source[1]	**0.0%**	**5.3%**	**0.0%**	**0.0%**	**30.0%**	**10.0%**

Table 4-1 (Continued)

Release or Waste Management Activity Type	Source	Percent of Facilities Documenting Releases or Waste Management Activity (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
POTW	Housekeeping Practices/Clean-up Wastes	0.0%	14.4%	12.4%	9.1%	0.0%	0.0%
	Accidental Spills/Releases	0.0%	11.4%	0.0%	0.0%	0.0%	0.0%
	Waste Treatment Discharge Streams	6.1%	24.4%	20.6%	0.0%	10.0%	50.0%
	Stormwater Runoff	0.0%	10.2%	0.0%	0.0%	0.0%	0.0%
	Process Discharge Streams	9.8%	14.4%	12.4%	9.1%	0.0%	30.0%
	TOTAL: Reporting from at Least One Source[1]:	**9.8%**	**24.4%**	**20.6%**	**12.0%**	**10.0%**	**70.0%**
Off-Site Transfer	Housekeeping Practices/Clean-up Wastes	75.6%	31.9%	38.0%	38.6%	0.0%	20.0%
	Accidental Spills/Releases	0.0%	12.0%	0.0%	18.5%	0.0%	0.0%
	Waste Treatment Discharge Streams	0.0%	20.0%	0.0%	0.0%	30.0%	30.0%
	Process Discharge Streams	33.9%	28.1%	0.0%	28.3%	0.0%	60.0%
	Container Residue	30.9%	15.3%	43.3%	27.4%	0.0%	10.0%
	Treatment Sludges, Recycling or Energy Recovery By-Product	16.1%	9.2%	31.1%	6.7%	40.0%	30.0%
	Combustion By-Products	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%
	Other[2]	1.4%	7.5%	6.6%	29.0%	10.0%	10.0%
	TOTAL: Reporting from at Least One Source[1]:	**88.7%**	**55.5%**	**63.1%**	**57.5%**	**40.0%**	**70.0%**

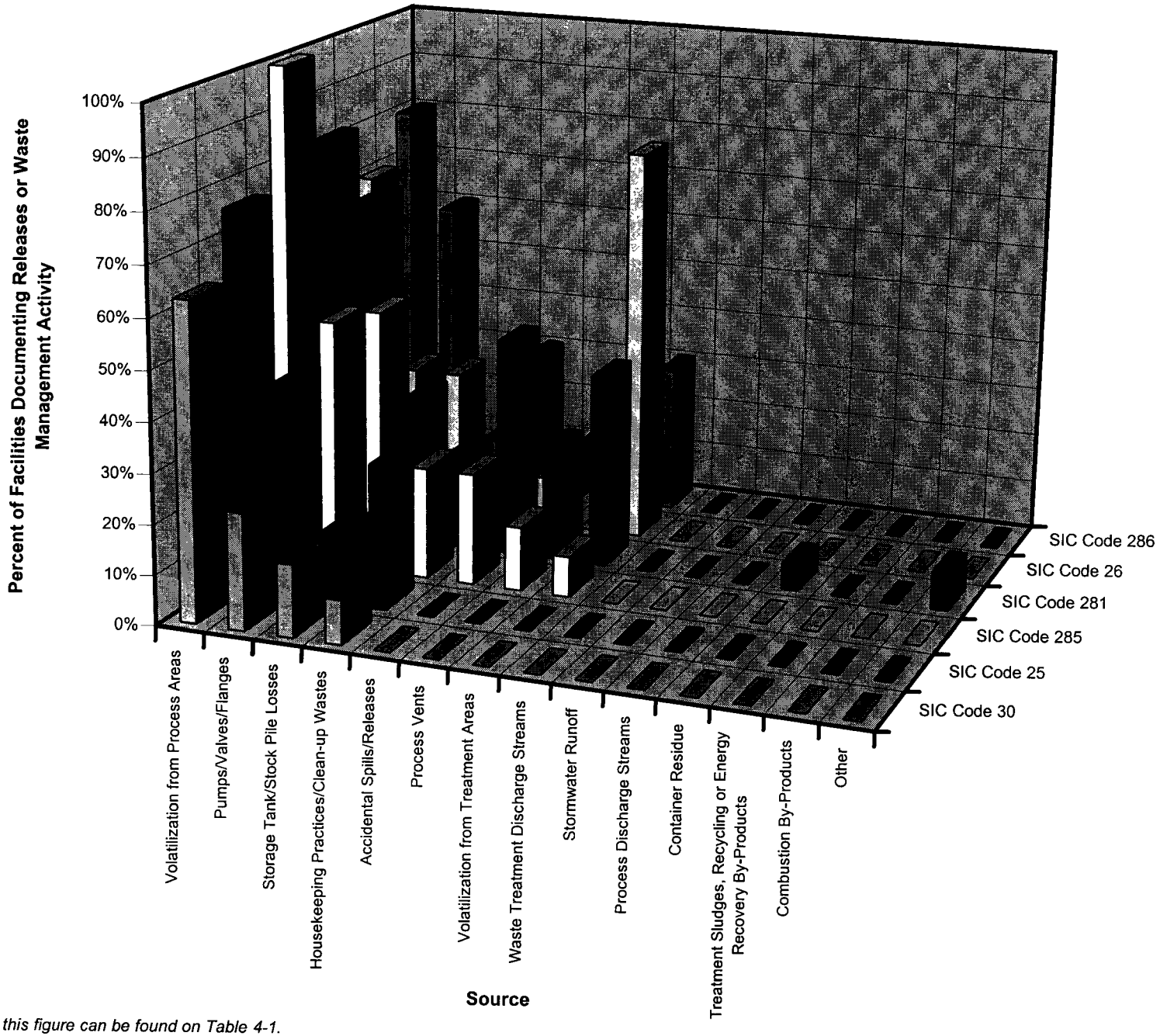
[1]Total is not additive as facilities may report a release type from multiple sources.
[2]Source listed as "other" include: off-spec product, uniform laundering, baghouse dust, cooling system wastewater, tank heel, sampling residue, and injection well treatment.

Figure 4-1a. Distribution to Release Type or Other Waste Management Activity, RY 1994 and RY 1995



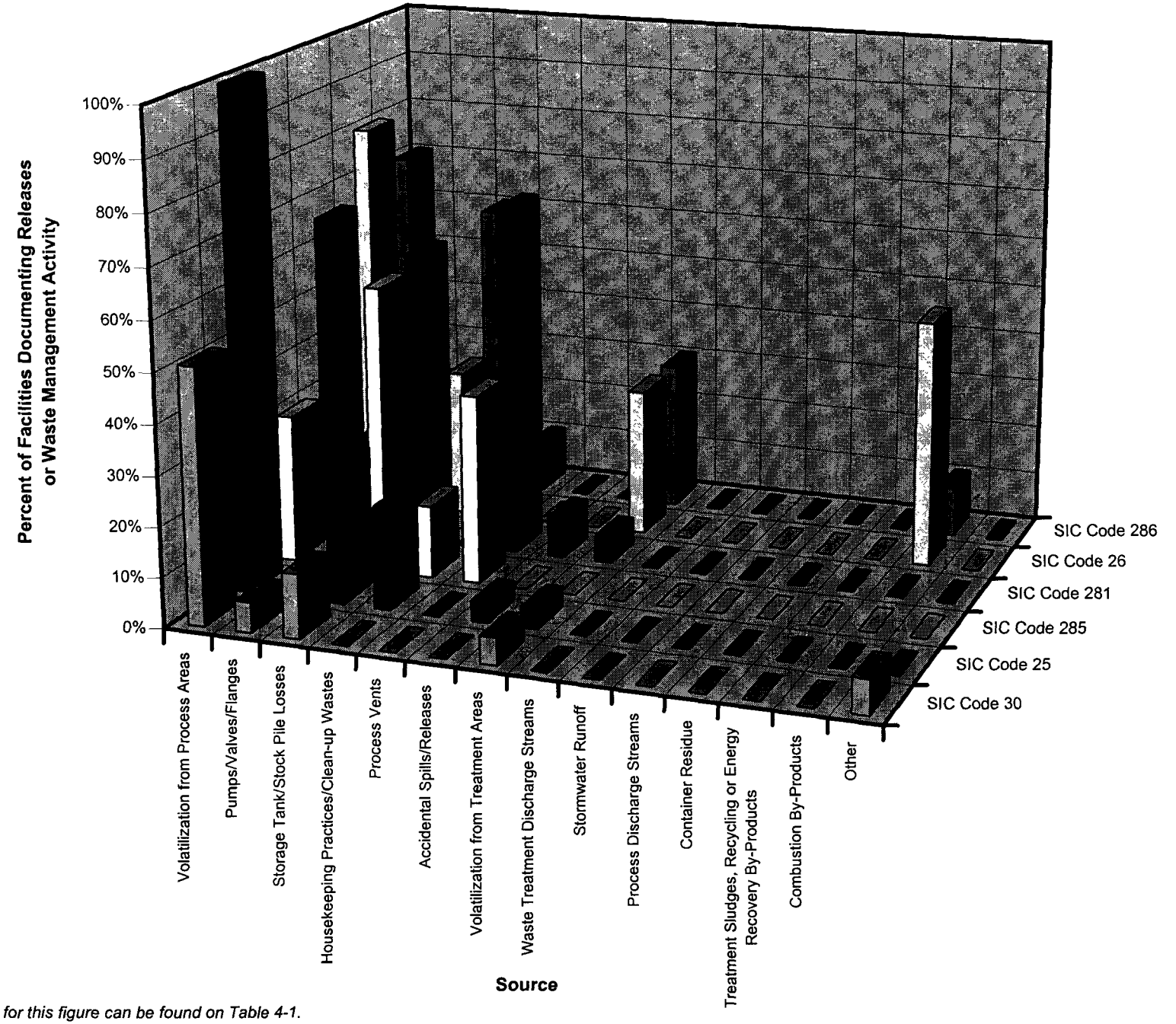
Data for this figure can be found on Table 4-1.

Figure 4-1b. Distribution to Sources for Fugitive Releases RY 1994 and RY 1995



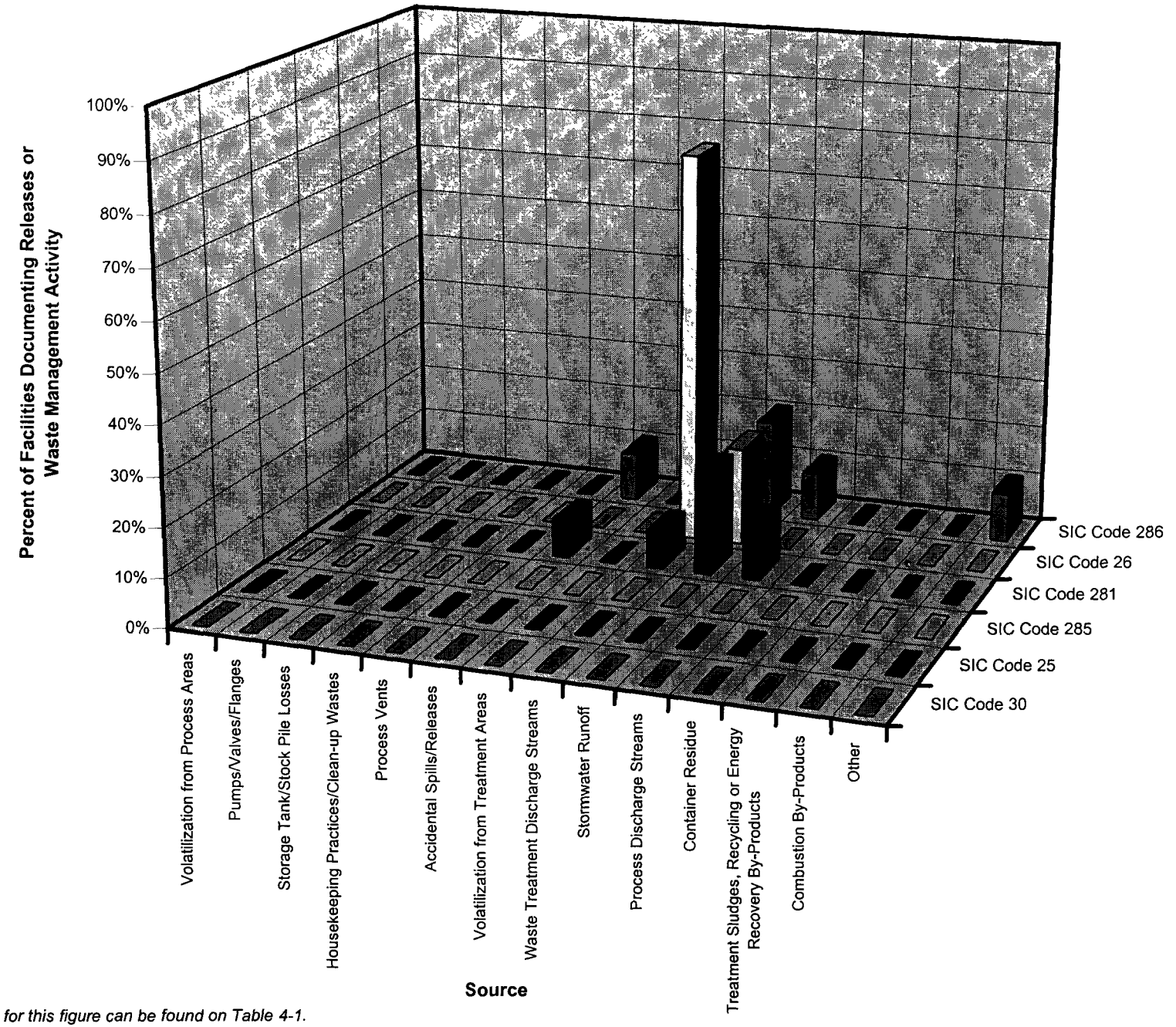
Data for this figure can be found on Table 4-1.

Figure 4-1c. Distribution to Sources for Stack Releases RY 1994 and RY 1995



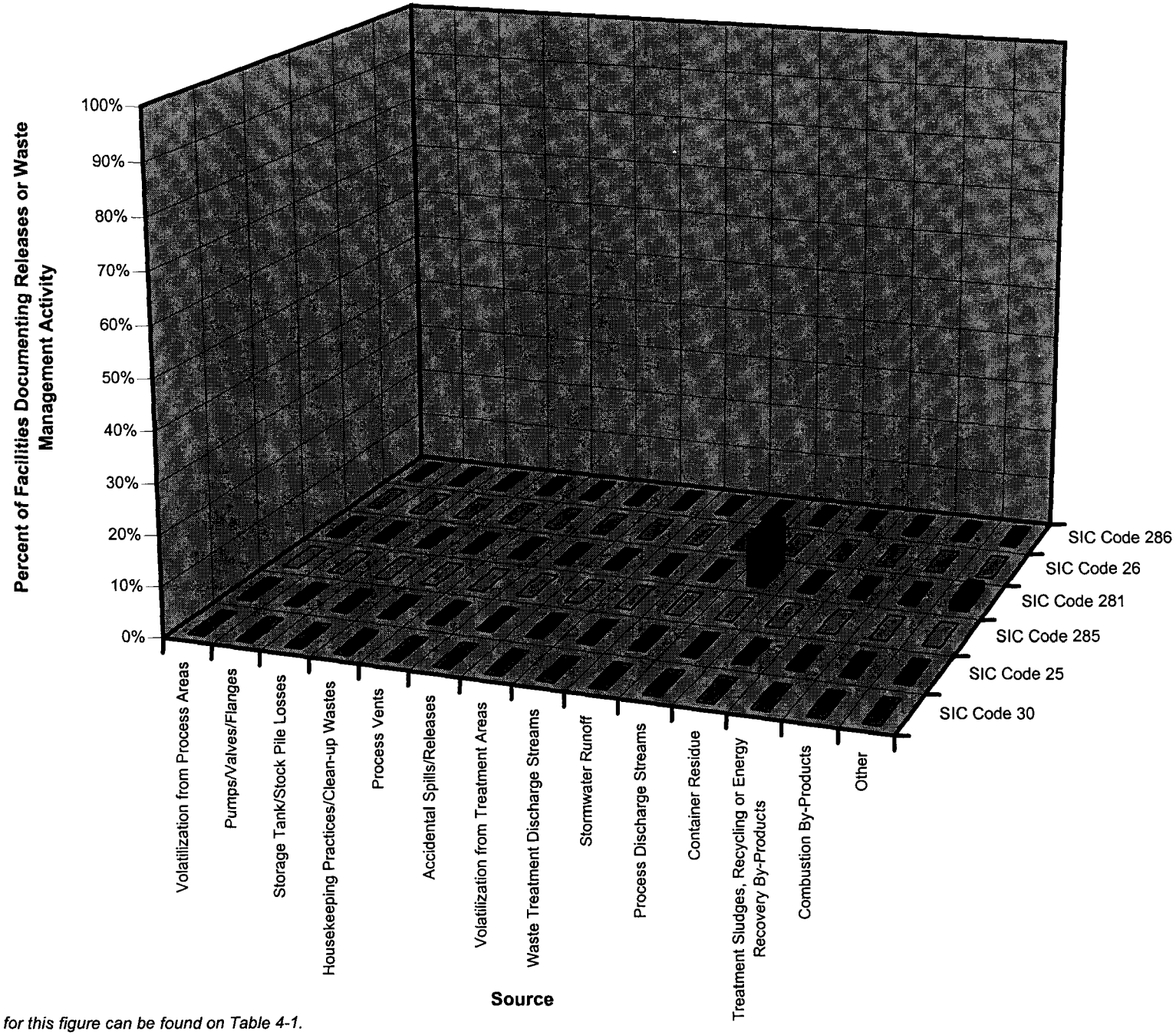
Data for this figure can be found on Table 4-1.

Figure 4-1d. Distribution to Sources for Receiving Stream Releases RY 1994 and RY 1995



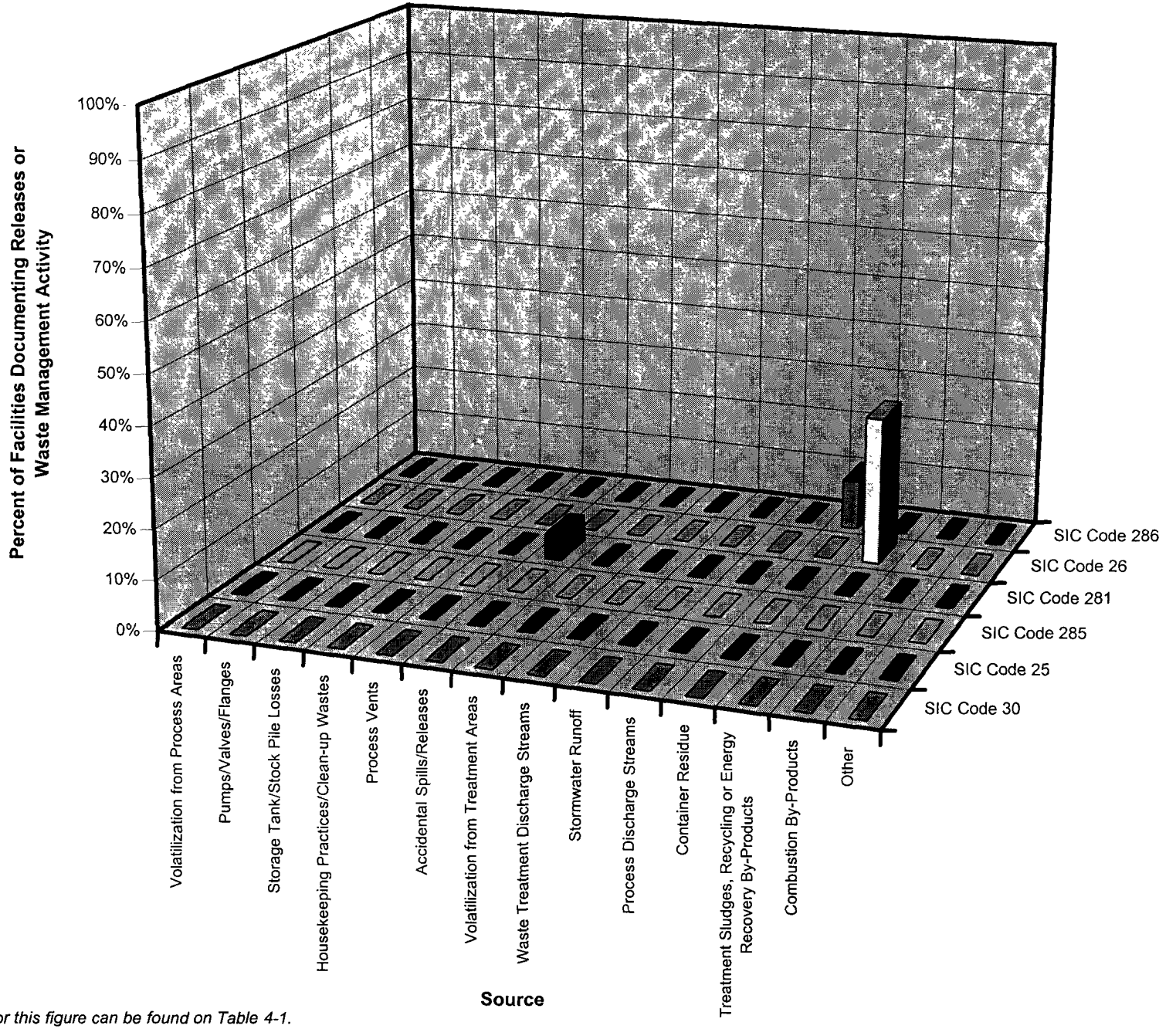
Data for this figure can be found on Table 4-1.

Figure 4-1e. Distribution to Sources for Underground Injection RY 1994 and RY 1995



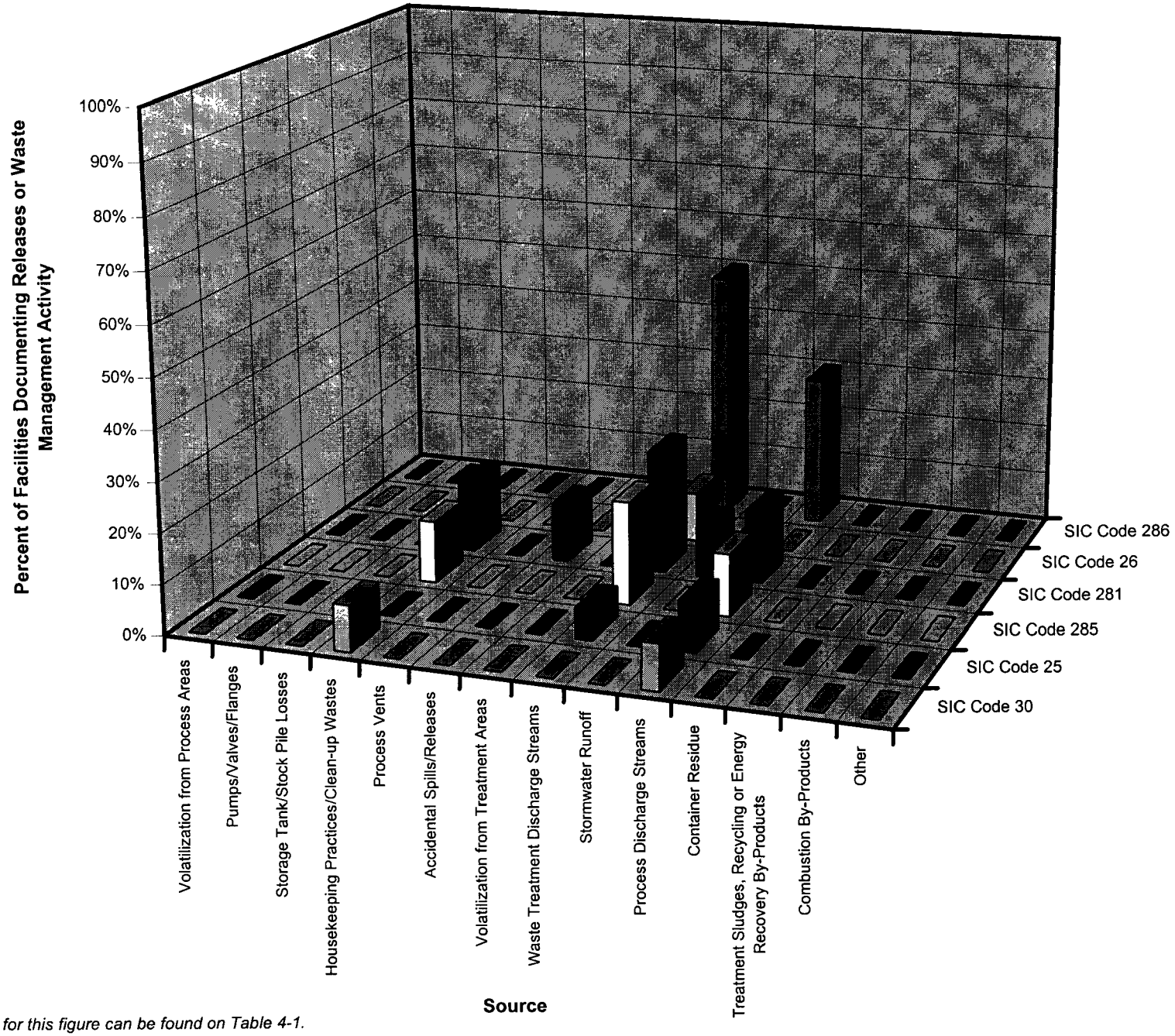
Data for this figure can be found on Table 4-1.

Figure 4-1f. Distribution to Sources for Land On-Site RY 1994 and RY 1995



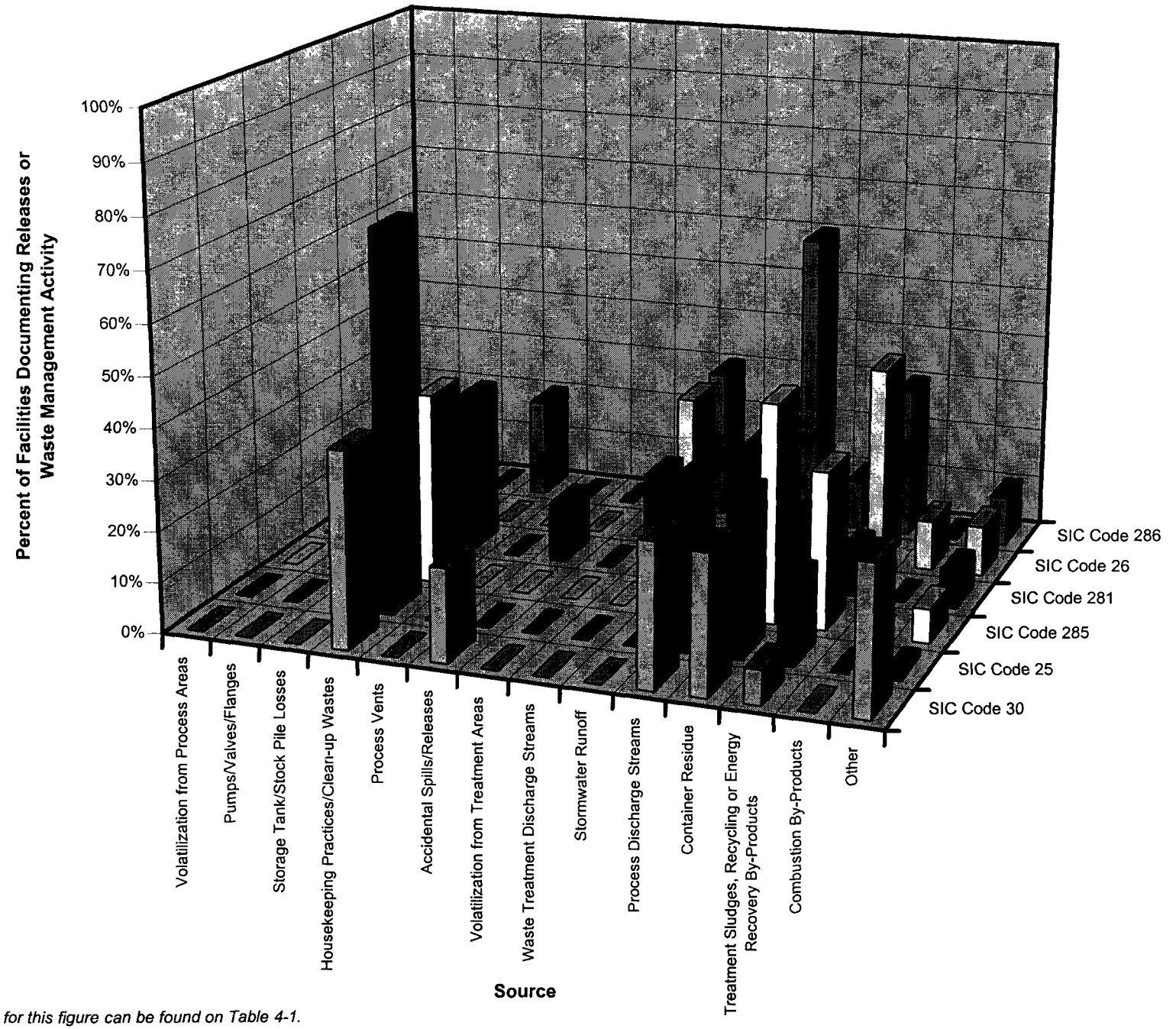
Data for this figure can be found on Table 4-1.

Figure 4-1g. Distribution to Sources for POTW Transfers RY 1994 and RY 1995



Data for this figure can be found on Table 4-1.

Figure 4-1h. Distribution to Sources for Off-Site Transfer RY 1994 and RY 1995



Data for this figure can be found on Table 4-1.

graphically by release type or other waste management activity for each source. Table 4-2 presents the percentage of occurrences (weighted) in which facilities incorrectly identified the release type or other waste management activity. Figure 4-2 presents the data graphically. Table 4-3 presents the percentage of occurrences (weighted) in which various release and other waste management sources were overlooked by facilities. Figure 4-3 presents the data graphically.

In general, most facilities in each SIC Code reported fugitive and stack releases and some type of transfer off-site for further waste management. Many facilities also reported transfers to POTWs. Other release types and waste management activities including those to on-site land were rarely observed.

4.2 Incorrectly Reported On-Site Release, Off-Site Transfer, and On-Site Waste Management Activity Types

A comparison of the on-site releases, off-site transfers, and on-site waste management activities reported by facilities and those identified by site surveyors showed that a large number of on-site releases, off-site transfers, and on-site waste management activities were reported to the wrong release or waste management activity type. This section discusses those types that were incorrectly reported and presents a qualitative discussion regarding the corresponding error in release and other waste management activity estimates. A detailed discussion of these quantities is presented in Section 5. Table 4-2 presents the weighted percent of reports that had release or other waste management activity types that were incorrectly identified.

In many circumstances, the overall estimates that were reported were correct, but they were assigned to the wrong type. For example, it was observed that many paint manufacturing facilities (SIC Code 285) correctly identified, and accurately estimated, air releases. However, the releases were incorrectly reported as stack releases (Section 5.2 of Form R) rather than as fugitive releases (Section 5.1). The main source of this error is that state reporting requirements and other federal reporting requirements often differ on the definition of stack vs. fugitive emissions, causing confusion for facilities. In some instances general room air

that is channeled to one vent on the building roof is considered a stack release, regardless of whether there is an associated air pollution control device (APCD). This is considered a fugitive release in other circumstances. This caused confusion when facilities completed various reporting requirements because they did not want to claim a release as a fugitive for one report and as a stack for another. This source of error was more common at facilities that had fugitive releases from indoor process areas without sophisticated air pollution control systems. Per TRI guidance, the use of an APCD makes this type of release a stack emission, which coincides with the definition of stack releases from most state requirements; thereby eliminating this source of error. While some facilities in each SIC Code incorrectly reported stack emissions, paint manufacturers (SIC Code 285) were the most likely to have this type of process (and corresponding error), and this type of error was rarely observed for furniture manufacturing (SIC Code 25) because typical facilities employed APCDs on building vents.

Table 4-2 and Figure 4-2 also show that many facilities (in most SIC Codes) incorrectly identified transfers off-site for further waste management (off-site recycling, off-site disposal, off-site energy recovery, and off-site treatment). Again, it was observed that the transfers were often correctly identified and estimated, but the reported disposition was incorrect. One source of this error is that many facilities expressed confusion as to how toxic chemical waste sent off-site should be classified. Many facilities did not investigate the ultimate disposition of the toxic chemical waste (nor felt it was their responsibility to do so). They simply guessed as to whether the waste would be treated, recycled, or disposed. This error was not typically observed at facilities that sent waste solvents off-site for energy recovery. This may be due to the fact that waste solvents are often sent off-site in large quantities (requiring large fees) and the receiving companies rigorously test, track, and charge by the quantity received.

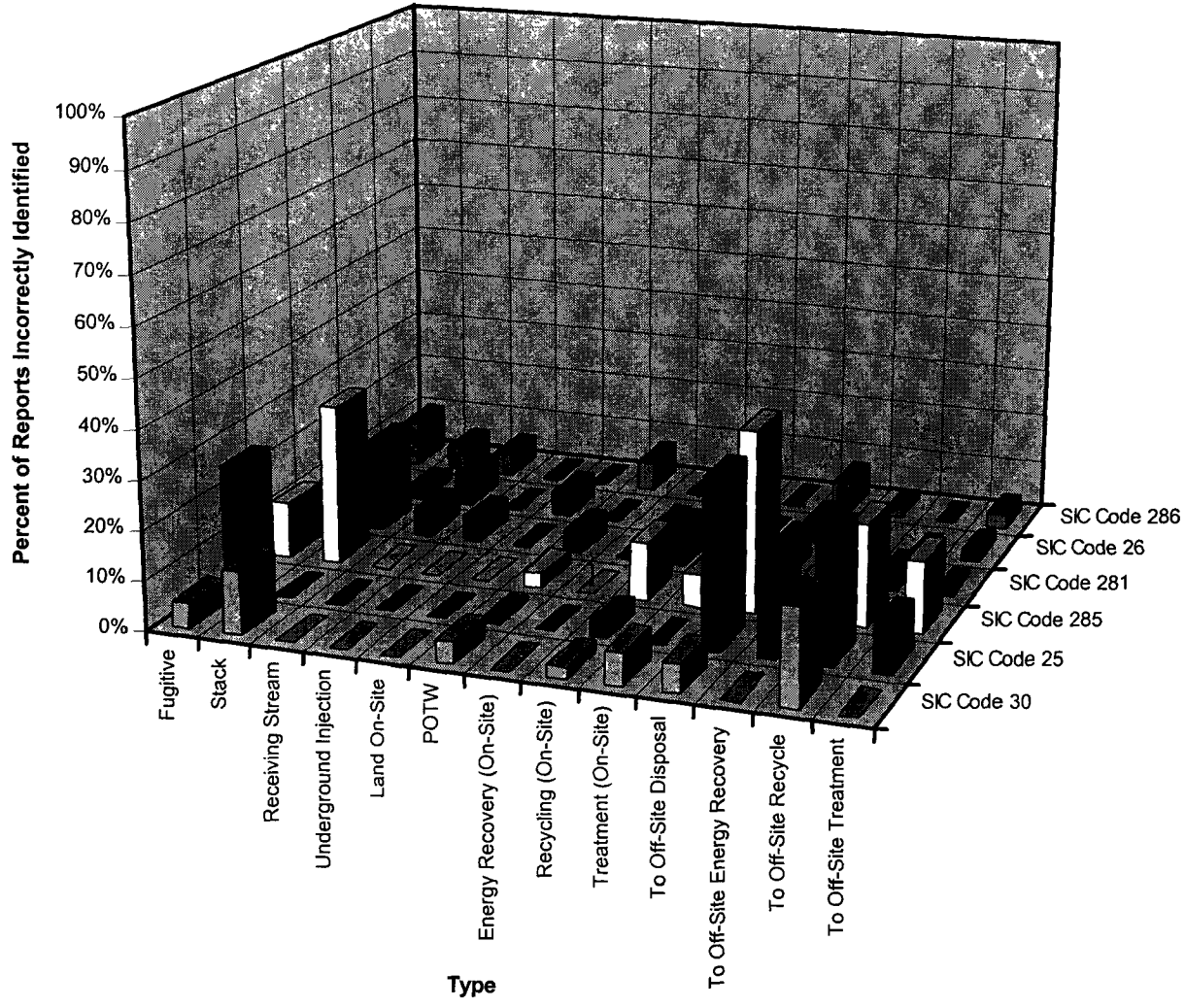
There were significant quantities of transfers to POTWs. However, these transfers were typically identified correctly by facilities (although the estimated quantity transferred may have been in error). This was expected because there are typically federal, state, and local limits on the water discharged to POTWs, and most POTWs require discharge monitoring. Therefore, facilities were aware of these discharges and had already invested time and effort to determine their quantity and source.

Table 4-2

Incorrectly Identified On-Site Releases, Off-Site Transfers, or On-Site Waste Management Activity Types, RY 1994 and RY 1995

Release or Waste Management Activity Type	Percent of Reports Identified (weighted)					
	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Fugitive	25.7%	9.0%	11.4%	5.2%	9.0%	9.4%
Stack	0:3%	18.6%	32.8%	12.8%	2.3%	4.7%
Receiving Stream	0.0%	5.5%	0.0%	0.0%	6.8%	4.7%
Underground Injection	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%
Land On-Site	0.0%	0.0%	0.0%	0.0%	4.9%	0.0%
POTW	0.9%	4.7%	3.1%	4.2%	0.0%	6.3%
Recycling (On-Site)	3.3%	7.3%	11.8%	2.3%	0.0%	0.0%
Treatment (On-Site)	0.0%	0.5%	6.6%	6.5%	0.0%	0.0%
To Off-Site Disposal	34.4%	6.9%	36.9%	5.9%	4.5%	6.5%
To Off-Site Energy Recovery	15.4%	1.1%	6.5%	0.0%	0.0%	1.6%
To Off-Site Recycle	25.4%	3.5%	20.7%	19.7%	0.0%	0.0%
To Off-Site Treatment	9.8%	0.8%	14.6%	0.0%	2.3%	3.2%

Figure 4-2. Incorrectly Identified Release Types and Other Waste Management Activities RY 1994 and RY 1995



Data for this figure can be found in Table 4-2.

Releases to receiving streams, underground injection wells, on-site land and on-site energy recovery were rarely observed during the site visits. Therefore, the potential for incorrectly identifying releases or on-site energy recovery was low or non-existent.

4.3 Overlooked Releases and Other Waste Management Activities

As shown on Table 4-3 and Figure 4-3, several facilities overlooked some releases and other waste management activities entirely. In some cases this resulted in an underestimation of the overall quantity of the toxic chemical managed as waste by the facility. However, in cases where a mass balance was used as the method to determine the quantity of the toxic chemical managed as waste, the facility may have included the quantity that was overlooked in another release type. For example, a facility may have overlooked a release or transfer off-site from container residual. However, after conducting a material balance and analyzing the total throughput and quantifiable releases and other waste management activities, this quantity may have been unaccounted for. The facility may have assumed this quantity was released from process areas as fugitive emissions. In this case, the release or transfer off-site to one type would have been under reported, while the fugitive air emissions would have been over reported.

It was observed that the primary overlooked sources were from chemicals sent off-site as container residue (typically as liquid residue in "empty" drums), stack emissions of volatile chemicals from on-site storage tanks, liquid discharges to POTWs or receiving streams (from aqueous washwater and spent solvents from waste cleaning materials), and fugitive releases from process areas and process lines (pumps, valves, and flanges).

The largest source of overlooked releases and other waste management activities (both frequency and overall quantity) was from container residue. Although the EPCRA Section 313 instructions specify that container residue should be considered as a release, most facilities assumed that all used drums, totes, or small containers were completely empty and the subsequent transfer of the empty containers off site (or the disposal on site) did not result in any release or transfer of EPCRA Section 313 chemicals. Many facilities did not consider the potential for reportable quantities of residual chemicals in these containers. Other facilities

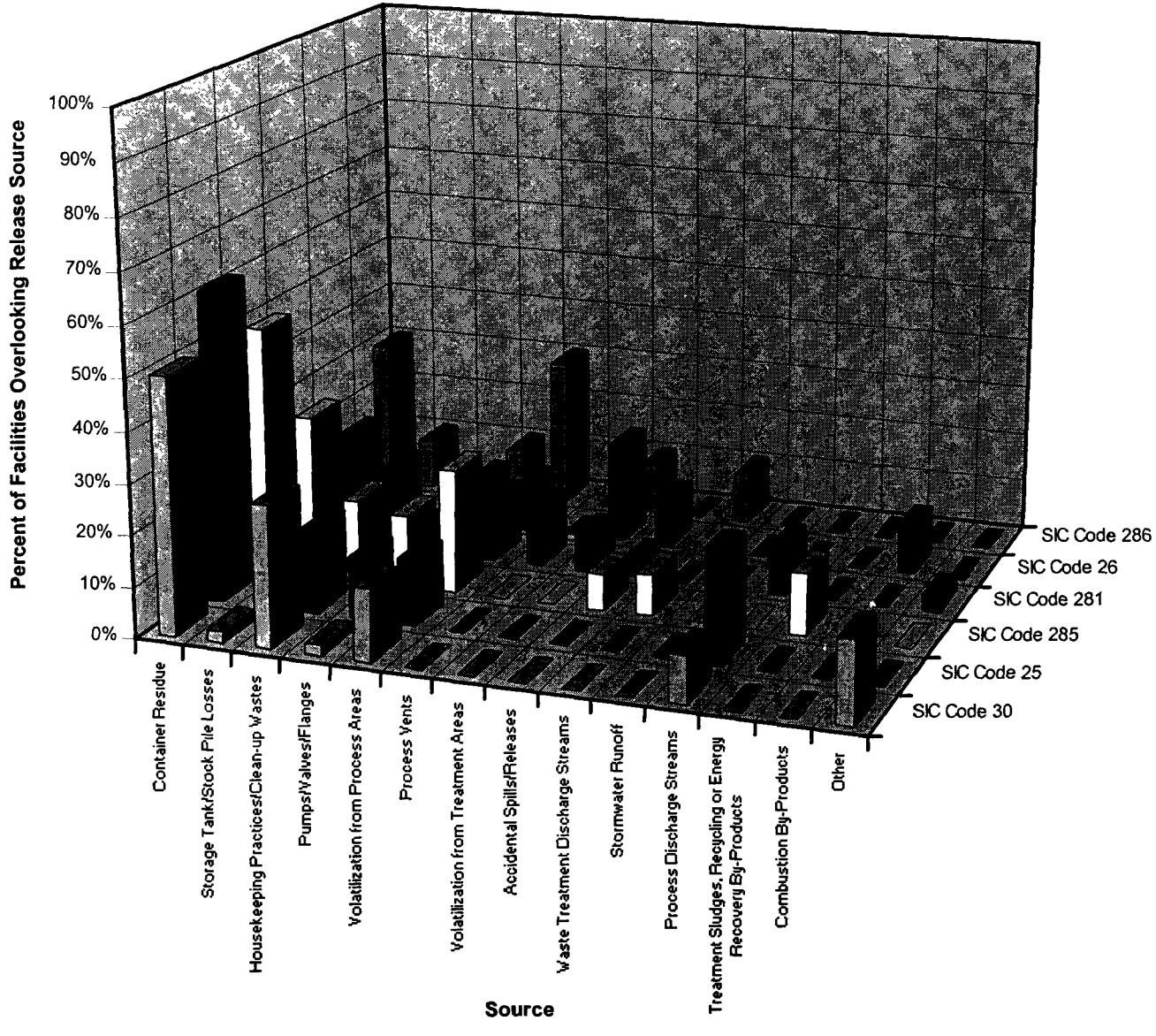
Table 4-3

Overlooked Release and Other Waste Management Activity Sources RY 1994 and RY 1995

Source	Percent of Reports Identified (weighted)					
	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Container Residue	61.4%	17.7%	49.0%	50.3%	10.0%	30.0%
Storage Tank/Stock Pile Losses	0.0%	22.9%	32.1%	2.1%	10.0%	10.0%
Housekeeping Practices/Clean-up Wastes	16.6%	5.3%	16.3%	27.9%	0.0%	0.0%
Pumps/Valves/Flanges	12.2%	8.6%	14.3%	2.1%	10.0%	10.0%
Volatilization from Process Areas	12.9%	13.0%	24.5%	14.0%	10.0%	30.0%
Process Vents	0.0%	12.3%	0.0%	0.0%	0.0%	0.0%
Volatilization from Treatment Areas	0.0%	7.5%	0.0%	0.0%	20.0%	10.0%
Accidental Spills/Releases	0.0%	3.4%	7.2%	0.0%	10.0%	0.0%
Waste Treatment Discharge Streams	0.0%	0.0%	8.2%	0.0%	0.0%	10.0%
Process Discharge Streams	21.5%	10.1%	0.0%	9.1%	0.0%	0.0%
Treatment Sludges, Recycling or Energy Recovery By-Products	0.0%	0.0%	12.3%	0.0%	0.0%	0.0%
Combustion By-Products	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%
Other[1]	0.0%	3.4%	0.0%	15.9%	0.0%	0.0%

[1]Source of "other" include: baghouse dust and repackaging losses.

Figure 4-3. Overlooked Releases and Other Waste Management Activity Sources RY 1994 and RY 1995



Data for this figure can be found on Table 4-3.

considered this potential release or waste management quantity but felt it was negligible (and did not report it) if drums were shipped as "empty", as defined by federal and/or state shipping regulations.

In practice, liquids are often removed from drums by gravity draining or by pumping. Neither of these methods removes all material from the drum and an appreciable quantity may remain. Additionally, some Department of Transportation (DOT) and RCRA Regulations require special handling precautions when transporting drums containing hazardous materials. Drums that once contained these materials that have been emptied may be exempt from these regulations. The definition can vary, but drums are often defined as empty for shipping purposes if they contain less than two inches of a liquid substance. Therefore, facilities often empty drums to comply with these regulations, but they do not completely empty them, due to economical considerations. It should be noted that many facilities sent hundreds of "empty" drums off-site and that if each drum contained some residual chemical, a significant quantity of release and otherwise managed was overlooked. Additionally, many facilities overlooked releases and other waste management quantities due to residual powdered EPCRA Section 313 chemicals in empty bags.

Most of the liquid releases and other waste management quantities from overlooked container residue should have been reported as off-site transfers to a disposal facility. However, some should have been reported to off-site recycling, off-site treatment, or off-site energy recovery. Other overlooked liquid discharges should have been reported to either POTWs or to receiving streams because the drums were rinsed on site and the rinsewater was collected and disposed to the local POTW or receiving stream. Most overlooked solid releases from bag residue should have been reported as being disposed to on-site landfills or to off-site disposal.

Volatilization from treatment areas was rarely overlooked. This is presumably because most treatment chemicals are either non-volatile or are completely destroyed during the treatment process.

Accidental spills and releases were also rarely overlooked. However, a number of facilities questioned the definition of a spill and requested additional guidance. The primary points of confusion pertained to the quantity and frequency of occurrence of spills. For example, it is common that paint manufacturing facilities have "spills" of paints containing EPCRA Section 313 chemicals or solvents used to make the paints on a daily basis. These "spills" are typically collected and sent to disposal, or the EPCRA Section 313 chemical was assumed to be volatilized and lost as a fugitive emission. Most facilities did not claim this as a catastrophic release in Section 8.8. However, they were unsure how to estimate the quantity and how to report it. Additionally, these "spills" are typically small (drippings that are less than one liter per occurrence). However, occasionally a pail, barrel, or drum may be knocked over. In these cases, facilities have asked for guidance as to when this should be reported as a catastrophic release rather than a "typical" release from the process.

Site surveyors did not identify any overlooked releases or other waste management activities from combustion by-products at facilities in SIC Codes 25, 281, 285, or 30. This can be attributed to the fact that very few of these facilities utilized on-site boilers, industrial furnaces, or incinerators. Those that did (typically chemical facilities or furniture manufacturers) used clean fuels (such as natural gas) that generated quantities of EPCRA Section 313 chemicals that were below reporting thresholds. However, some facilities in SIC Codes 26 and 286 that used coal and/or fuel oil for on-site boilers overlooked the incidental manufacture of EPCRA Section 313 chemicals from these units.

The pulp and paper industry often uses on-site boilers or recovery furnaces for the destruction of unwanted byproducts and the concurrent generation of steam for use in the manufacturing process. Coal and/or fuel oil are typical fuels for these units. Combustion of these fuels can result in the coincidental manufacture and subsequent release of EPCRA Section 313 chemicals above the reporting threshold. Some facilities overlooked this potential manufacture and release. EPCRA Section 313 chemicals that were manufactured above the threshold, but overlooked included sulfuric acid (acid aerosols) and hydrochloric acid (acid aerosols). Formaldehyde was also manufactured in appreciable quantities, and overlooked, by

some facilities. However, it was not manufactured above the reporting threshold at any sites that were visited. It is expected that facilities in other SIC Codes that utilize large coal or fuel oil burning recovery boilers may have also overlooked this release source.

4.4 Calculation Methodologies

EPA requires facilities to designate one of four categories of calculation methodology that were used for each release or other waste management activity estimate (monitoring data, mass balances, emission factors, and engineering judgment or calculations). Table 4-4 presents the distribution of calculation methodologies that were used (weighted) to determine estimates for each release or other waste management activity type. It was observed during the review of facility notes that facilities often used multiple methods or reported a method that was inconsistent with the method actually used. Therefore, the data reported in Table 4-4 represents the site surveyor's opinion as to the primary method actually used by the facility, not necessarily the method reported on the facility's Form R. This allows for analysis of data accuracy when compared to the actual methods used. Additionally, a significant number of facilities used hazardous waste manifests to calculate estimates of off site transfers. Site surveyors noted these occurrences and their frequency of use is presented along with the four EPA-accepted methods when applicable. Figures 4-4a through 4-4m present the calculation methodology data graphically. There was considerable difference in the methodologies used between each SIC Code and in those used within SIC Codes for each release or other waste management activity type. It should be noted that there were few or no releases reported to several release types. In these circumstances the table and corresponding figures currently show 0%.

Nearly all facilities reported at least one fugitive release. Site surveyors observed that fugitive releases were typically the most difficult for facilities to estimate. Engineering calculations, as presented in Table 4-4 and the corresponding figures, are the predominant method used by most facilities. Site surveyors observed that many facilities actually used one or more of the methods to estimate fugitive emissions, and applied engineering judgement to total the emissions from all sources. This included engineering judgement for partitioning releases between stack and fugitive if monitoring data was not available. Mass balances, monitoring data,

Table 4-4

Distribution of Calculation Methodologies, RY 1994 and RY 1995

Release or Other Waste Management Activity Type	Calculation Methodology	Percent of Facilities Documenting Releases (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Fugitive	Engineering Calculations	26.8%	59.5%	62.4%	38.5%	40.7%	22.6%
	Mass Balance	62.1%	1.6%	8.7%	23.6%	0.0%	9.4%
	Monitoring Data	0.0%	6.8%	0.0%	0.0%	0.0%	15.1%
	Emission Factors	1.8%	30.9%	21.5%	34.5%	51.9%	52.8%
	Other[1]	9.3%	1.2%	7.5%	3.4%	7.4%	0.0%
Stack	Engineering Calculations	19.4%	62.0%	59.7%	52.5%	15.1%	46.3%
	Mass Balance	72.1%	3.3%	11.0%	24.2%	3.0%	0.0%
	Monitoring Data	0.0%	17.8%	9.7%	5.8%	12.1%	11.1%
	Emission Factors	1.7%	11.1%	19.7%	14.1%	69.7%	40.7%
	Other[1]	6.8%	5.7%	0.0%	3.4%	0.0%	1.9%
Receiving Stream	Engineering Calculations	0.0%	18.4%	0.0%	0.0%	36.7%	13.0%
	Mass Balance	0.0%	0.0%	0.0%	0.0%	3.3%	8.7%
	Monitoring Data	0.0%	81.6%	0.0%	0.0%	33.3%	78.3%
	Emission Factors	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%
	Other[1]	0.0%	0.0%	0.0%	0.0%	6.7%	0.0%
Underground Injection	Engineering Calculations	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Land On-Site	Engineering Calculations	0.0%	100.0%	0.0%	0.0%	60.0%	100.0%
	Monitoring Data	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%
	Emission Factors	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%

Table 4-4 (Continued)

Distribution of Calculation Methodologies, RY 1994 and RY 1995

Release or Other Waste Management Activity Type	Calculation Methodology	Percent of Facilities Documenting Releases (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Land On-Site (Cont.)	Other[1]	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%
POTW	Engineering Calculations	15.7%	40.8%	100.0%	0.0%	0.0%	26.8%
	Mass Balance	84.3%	37.7%	0.0%	0.0%	0.0%	9.8%
	Monitoring Data	0.0%	21.6%	0.0%	100.0%	100.0%	63.4%
To Off-Site Disposal	Engineering Calculations	0.0%	22.2%	92.3%	47.3%	42.9%	75.0%
	Mass Balance	0.0%	12.1%	6.8%	53.7%	28.6%	0.0%
	Monitoring Data	0.0%	65.7%	0.9%	0.0%	0.0%	25.0%
	Emission Factors	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%
	Other[1]	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%
To Off-Site Treatment	Engineering Calculations	0.0%	21.1%	71.1%	27.2%	0.0%	4.8%
	Mass Balance	0.0%	10.5%	0.0%	33.2%	0.0%	0.0%
	Monitoring Data	87.5%	34.2%	28.9%	39.5%	0.0%	95.2%
	Hazardous Waste Manifests	0.0%	34.2%	0.0%	0.0%	0.0%	0.0%
	Emission Factors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Other[1]	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%
To Off-Site Recycle	Engineering Calculations	4.9%	0.0%	63.3%	73.3%	0.0%	0.0%
	Monitoring Data	0.0%	100.0%	29.6%	26.7%	0.0%	100.0%
	Hazardous Waste Manifests	92.3%	0.0%	7.1%	0.0%	0.0.%	0.0%

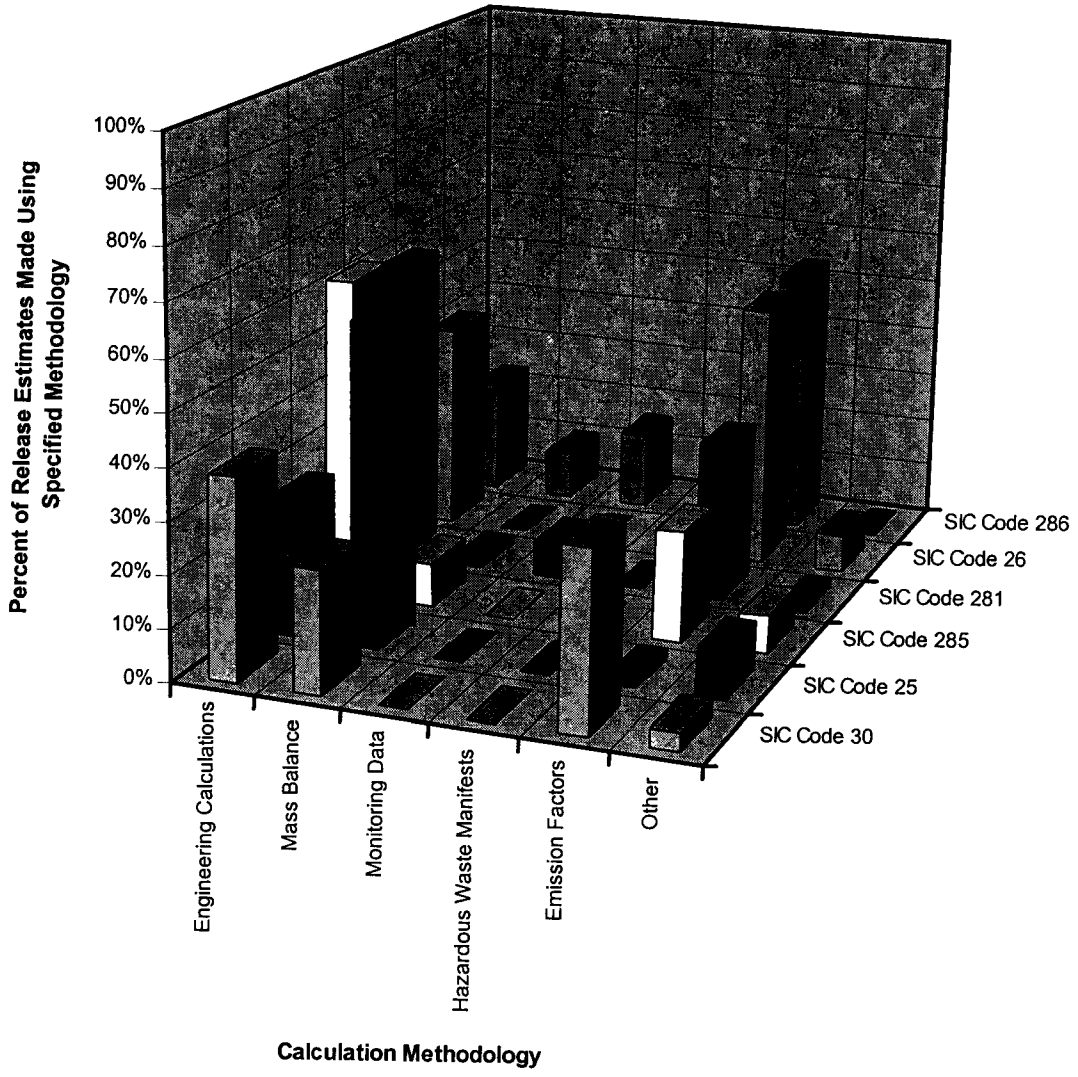
Table 4-4 (Continued)

Distribution of Calculation Methodologies, RY 1994 and RY 1995

Release or Other Waste Management Activity Type	Calculation Methodology	Percent of Facilities Documenting Releases (weighted)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
To Off-Site Recycle (Cont.)	Other[1]	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%
To Off-Site Energy Recovery	Engineering Calculations	19.9%	71.6%	8.1%	16.7%	0.0%	4.5%
	Mass Balance	13.9%	0.0%	0.0%	0.0%	0.0%	13.6%
	Monitoring Data	31.6%	0.0%	89.8%	0.0%	0.0%	81.8%
	Hazardous Waste Manifests	23.2%	28.4%	2.1%	83.3%	0.0%	0.0%
	Other[1]	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%
On-Site Treatment	Engineering Calculations	0.0%	33.5%	100.0%	20.9%	30.3%	29.4%
	Mass Balance	100.0%	32.8%	0.0%	0.0%	30.3%	5.9%
	Monitoring Data	0.0%	29.0%	0.0%	79.1%	18.2%	64.7%
	Emission Factors	0.0%	4.6%	0.0%	0.0%	21.2%	0.0%
On-Site Energy Recovery	Engineering Calculations	0.0%	0.0%	0.0%	0.0%	42.9%	0.0%
	Mass Balance	0.0%	0.0%	0.0%	0.0%	28.6%	0.0%
	Monitoring Data	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Emission Factors	0.0%	0.0%	0.0%	0.0%	28.6%	0.0%
On-Site Recycling	Engineering Calculations	18.2%	47.5%	48.7%	92.0%	100.0%	71.4%
	Mass Balance	3.2%	0.0%	21.1%	0.0%	0.0%	0.0%
	Monitoring Data	33.2%	52.5%	26.5%	8.0%	0.0%	28.6%
	Other[1]	45.3%	20.5%	3.6%	0.0%	0.0%	0.0%

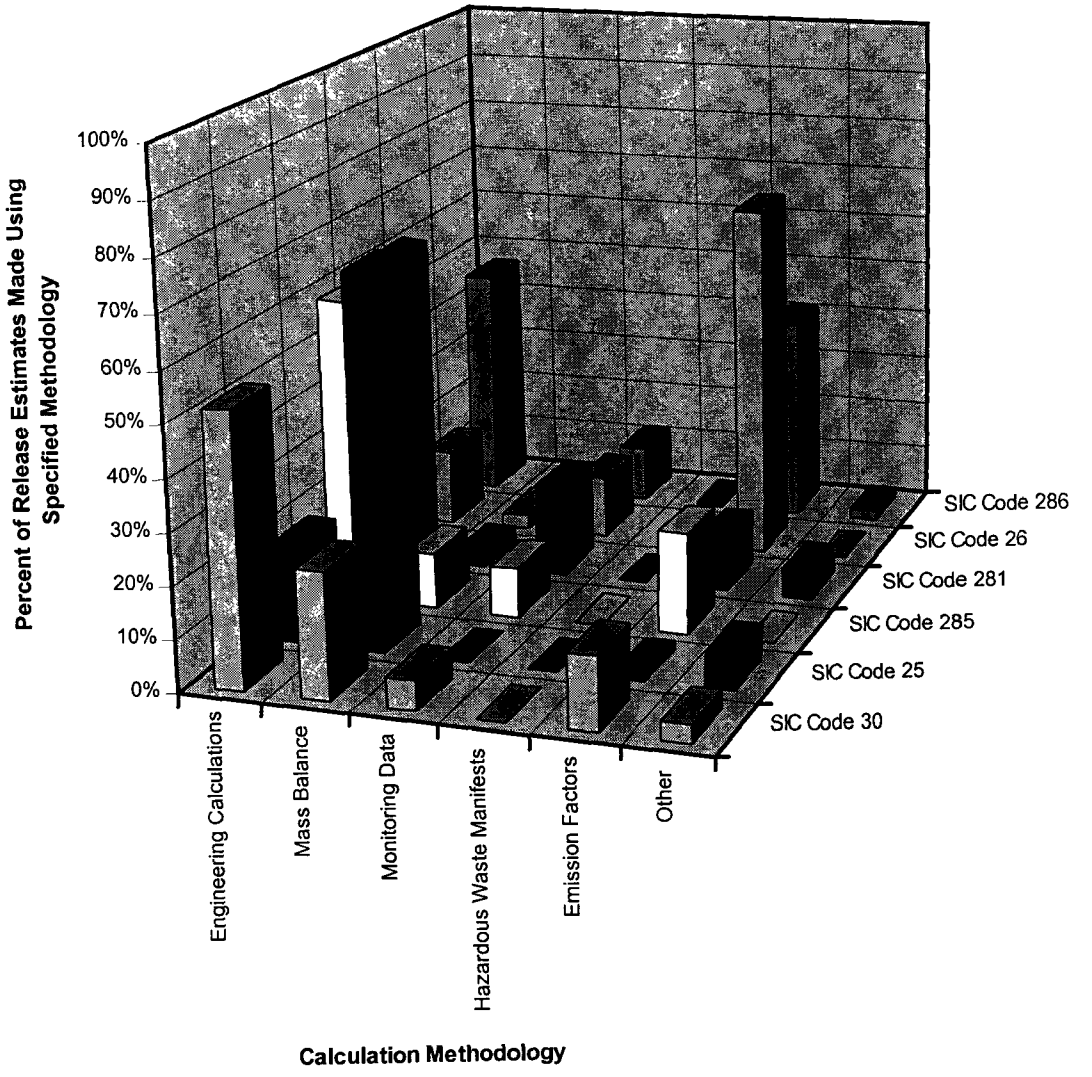
[1]"Other" methodologies according to facility notes include: hazardous waste manifests, off-site facility test reports, facility or trade association computer modeling, air permit limits, and "undocumented".

Figure 4-4a. Distribution of Calculation Methodologies (Fugitive) RY 1994 and RY 1995



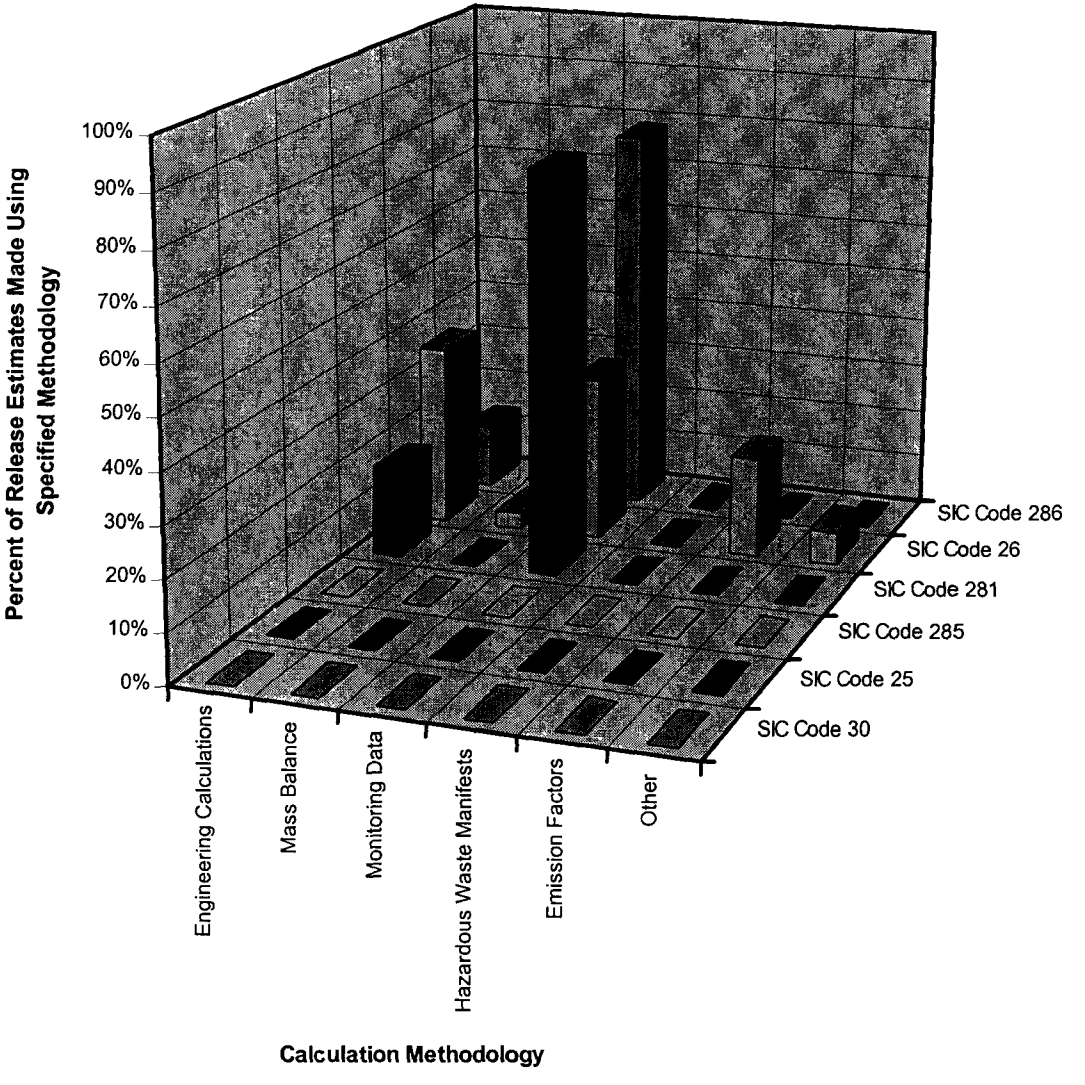
Data for this figure can be found on Table 4-4.

Figure 4-4b. Distribution of Calculation Methodologies (Stack) RY 1994 and RY 1995



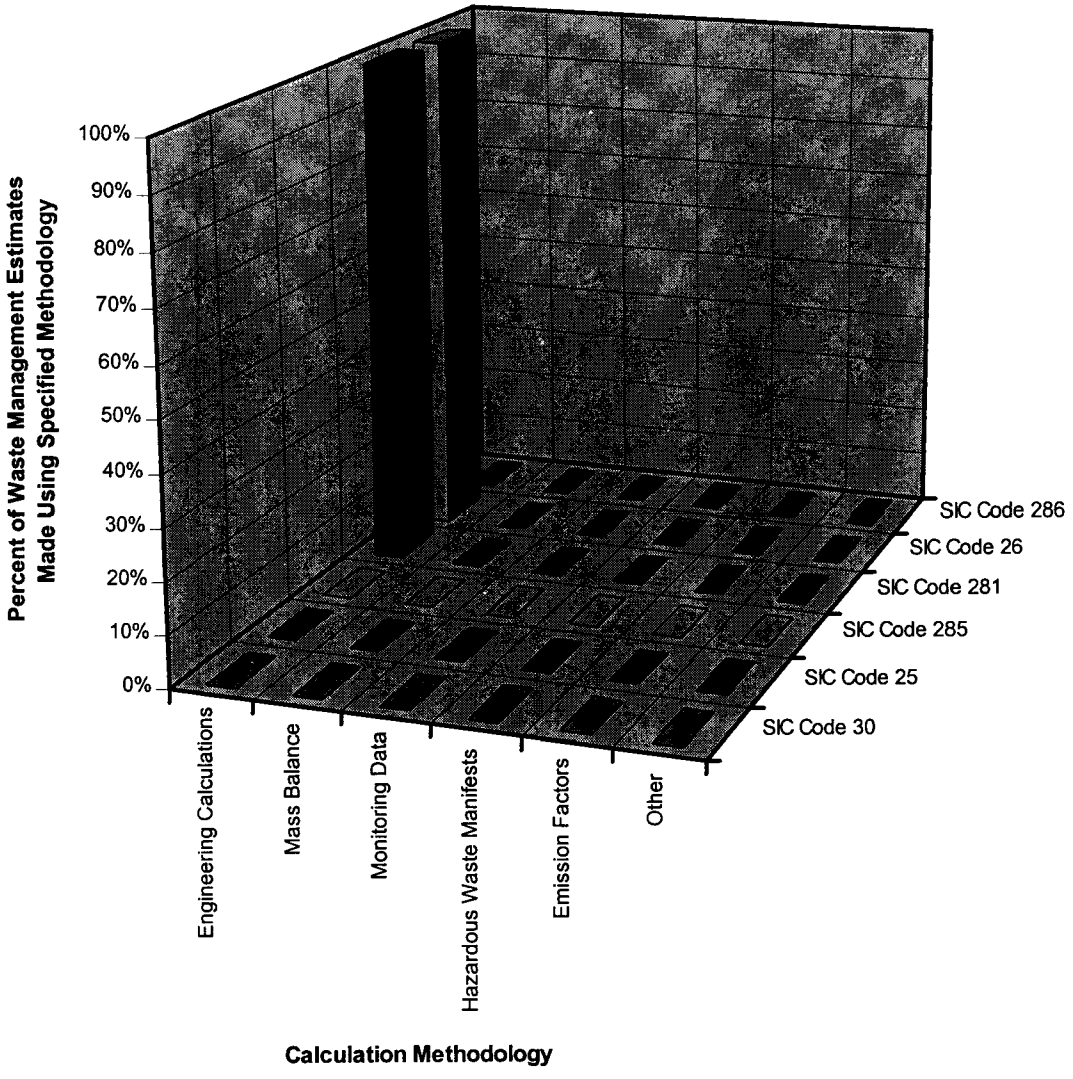
Data for this figure can be found on Table 4-4.

Figure 4-4c. Distribution of Calculation Methodologies (Receiving Stream) RY 1994 and RY 1995



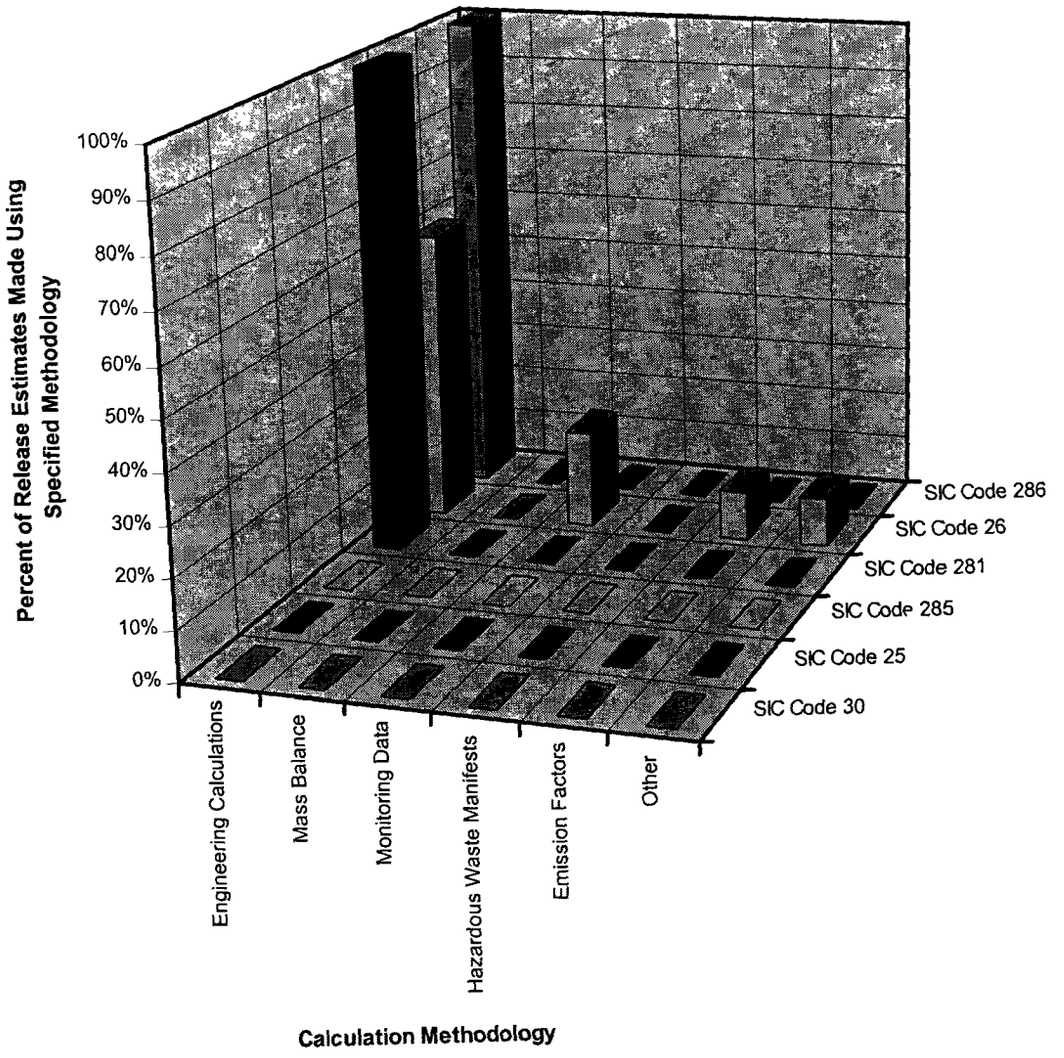
Data for this figure can be found on Table 4-4.

Figure 4-4d. Distribution of Calculation Methodologies (Underground Injection) RY 1994 and RY 1995



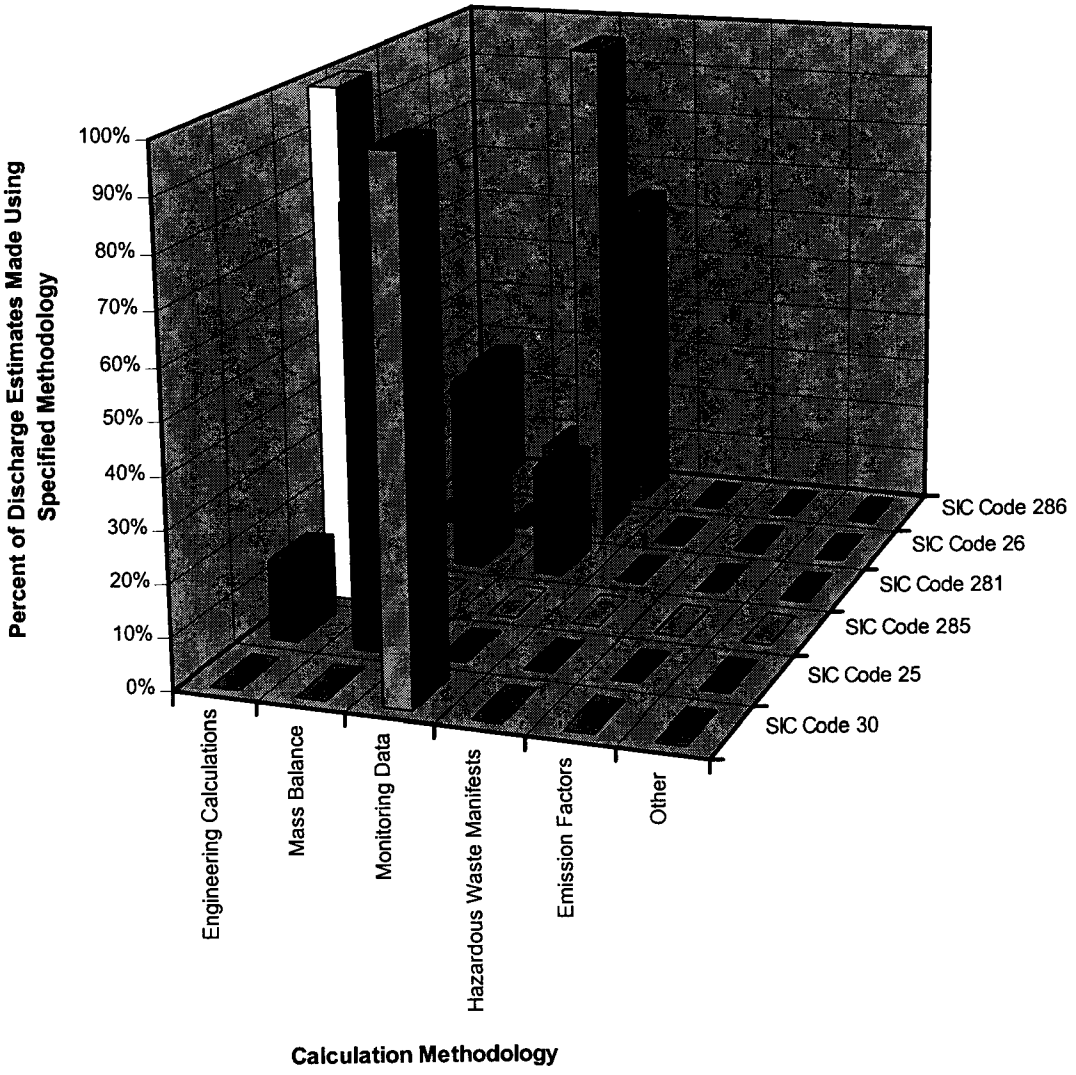
Data for this figure can be found on Table 4-4.

Figure 4-4e. Distribution of Calculation Methodologies (Land On-Site) RY 1994 and RY 1995



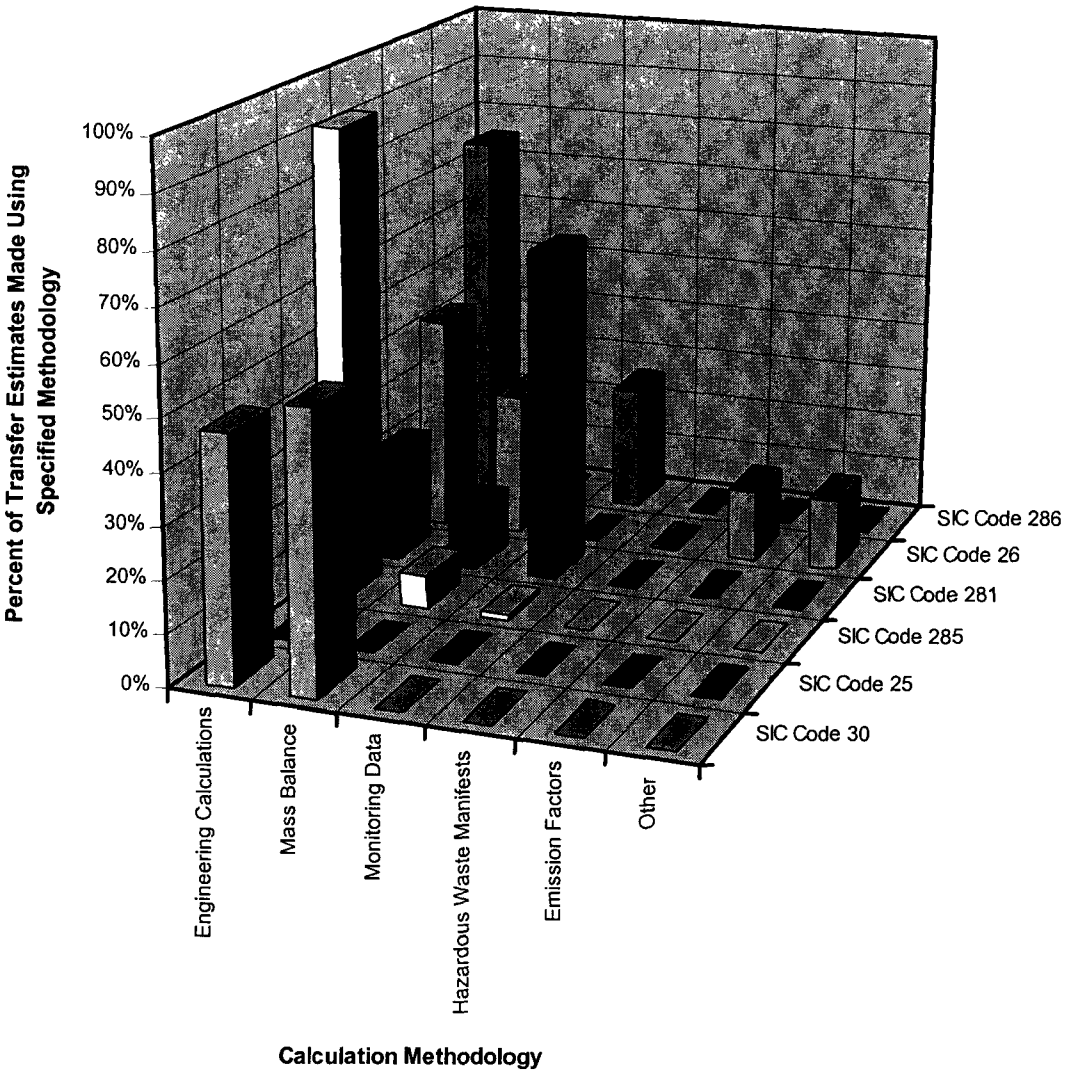
Data for this figure can be found on Table 4-4.

Figure 4-4f. Distribution of Calculation Methodologies (POTW) RY 1994 and RY 1995



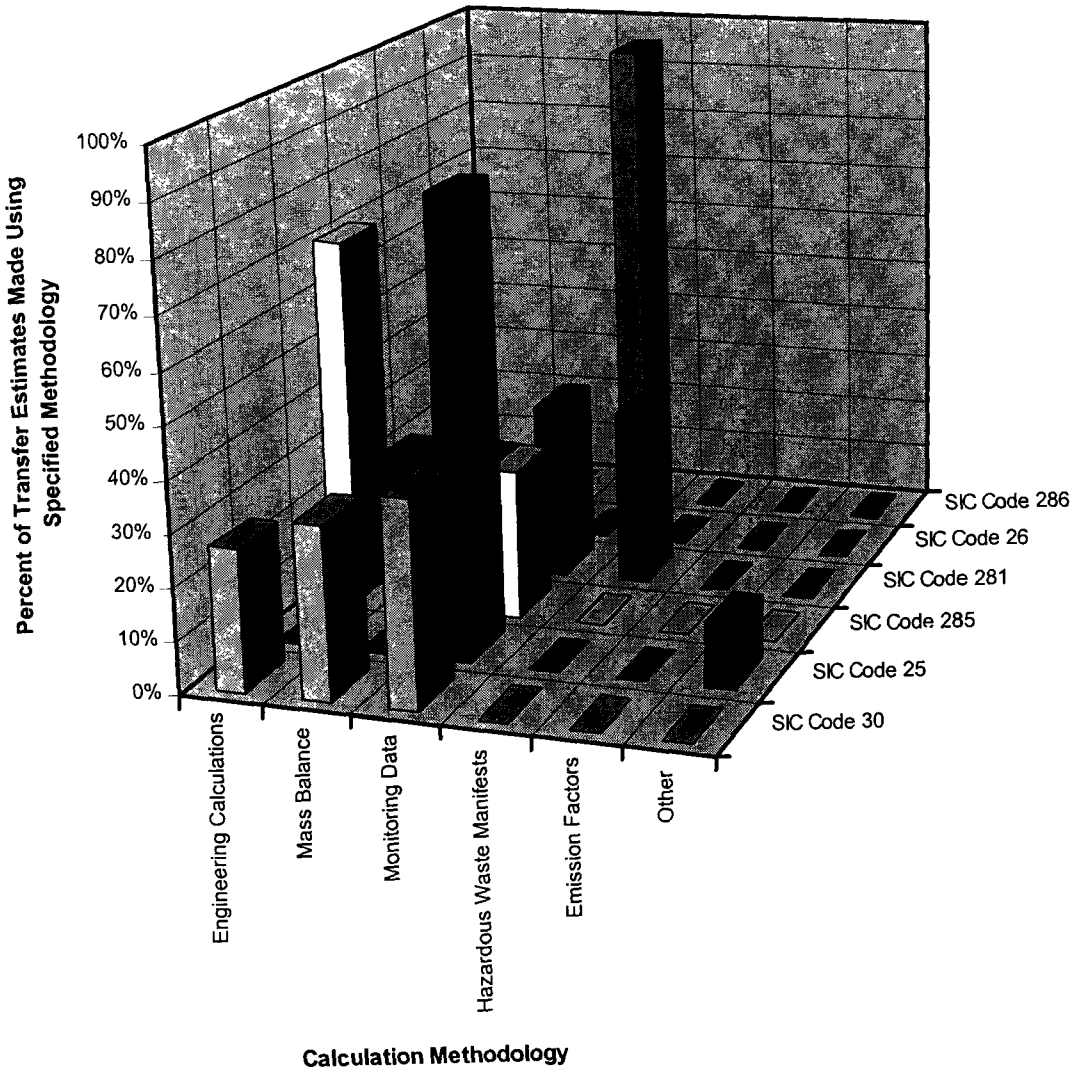
Data for this figure can be found on Table 4-4.

Figure 4-4g. Distribution of Calculation Methodologies (To Off-Site Disposal) RY 1994 and RY 1995



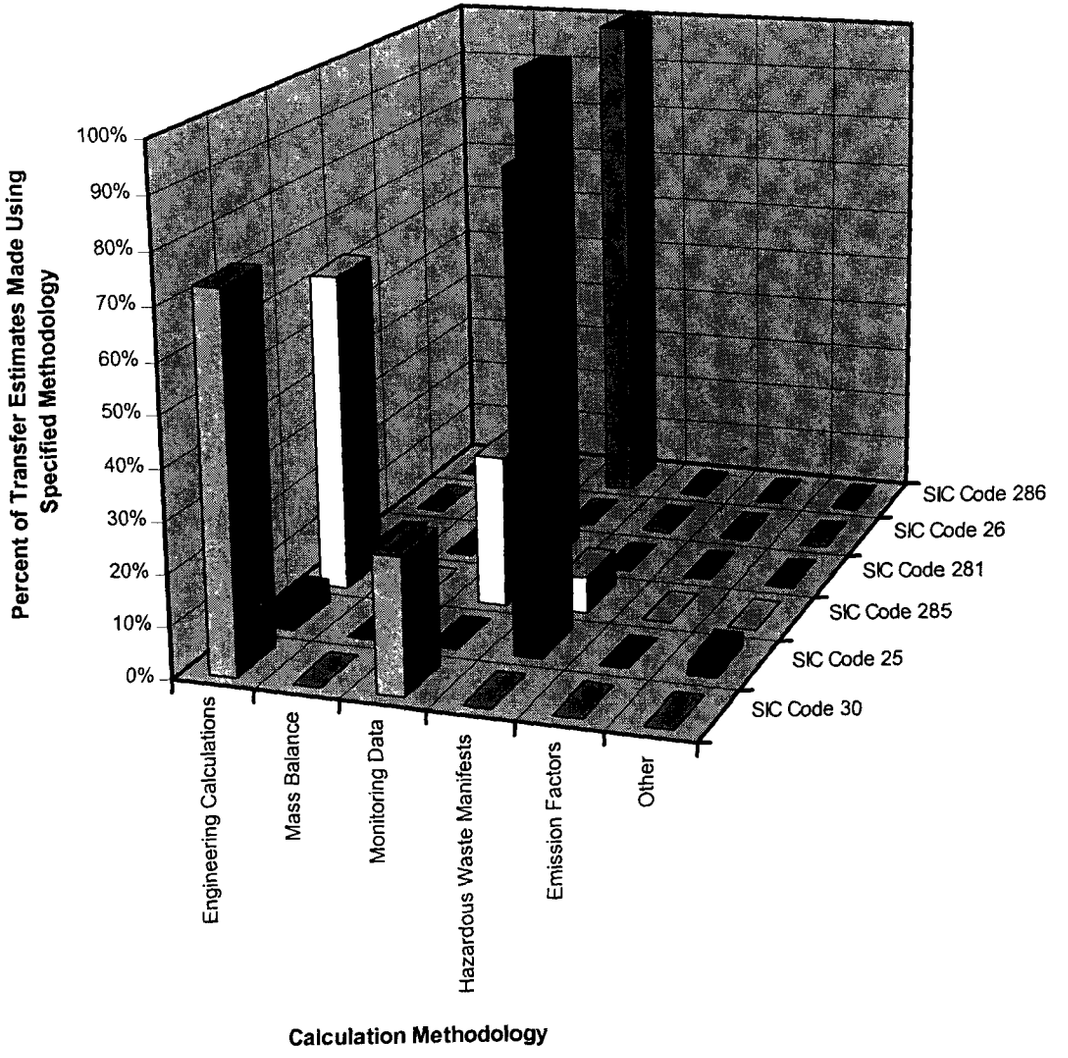
Data for this figure can be found on Table 4-4.

Figure 4-4h. Distribution of Calculation Methodologies (To Off-Site Treatment) RY 1994 and RY 1995



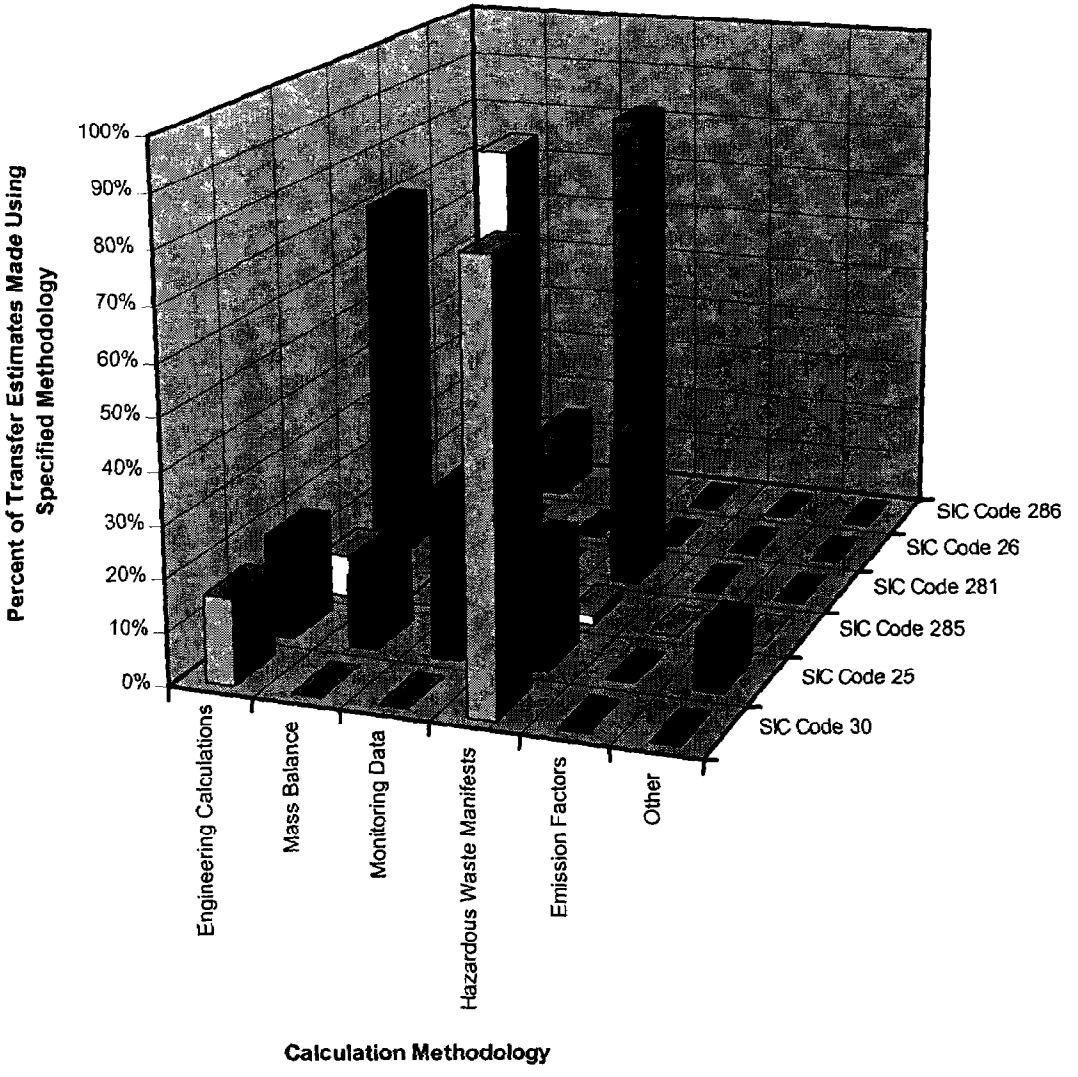
Data for this figure can be found on Table 4-4.

Figure 4-4i. Distribution of Calculation Methodologies (To Off-Site Recycle) RY 1994 and RY 1995



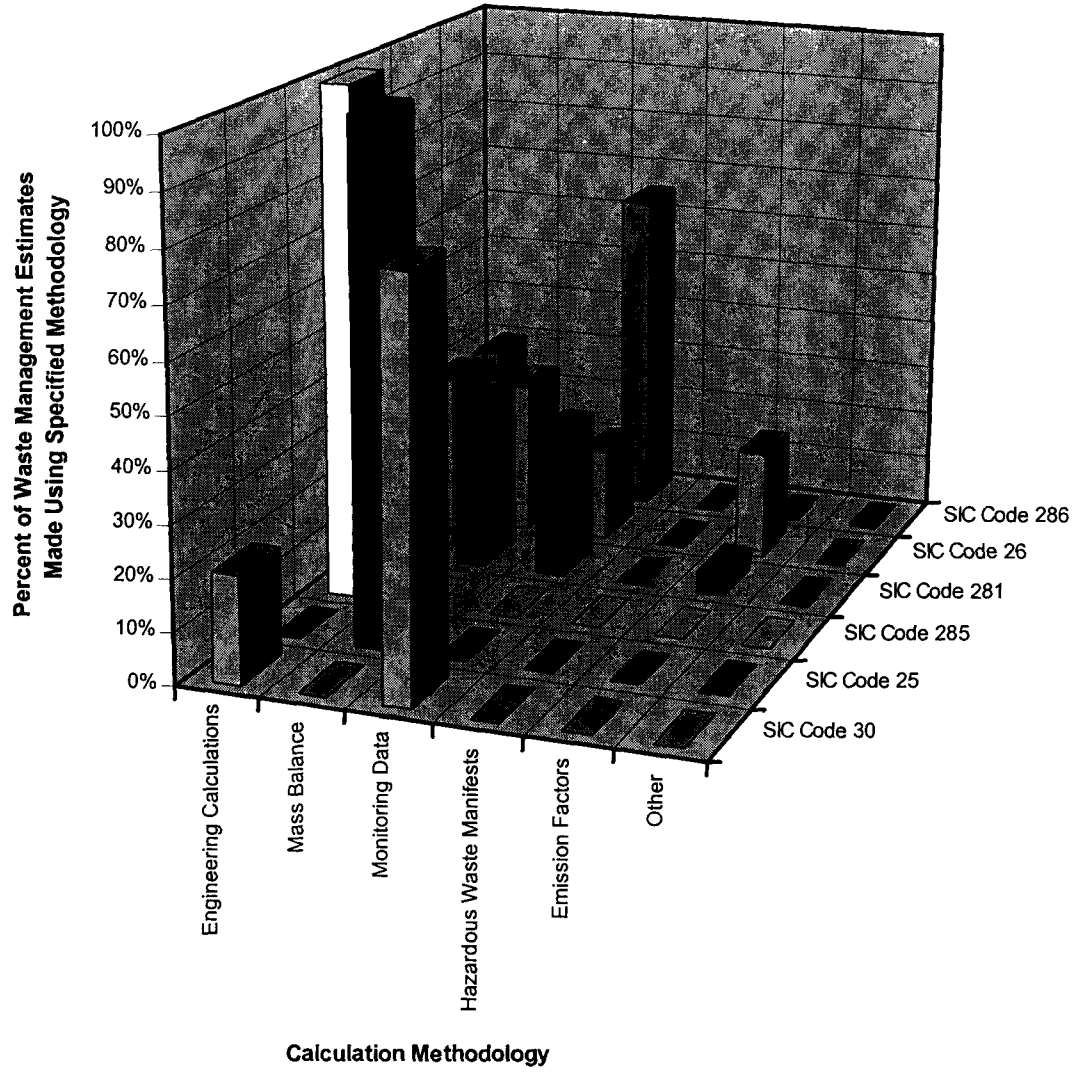
Data for this figure can be found on Table 4-4.

Figure 4-4j. Distribution of Calculation Methodologies (To Off-Site Energy Recovery) RY 1994 and RY 1995



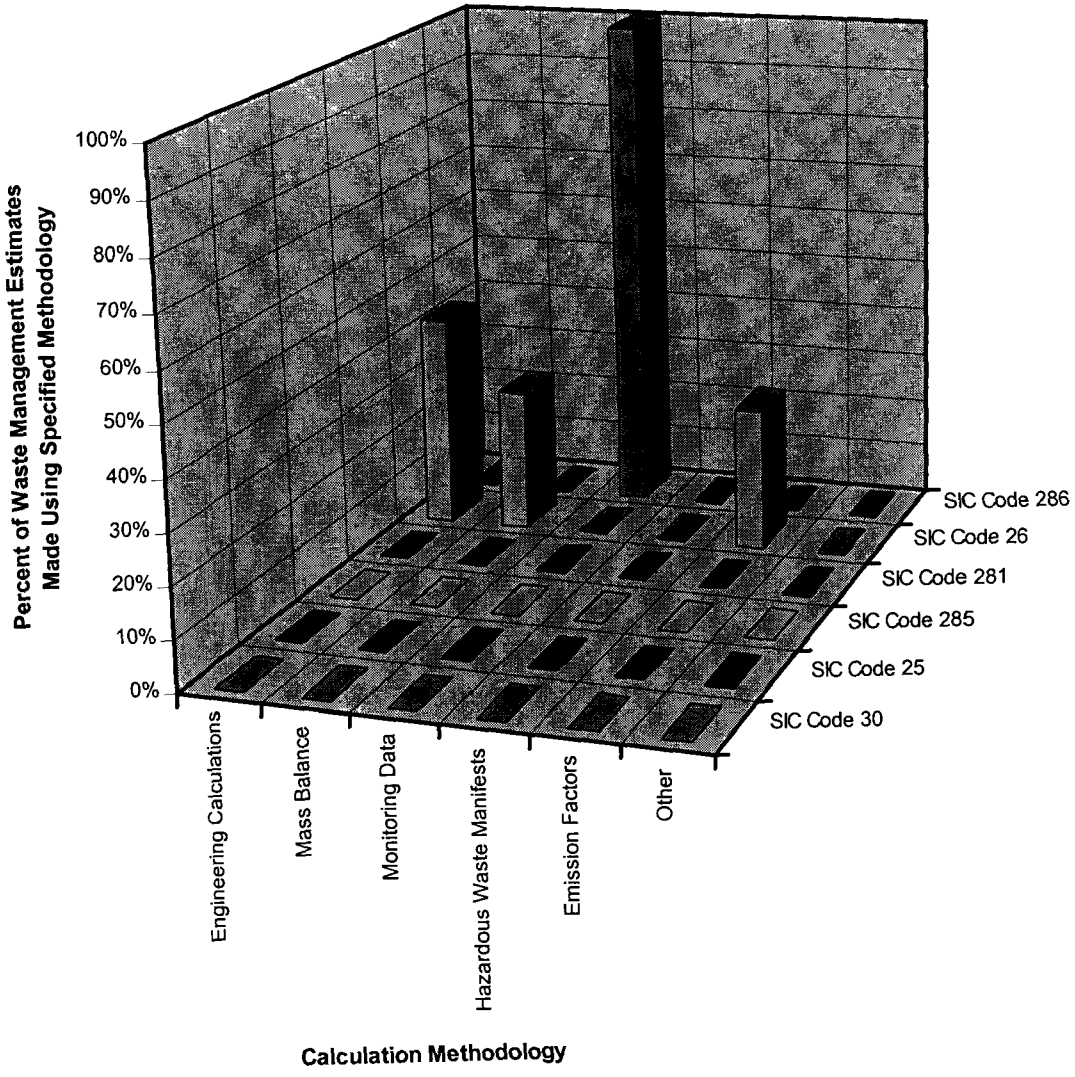
Data for this figure can be found on Table 4-4.

Figure 4-4k. Distribution of Calculation Methodologies (To On-Site Treatment) RY 1994 and RY 1995



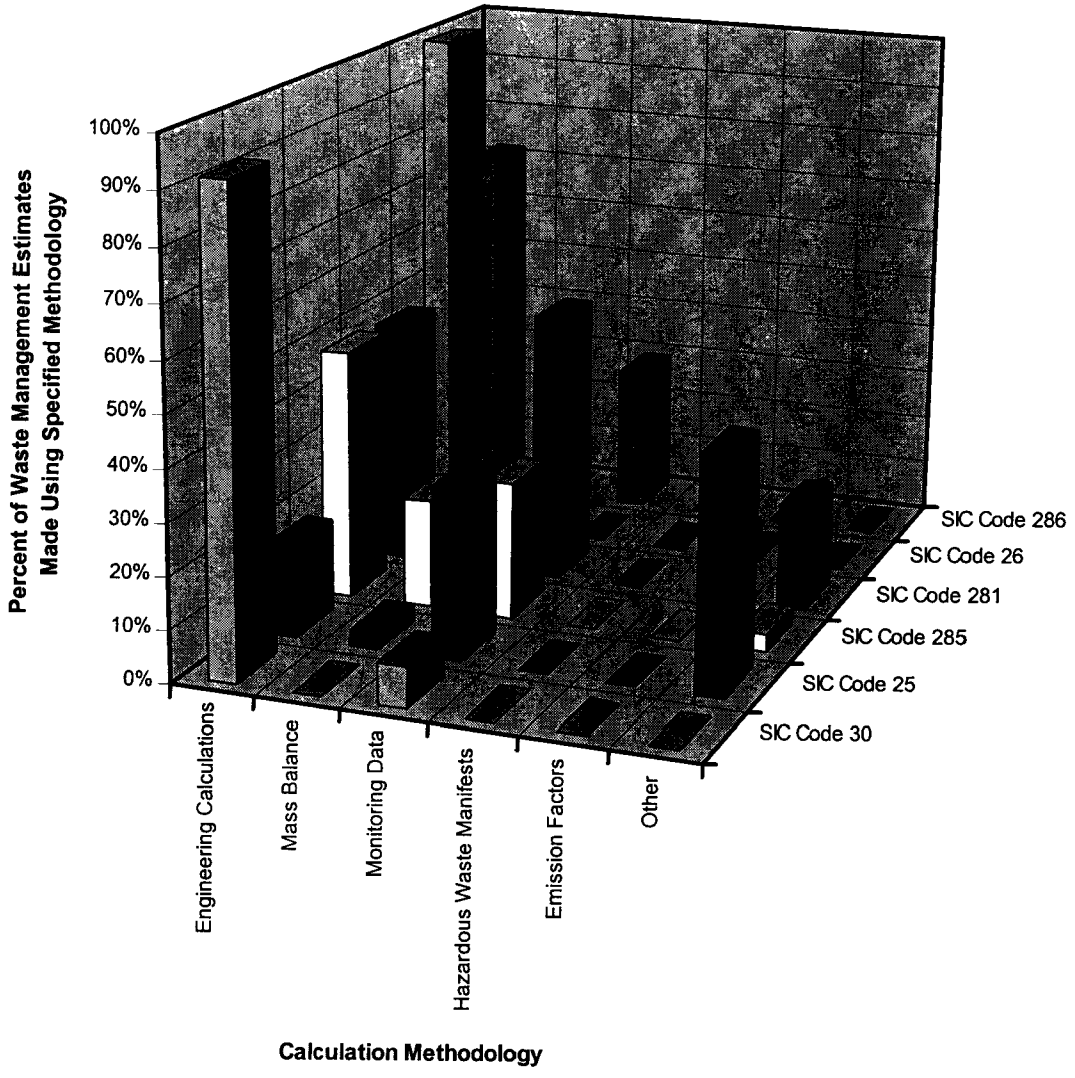
Data for this figure can be found on Table 4-4.

Figure 4-4l. Distribution of Calculation Methodologies (To On-Site Energy Recovery) RY 1994 and RY 1995



Data for this figure can be found on Table 4-4.

Figure 4-4m. Distribution of Calculation Methodologies (To On-Site Recycling) RY 1994 and RY 1995



Data for this figure can be found on Table 4-4.

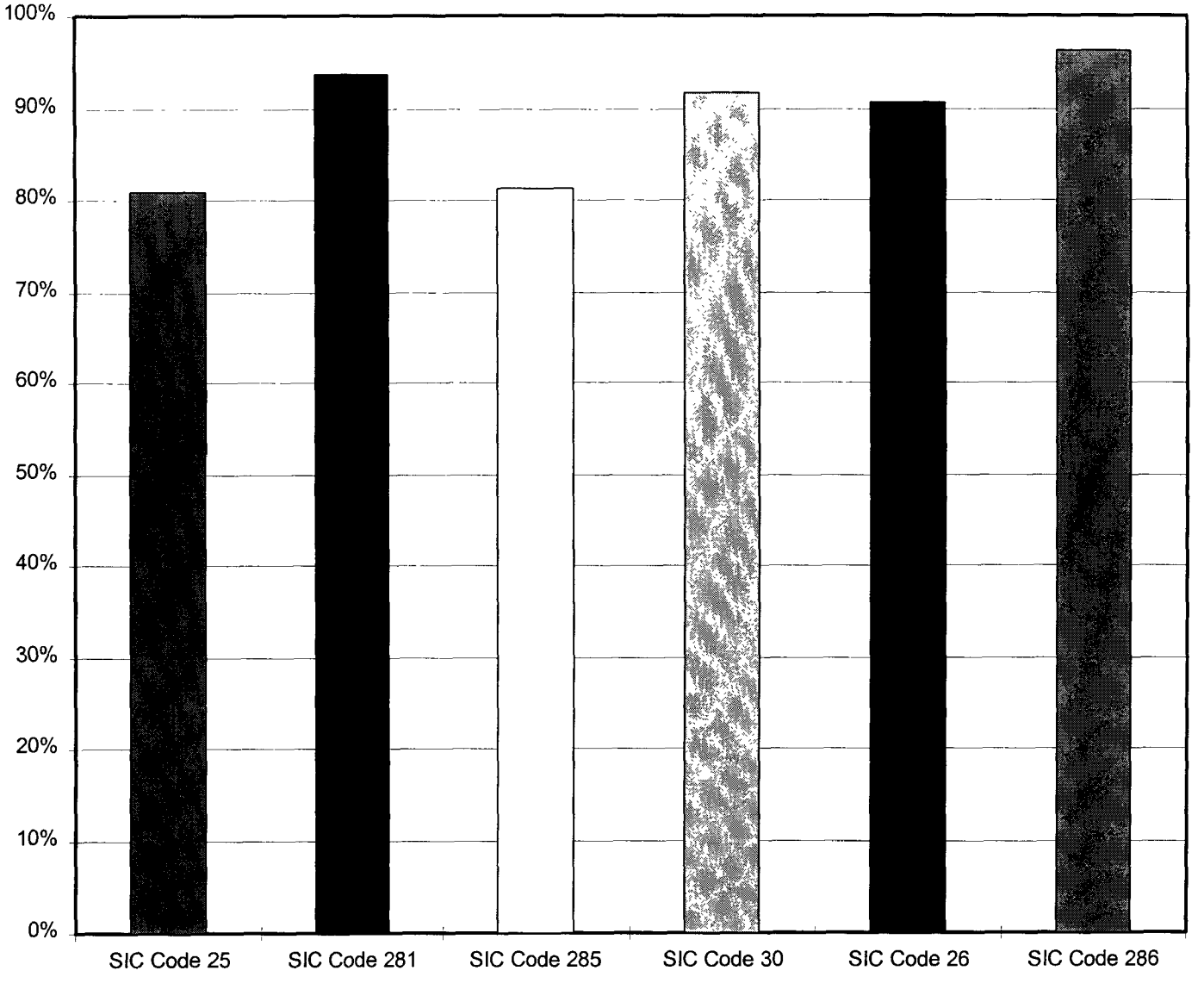
and emission factors have been presented in Table 4-4 only when they were the predominant method used.

It was uncommon for facilities to have access to monitoring data for fugitive releases. However, it was used when available (typically in the form of periodic leak tests). Emission factors were used by several facilities (except in SIC Code 25). The type of emission factors used and a subsequent discussion is presented below. Mass balances were also used by many facilities to determine fugitive releases from at least one process line or unit operation when a material balance around the entire facility resulted in a quantity of chemical that was unaccounted for.

Most facilities reported a stack release. Although facilities had difficulty in estimating these releases, they typically indicated less difficulty in identifying and quantifying these releases than observed with fugitives. Engineering calculations and mass balances were the most often used methods. However, the use of emission factors (including emission factors for releases from storage tanks and facility-derived factors for releases from stacks) and monitoring data (actual releases from stack tests) were often observed. Facilities with sophisticated monitoring equipment associated with large stack emissions, such as chemical manufacturers and pulp and paper mills, were more likely to use monitoring data and/or associated emission factors than smaller facilities, such as paint manufacturers which typically used mass balances or engineering judgement.

Table 4-4 and the corresponding figures also show that most facilities used monitoring data and/or hazardous waste manifests in conjunction with engineering calculations to estimate transfers off-site for further waste management. There were two main sources of these data. One was from periodic facility sampling of the waste that was collected prior to shipment. The second was from sampling conducted by the receiving facility. Documentation for this data was typically more prevalent and more complete (and therefore, presumably more accurate) than methods used to estimate releases to most other sources.

Figure 4-5. Frequency the Facility Used the Best Methodology to Estimate Releases and Other Waste Management Activities



Some facilities reported discharges to POTWs and/or receiving streams (predominantly organic chemical manufacturer and pulp and paper mills, which have large water releases). A mass balance and/or engineering judgement were the primary methods used for POTW discharges. Facilities typically used a mass balance around the entire facility to determine the quantity of EPCRA Section 313 chemical that could not be accounted for. Then, engineering judgement (usually based on knowledge of chemical volatility and solubility) was used to estimate a partition factor between releases of the unaccounted quantity that would be lost to fugitive air vs. that sent to a POTW. This method was also used to determine discharges to receiving streams, when applicable. However, discharges to receiving streams were often monitored for compliance with various local, state, or other federal regulations, resulting in a more accurate estimate.

Figure 4-5 presents the frequency that site surveyors felt the method used by the facility would result in the most accurate estimate of release or other waste management quantity based on information and data available to the surveyor at the time of the site visit. It does not present the frequency that the facility correctly calculated the quantity of release or other waste management activity. This figure shows concurrence with the selected method in most cases. It should be noted that during many visits the surveyor identified another, more accurate method that could have been used to estimate releases and other waste management quantities, if a particular variable had been tracked for the reporting year. In many cases, the facility contact indicated that it would have been fairly easy for the facility to implement the suggestion and that they planned to take the surveyors advice for subsequent years. However, there was no way to recreate the required variable for the reporting year(s) surveyed. Another limitation to this analysis is the fact that surveyors often identified a more accurate method that could be used based on data the facility claimed to have. However, the facility stated that they could not gather the information in a reasonable time period for use by the site surveyor.

Emission factors were frequently used to estimate fugitive and stack releases. EPA instructed site surveyors to determine the type of emission factors used, when applicable. The potential types were designated as facility-derived, EPA-approved or published, trade

Table 4-5

Types of Emission Factors Used for Fugitive and Stack Releases RY 1994 and RY 1995

Release and Other Waste Management Activity Type	Release and Other Waste Management Activity Source	Percent (weighted by chemical)					
		SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Fugitive	Facility Derived	93.9%	26.9%	38.7%	35.3%	5.0%	13.9%
	EPA Derived	0.0%	8.4%	61.3%	27.6%	0.0%	41.7%
	Trade Association Derived	0.0%	51.8%	0.0%	37.1%	90.0%	36.1%
	Other	6.1%	12.9%	0.0%	0.0%	5.0%	8.3%
	TOTAL:	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Stack	Facility Derived	0.0%	53.2%	82.7%	81.9%	10.7%	33.3%
	EPA Derived	61.6%	38.4%	17.3%	12.9%	3.6%	56.7%
	Trade Association Derived	0.0%	0.0%	0.0%	5.2%	85.7%	10.0%
	Other	38.4%	8.4%	0.0%	0.0%	0.0%	0.0%
	TOTAL:	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Figure 4-6a. Type of Emission Factors Used (Fugitive)
RY 1994 and RY 1995

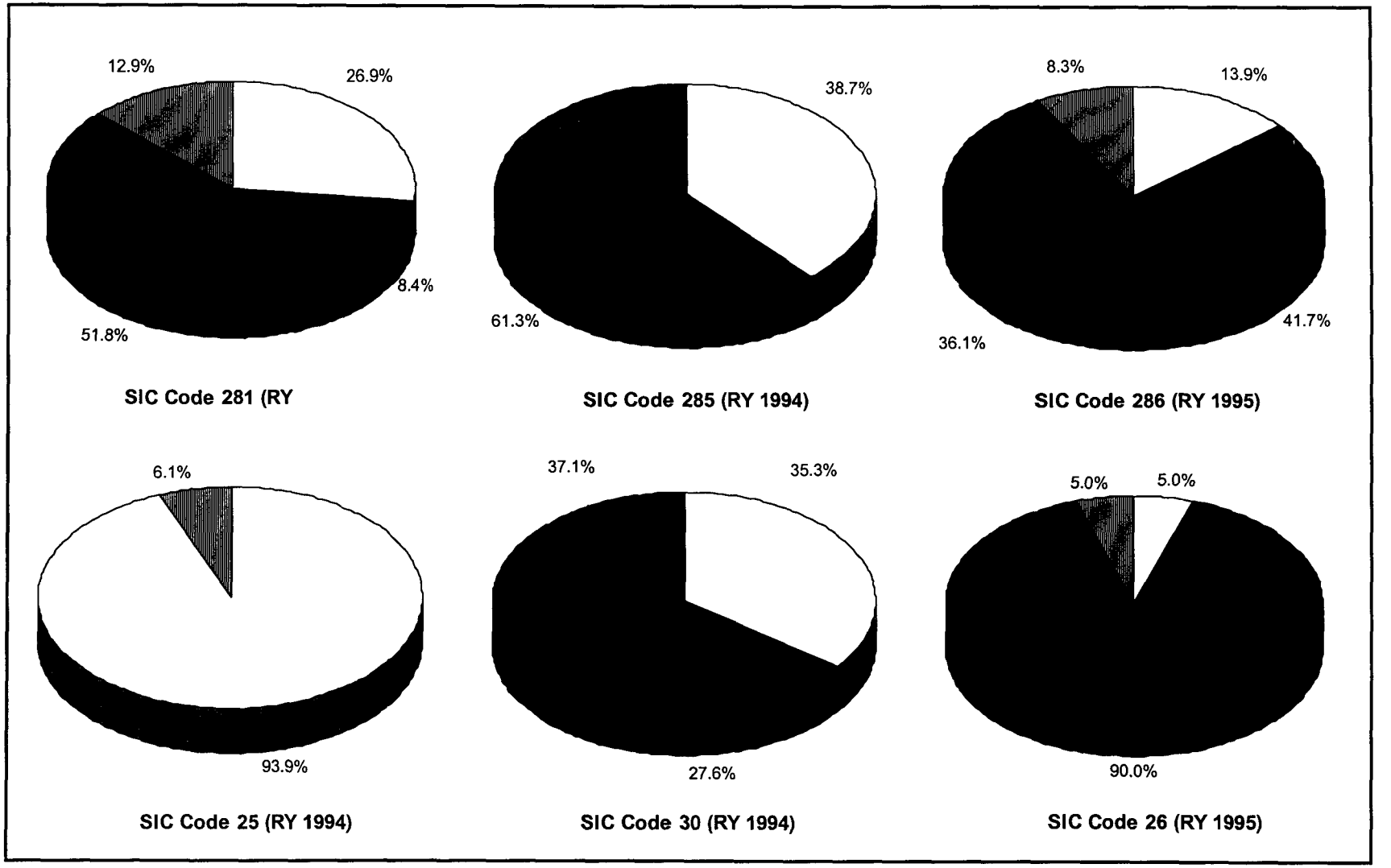
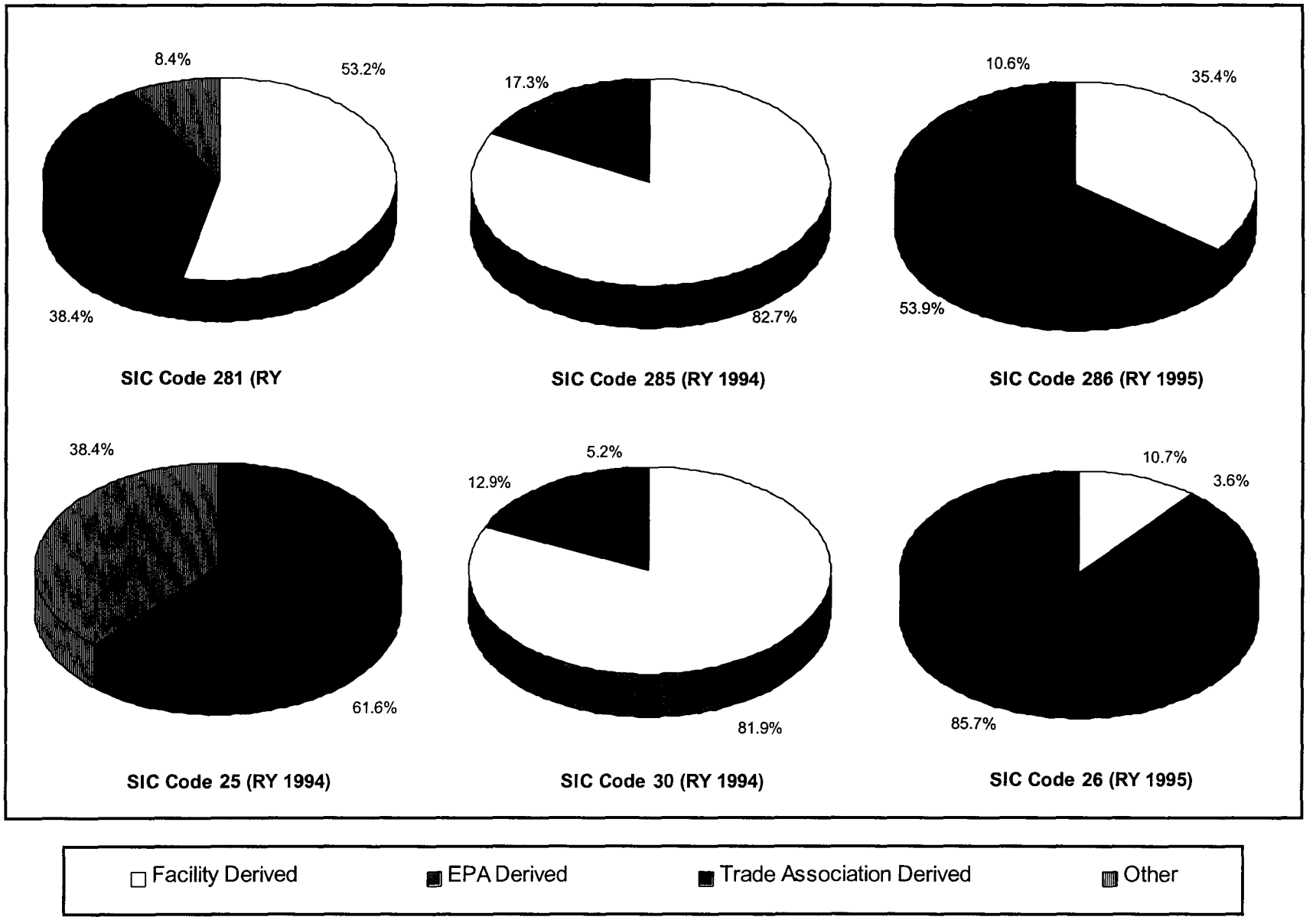


Figure 4-6b. Type of Emission Factors Used (Stack)
RY 1994 and RY 1995



association-derived, and other. Table 4-5 and Figures 4-6a and 4-6b present the percentage of use for each type of emission factor (weighted).

These factors were typically employed to estimate fugitive releases of volatile chemicals from process areas (open mix tanks or vats) or piping (leaks from pumps, valves, flanges, etc.) or to estimate stack releases from storage tanks and stack releases from gasses generated by unit operations that were channeled through stacks (typically stacks from various air pollution control devices).

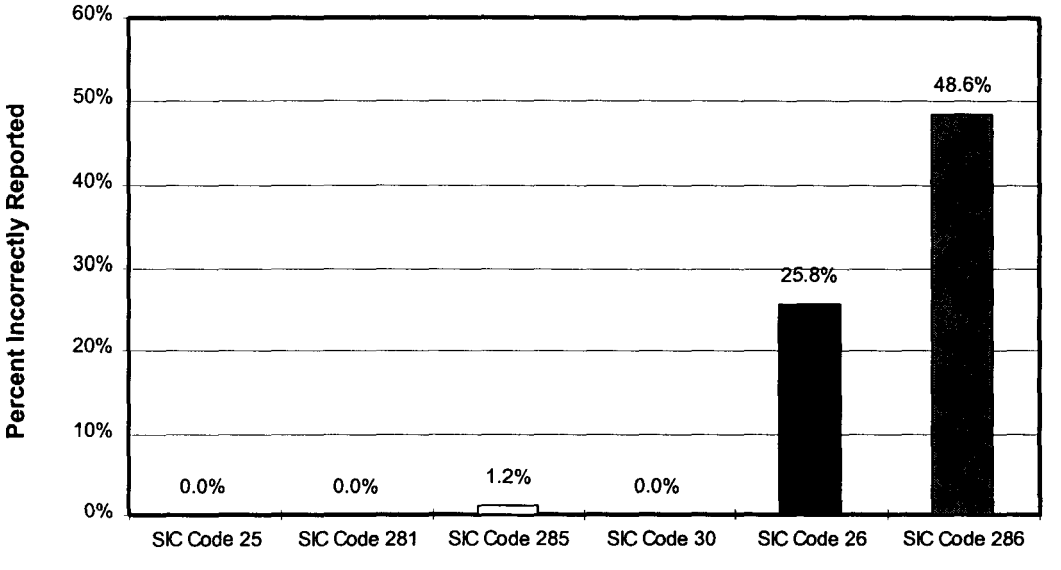
4.5 On-Site Waste Management Activities (recycling, treatment, and energy recovery)

Quantities of the toxic chemicals in waste managed by on-site waste management activities (recycling, treatment, and energy recovery) were rarely observed during the site visits. Table 4-2 and Figure 4-2 show that a considerable number of facilities in SIC Codes 26 and 286 incorrectly identified these releases. It should be noted that there may be considerable uncertainty in the quantitative values presented because most facilities were confused by the definition of "recycling". EPA recognized, before the RY 1994 and RY 1995 site surveys were initiated, that this potential might exist and instructed site surveyors only to analyze releases to recycling activities if the facility reported them. Therefore, site surveyors only recorded on-site waste management activities as incorrect if such activities were claimed but did not exist. Facilities typically correctly identified on-site treatment activities when they existed. However, there was considerable confusion and error when the releases and other waste management activities were quantified for Section 8 of the Form R.

Additionally, for the site visits completed through May 1997 (those pertaining to RY94) EPA only asked site surveyors to compile the data for source reduction and on-site recycling. Site surveyors were not requested to investigate these issues further or discuss them with the facility contacts. Therefore, specific, quantitative input from these visits cannot be provided, other than raw data based on what was reported by each facility.

Additionally, EPA was concerned that facilities may incorrectly report the quantity of EPCRA Section 313 Chemicals to on-site treatment in Section 8 of the Form R due to potential confusion between requirements for Section 7 and Section 8. Site surveyors specifically determined whether the quantities reported were quantities sent to treatment or quantities actually treated. Figure 4-7 presents the weighted percent of facilities that incorrectly reported the quantity sent to treatment rather than that actually treated. A significant number of facilities in SIC Codes 26 and 286 incorrectly reported this quantity (25.8% and 48.6%, respectively) while only one facility incorrectly reported from SIC Code 281 (representing 1.2%) and no facilities from SIC Codes 25, 30, or 281 incorrectly reported.

Figure 4-7. Facilities Incorrectly Reporting the Quantity sent to Treatment Rather than that Actually Treated (Weighted)



It was observed that many facilities in the organic chemical and the paper manufacturing SIC Codes, 286 and 26, respectively, had large on-site wastewater treatment plants. Several EPCRA Section 313 chemicals (such as ammonia, sulfuric acid, and chlorine) were used in the treatment process. Several facilities incorrectly reported that these chemicals were treated themselves because they were destroyed during the treatment process. EPCRA Section 313 chemicals added to waste treatment units are not considered to be treated themselves. This situation was never observed at facilities in SIC Codes 25, 281, 285, or 30 because these facilities did not typically have on-site wastewater treatment plants or the quantity of treatment chemical used was below the threshold.

EPA requested site surveyors to discuss source reduction and on-site recycling issues and acquire feedback from facility contacts during visits to SIC Codes 26 and 286 (those pertaining to RY 1995).

The following points were raised by facility contacts during the 20 visits to Paper and/or Organic Chemical facilities for RY 1995.

- Facilities tend to only claim source reduction or recycling if they implement a procedure for the specific purpose of reducing releases. Often a facility implements one or more of the items that EPA considers source reduction, but they do not bother to go through the entire list to see if they can claim it. For example, a facility may change their raw material transfer operations due to a management decision. This change may result in source reduction as a side effect, but the facility does not claim it because the purpose was not source reduction.

- Facilities often do not claim source reduction or recycling activities due to what they consider to be a lack of detailed definitions. For example, facilities believe that many of the codes and corresponding descriptions are vague and they do not feel comfortable claiming an activity without better guidance.

- Facilities have stated that they would rather be conservative and only claim a source reduction or recycling activity if they can verify and document it. For example, some categories such as "better management practices" are vague and facilities do not claim it because they do not know how to verify it.

- Some trade associations instruct their members not to claim a source reduction activity unless they can document a corresponding reduction in releases - even if the facility specifically installs a unit or practice that is intended to serve as recovery or recycling.

- Facilities have stated that there are so many codes that they do not bother to analyze each code every year to see if any changes in their processes apply.

Tables 4-6 through 4-11 summarize data that was collected for on-site recycling that was observed during site visits pertaining to RY 1994 and RY 1995. Table 4-11 presents the frequency that each chemical was recycled, as reported by these facilities.

Table 4-6

Observed On-Site Recycling Activities
(SIC Code 281)

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream
1	Cleaning Waste	Not Specified
1	Spent Process Solvent	Not Specified
1	Other	Scrubber Water
2	Other	Dust Collector Waste
3	Other	Off-Spec. Product
1	Other	Ion Exchange Waste
1	Other	Vapor Recovery Unit

Table 4-7

Observed On-Site Recycling Activities
(SIC Code 285)

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream
5	Cleaning Waste	Not Specified
5	Spent Process Solvent	Not Specified

Table 4-8

Observed On-Site Recycling Activities
(SIC Code 25)

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream
1	Spent Process Solvent	Distillation Unit
1	Spent Process Solvent	Not Specified
1	Spent Process Solvent	Batch Still and Thin-Film Evaporation
1	Other (obsolete material)	Batch Still
1	Cleaning Waste	Not Specified
1	Cleaning Waste	Batch Still and Thin-Film Evaporation

Table 4-9

Observed On-Site Recycling Activities
(SIC Code 30)

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream
1	Spent Process Solvent	Not Specified
1	Other	Resin from waste plastic
1	Other (off-spec product)	Reuse in subsequent batch

Table 4-10

Observed On-Site Recycling Activities
(SIC Code 286)

# Of Facilities Reporting	Type of Recycling Claimed	Description of Recycling Stream
1	Not specified	Removed Stack Emissions
4	Spent Process Solvent	Not Specified
1	Other	Scrubber Water
3	Other (unreacted raw materials)	Process Waste (off-spec product)

Table 4-11

Chemicals For Which Recycling Was Claimed
(SIC Codes 281, 285, 25, 30, and 286 Combined)

CHEMICAL	# OF FACILITIES REPORTING
Xylene	7
Toluene	5
Methanol	3
MIBK	3
1,3-Butadiene	2
Ammonia	2
Ethylbenzene	2
Ethylene glycol	2
Glycol ehters	2
2-ethoxyethanol	1
4,4'-isopropylidenediphenol	1
Ammonium Nitrate	1
Aniline	1
Chlorine	1
Copper Compounds	1
Cyanide Compounds	1
Di-(2-ethylhexyl)Phthalate	1
Dichloromethane	1
Freon	1
HCl	1
Mercury	1
N-butyl alcohol	1
N-butyl alcohol	1
Nitric Acid	1
N-N-Dimethylaniline	1
Phosphoric Acid	1

5.0 RELEASES AND OTHER WASTE MANAGEMENT ACTIVITIES

5.1 On-Site Release and Transfers Off-Site for Waste Management Estimates

Release and other waste management estimates are the most highly scrutinized and publicized data in the TRI program. This section and section 5.2 discuss release estimates and other waste management activities made by facilities and by site surveyors. Major differences in these estimates between the facilities and the site surveyors are noted and, if possible, the reasons for the differences are explained. A discussion of the methodology used by the site surveyors to gather the data necessary to estimate these quantities is contained in Section 2. A discussion of the specific techniques used by the facilities and by the site surveyors when estimating releases and other waste management quantities is contained in Section 4.

Releases and transfers off-site for waste management estimates are reported by chemical and by the medium to which the chemical was released or transferred. When completing the Form R, facilities must assign on-site releases to one of the following five categories:

- Fugitive or non-point air emissions;
- Stack or point air emissions;
- Discharges to receiving streams or water bodies;
- Underground injections on site; or
- Releases to land on site.

Transfers to other off-site locations for other waste management practices are further subdivided into:

- Discharges to Publicly Owned Treatment Works (POTWs);
- Off-site transfer for disposal;
- Off-site transfer for treatment;
- Off-site transfer for recycling; and
- Off-site transfer for energy recovery.

This section also contains a discussion of releases and other waste management practices to each medium, how facility estimates compared to site surveyors estimates for that medium, and how estimates for reporting years 1994 and 1995 compared to estimates from reporting years 1987 and 1988.

When comparing the release and other waste management activity estimates of a facility to the estimate of a site surveyor, the percent difference between the two estimates is used. The percent difference between the facility estimate and the site surveyor estimate is calculated as follows:

$$\text{Percent Difference} = (Fa - SS)/SS \times 100$$

where: Fa = Facility Estimate
SS = Site Surveyor Estimate

5.1.1 Overview of On-Site Releases and Transfers Off-Site for Waste Management as Reported by Facilities and by Site Surveyors

On-site releases and transfers off-site for waste management quantities as reported by the facilities and the site surveyors were summed for all chemicals to get total facility estimates. Total facility estimates were scaled and summed for all facilities to get total releases and other waste management quantities for each SIC Code. The total quantity for each SIC Code are presented by medium in Tables 5-1, 5-3, 5-5, 5-7, 5-9, and 5-11. Facility estimates were lower than site surveyor estimates in all SIC Codes for fugitive air releases, transfers to off-site recycling, and transfers to off-site energy recovery. In general, facility estimates were higher than site surveyor estimates in each SIC Code for stack air releases. For all SIC Codes surveyed for reporting year (RY) 1994, total quantities for the SIC Code as estimated by the facility are lower than total quantities for the SIC Code as estimated by the site surveyor. Total on-site releases and transfers off-site for waste management for SIC Codes 26 and 286, surveyed for RY 1995, as estimated by the facility are within 2% of the total quantities estimated by the site surveyor.

Table 5-1 is a summary of SIC Code 25 TRI on-site releases and transfers off-site for waste management quantities for the RY 1994. The greatest percent difference in estimates by facility and by site surveyor are for off-site transfers to treatment, where facility estimates were 250% greater than site surveyor estimates. The overall impact of this difference in off-site treatment is not significant, as transfer to off-site treatment makes up only a small portion of the total quantity. None of the facilities surveyed in SIC Code 25 had releases to receiving streams, performed underground injection, or had releases to land on site. Total on-site releases and transfers off-site for waste management estimated by facilities and site surveyors were in close agreement.

Table 5-1

Summary of SIC Code 25 TRI On-Site Releases and Transfers Off-Site for Waste Management for Reporting Year 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	3.72	4.54	-18%
Stack Air	37.9	36.9	2.8%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.647	0.783	-17%
Off-Site Disposal	0.00	0.437	-100%
Off-Site Treatment	1.13	0.319	250%
Off-Site Recycling	0.733	1.20	-39%
Off-Site Energy Recovery	9.12	10.6	-14%
Total	53.3	54.8	-2.8%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-2 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 25. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total releases and transfers off-site for waste management for SIC Code 25 for those facilities with less than 16 Form Rs. Thus, each facility surveyed represents a group of facilities in the TRIS database to determine the scaled-up total. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 25 as reported by SIC Code 25 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 25 release profile. (Site surveyors estimates are not presented on this table). As discussed in Section 2, facility site selection excluded facilities that reported more than 15 chemicals. Most facilities that manufacture, process, or otherwise use more than 15 chemicals would have larger quantities than the average facility. The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is -17%.

Table 5-2

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 25 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	41.6	51.5	-19%
Receiving Stream	0.00	0.000266	-100%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.0637	-100%
POTW	0.647	0.145	346%
Off-Site Transfers	11	12.6	-13%
Total	53.3	64.3	-17%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-3 is a summary of SIC Code 281 TRI on-site releases and transfers off-site for waste management for RY 1994. In SIC Code 281, the most significant difference between facility estimates and site surveyor estimates is in underground injection. This difference is attributed to errors made by two facilities surveyed. These two facilities perform manufacturing process operations that are not typical in chemical manufacturing facilities. If these two facilities are not considered in the sum of on-site releases and transfers off-site for waste management, the total percent difference for total on-site releases and transfers off-site for waste management quantities in SIC Code 281 releases drops to -1.1 percent.

Table 5-3

Summary of SIC Code 281 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	15.4	16.1	-4.3%
Stack Air	126	126	0.53%
Receiving Stream	1.73	1.65	5.1%
Underground Injection	15.0	38.0	-61%
Land On Site	0.00440	0.00440	0.0%
POTW	0.0644	0.0641	0.47%
Off-Site Disposal	29.9	30.0	-0.17%
Off-Site Treatment	9.97	10.1	-1.5%
Off-Site Recycling	1.18	1.48	-21%
Off-Site Energy Recovery	0.304	2.00	-85%
Total	200	225	-11%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-4 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 281. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 281 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 281 as reported by all SIC Code 281 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 281 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is -51%.

Table 5-4

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 281 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	141	90.8	36%
Receiving Stream	1.73	25.4	-94%
Underground Injection	15.0	153	-90%
Land On Site	0.004	68.2	-100%
POTW	0.064	31.4	-100%
Off-Site Transfers	41.1	41.1	0.7%
Total	200	410	-51%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-5 is a summary of SIC Code 285 TRI on-site releases and transfers off-site for waste management for the reporting year 1994. The most significant difference in on-site releases and transfers off-site for waste management activity estimates by facility and by site surveyor are for transfers to off-site recycling. None of the facilities surveyed in SIC Code 285 had releases to receiving streams, underground injection, or to land on site. One of the surveyed facilities in this SIC Code put release values under the wrong release type and grossly underestimated all on-site releases and transfers off-site for waste management. If this facility is not considered in the total sum, the total percent difference between facility estimates and site surveyor estimates in SIC Code 285 drops to -20%.

Table 5-5

Summary of SIC Code 285 TRI On-Site Releases and Transfer Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	2.23	3.15	-29%
Stack Air	0.654	0.533	23%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.0615	0.0157	290%
Off-Site Disposal	0.0874	0.219	-60%
Off-Site Treatment	0.101	0.462	-78%
Off-Site Recycling	2.75	5.08	-46%
Off-Site Energy Recovery	2.67	2.87	-7.0%
Total	8.55	12.3	-31%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-6 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 285. In the second column, on-site releases and transfers off-site for waste management quantities as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 285 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 285 as reported by all SIC Code 285 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 285 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management releases and other waste management quantities between the scaled-up estimate and the TRI database totals is -92%.

Table 5-6

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 285 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	2.88	13.5	-79%
Receiving Stream	0.00	0.00	0.0%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.055	-100%
POTW	0.0615	1.63	-96%
Off-Site Transfers	5.61	95.5	-94%
Total	8.55	111	-92%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-7 is a summary of SIC Code 30 TRI on-site releases and transfers off-site for waste management quantities for the reporting year 1994. Many facilities in this SIC Code reported fugitive emissions as stack emissions. Even so, the sum of the fugitive and stack emissions estimated by the facilities and site surveyors was in close agreement. The greatest percent difference in estimates by facility and by site surveyor are for discharges to POTWs, where facility estimates were 100% less than site surveyor estimates. However, discharges to POTWs account for much less than 0.1 percent of all quantities. None of the facilities surveyed in SIC Code 30 had on-site releases to receiving streams, underground injection, or to land on site. Total on-site releases and transfers off-site for waste management quantities estimated by facilities and site surveyors were in close agreement.

Table 5-7

Summary of SIC Code 30 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	26.0	69.3	-63%
Stack Air	182	138	31%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.00	0.00145	-100%
Off-Site Disposal	7.13	5.84	22%
Off-Site Treatment	21.6	23.5	-8.1%
Off-Site Recycling	10.9	17.2	-37%
Off-Site Energy Recovery	0.332	0.347	-4.3%
Total	248	254	-2.4%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-8 presents two forms of the 1994 on-site releases and transfers off-site for waste management quantities for SIC Code 30. In the second column, on-site releases and transfers off-site for waste management quantities as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 30 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 30 as reported by all SIC Code 30 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC 30 release profile. The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is 7.4%.

Table 5-8

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 30 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	208	154	35%
Receiving Stream	0.00	0.230	-100%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.357	-100%
POTW	0.00	2.22	-100%
Off-Site Transfers	40.0	73.7	-46%
Total	248	231	7.4%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-9 is a summary of SIC Code 26 TRI on-site releases and transfers off-site for waste management for RY 1995. None of the facilities surveyed in SIC Code 26 had releases to underground injection, off-site treatment, off-site recycling, or off-site energy recovery. Facility and site surveyor estimates are in close agreement. The close agreement between the facility and surveyor estimates in SIC Code 26 can be attributed to the step-by-step procedures listed in the NCASI Handbook of Chemical Specific Information for SARA 313 Form R Reporting which most paper and paperboard facilities use as guidance for filling out Form Rs. This manual is distributed by NCASI, and has not been through EPA approval. However, it is still a good source for documentation and calculations needed to complete the Form Rs.

Table 5-9

Summary of SIC Code 26 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1995 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	12.6	12.9	-2.5%
Stack Air	69.9	69.1	1.2%
Receiving Stream	2.03	1.85	9.6%
Underground Injection	0	0	NA
Land On Site	0.189	0.119	59%
POTW	0.00421	0.00421	0.0%
Off-Site Disposal	0.761	0.767	-0.74%
Off-Site Treatment	0	0	NA
Off-Site Recycling	0	0	NA
Off-Site Energy Recovery	0	0	NA
Total	85	85	0.8%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-10 presents two forms of the 1995 on-site releases and transfers off-site for waste management for SIC Code 26. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management for SIC Code 26 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 26 as reported by SIC Code 26 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 26 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management between the scaled-up estimate and the TRI database totals is -66%.

Table 5-10

1995 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 26 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	82.5	166	-50%
Receiving Stream	2.03	7.01	-71%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.189	3.39	-94%
POTW	0.00421	41.0	-100%
Off-Site Transfers	0.761	29.9	-97%
Total	85	247	-66%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-11 is a summary of SIC Code 286 TRI on-site releases and transfers off-site for waste management quantities for the reporting year 1995. None of the facilities surveyed in SIC Code 286 had on-site releases to underground injection. The close agreement between the facility and surveyor estimates SIC Code 286 can be attributed to the relatively large environmental staff and explicit corporate policies followed by the large organic chemical companies visited.

Table 5-11

Summary of SIC Code 286 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1995 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	7.80	9.15	-15%
Stack Air	18.0	16.7	7.6%
Receiving Stream	0.0958	0.123	-22%
Underground Injection	0	0	NA
Land On Site	0.000136	0.000180	-24%
POTW	125	128	-2.2%
Off-Site Disposal	0.0910	0.100	-9.3%
Off-Site Treatment	36.4	36.4	-0.04%
Off-Site Recycling	5.11	5.11	0.0%
Off-Site Energy Recovery	127	129	-1.4%
Total	320	325	-1.5%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-12 presents two forms of the 1995 on-site releases and transfers off-site for waste management for SIC Code 286. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management for SIC Code 286 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 286 as reported by SIC Code 286 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 286 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management between the scaled-up estimate and the TRI database totals is 8.0%.

Table 5-12

1995 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 286 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	25.8	77.9	-67%
Receiving Stream	0.0958	4.07	-98%
Underground Injection	0.00	33.1	-100%
Land On Site	0.00	0.926	-100%
POTW	125	68.8	82%
Off-Site Transfers	169	163	3.7%
Total	320	348	-8.0%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

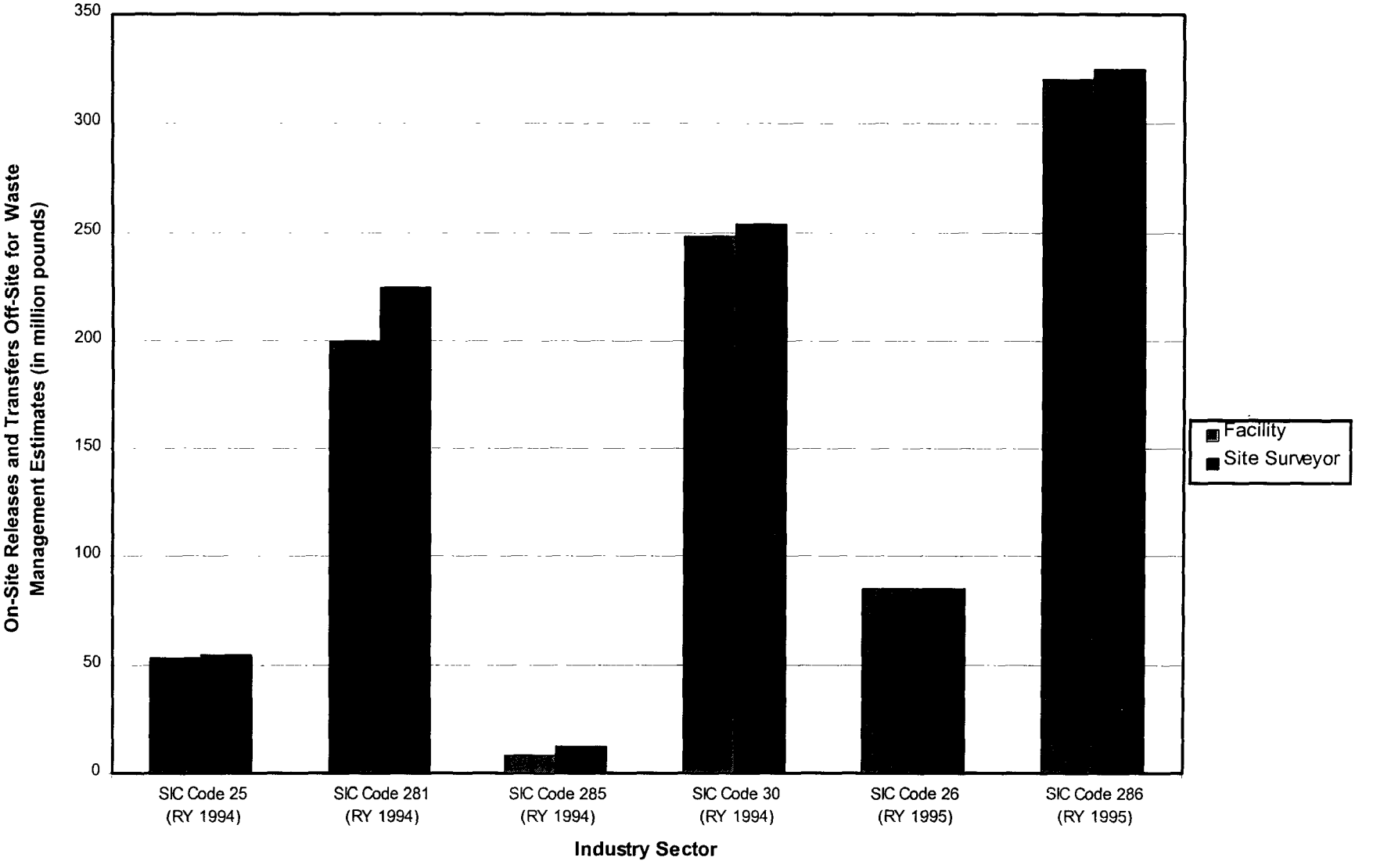
Figure 5-1 presents estimates of total on-site releases and transfers off-site for waste management calculated by facilities and site surveyors for each SIC Code surveyed for RY 1994 and RY 1995. The total on-site releases and transfers off-site for waste management were in good agreement, calculated to be within +3% for most SIC Codes. Estimates of total on-site releases and transfers off-site for waste management calculated by facilities and site surveyors for all SIC Codes surveyed in RY 1994 and RY 1995 differed by 4%.

Figures 5-2, 5-3, and 5-4 present the relative percent differences in estimates of on-site releases and transfers off-site for waste management between facilities and site surveyors for each SIC Code. In all SIC Codes, fugitive emissions tend to be incorrectly reported as stack emissions, leading to overestimates of stack emissions and underestimates of fugitive emissions. Another trend in SIC Codes 25, 281, 285, and 30 for RY 1994 is the misreporting of chemical transfers off-site for purposes of disposal, treatment, recycling, or energy recovery. Many facilities do not record the actual fate of chemicals transferred off-site when filling out the Form Rs. Most facilities check the off-site disposal or off-site treatment boxes without considering the possibility of recycling or energy recovery. Facilities in these same SIC Codes tend to have container residue that was overlooked. The container residue is usually treated, recycled, or disposed of by the vendor collecting the drums, and not incorporated into the product as reported by the facilities.

5.1.2 Comparison of RY 1994 and RY 1995 On-Site Releases and Transfers Off-Site for Waste Management to RY 1987 and RY 1988 On-Site Releases and Transfers Off-Site for Waste Management

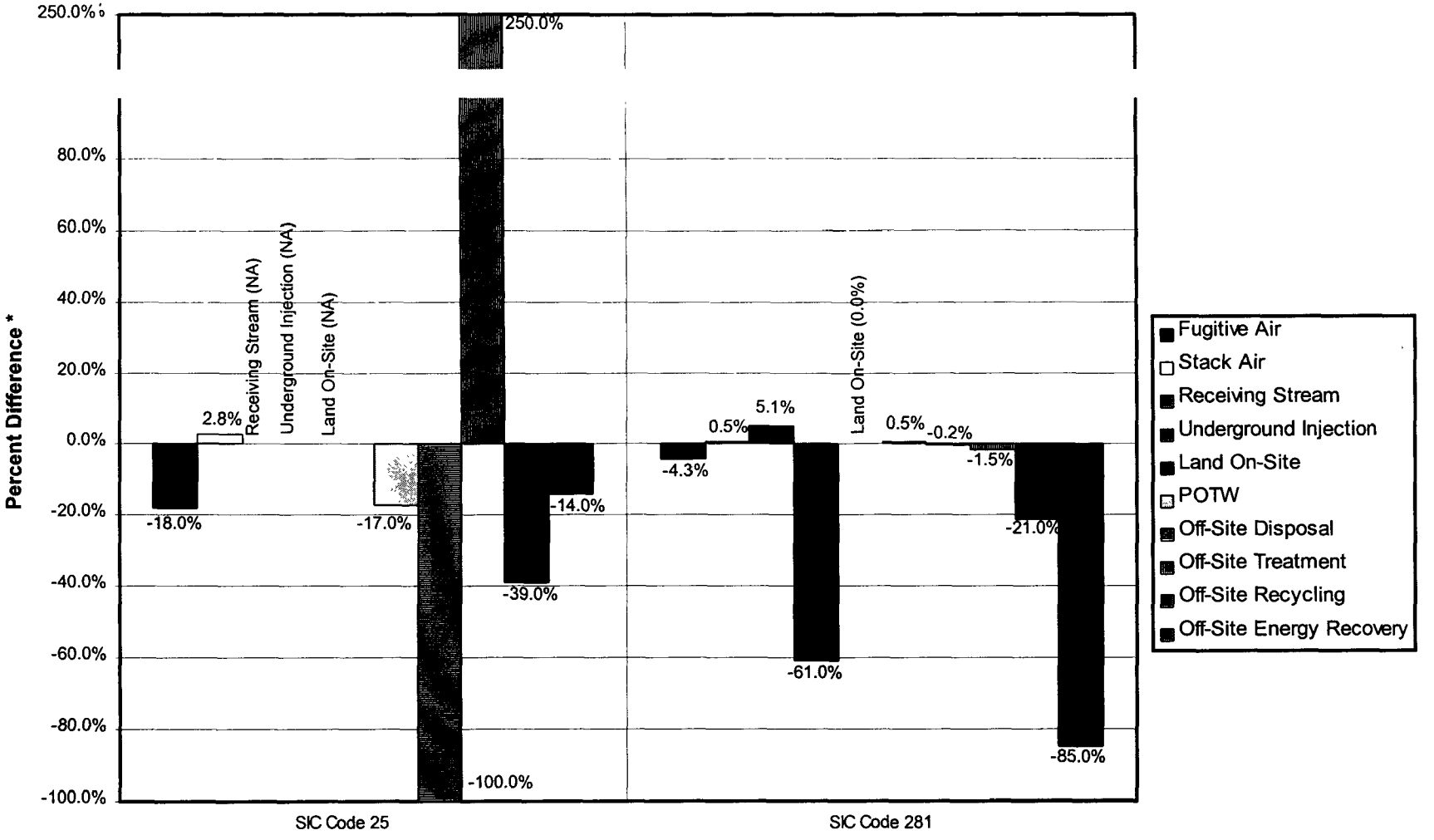
Tables 5-13 through 5-16 contain the TRI on-site releases and transfers off-site for waste management for the surveys conducted for RY 1995, 1994, 1988, and 1987 data, respectively. Different SIC Codes were surveyed in each reporting year of the site survey program, so caution should be exercised when comparing data from one reporting year to the next. The tables present a comparison between the quantity of chemicals released on-site or transferred off-site for waste management as reported by the facilities and the quantity of chemicals released on-site or transferred off-site for waste management as reported by the site surveyor. The percent difference between the estimates are also provided. The percent differences for each reporting year are summarized on Figures 5-5 and 5-6.

Figure 5-1. Comparison of Facility and Site Surveyor Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management



Data for this figure can be found on Tables 5-1 through 5-12.

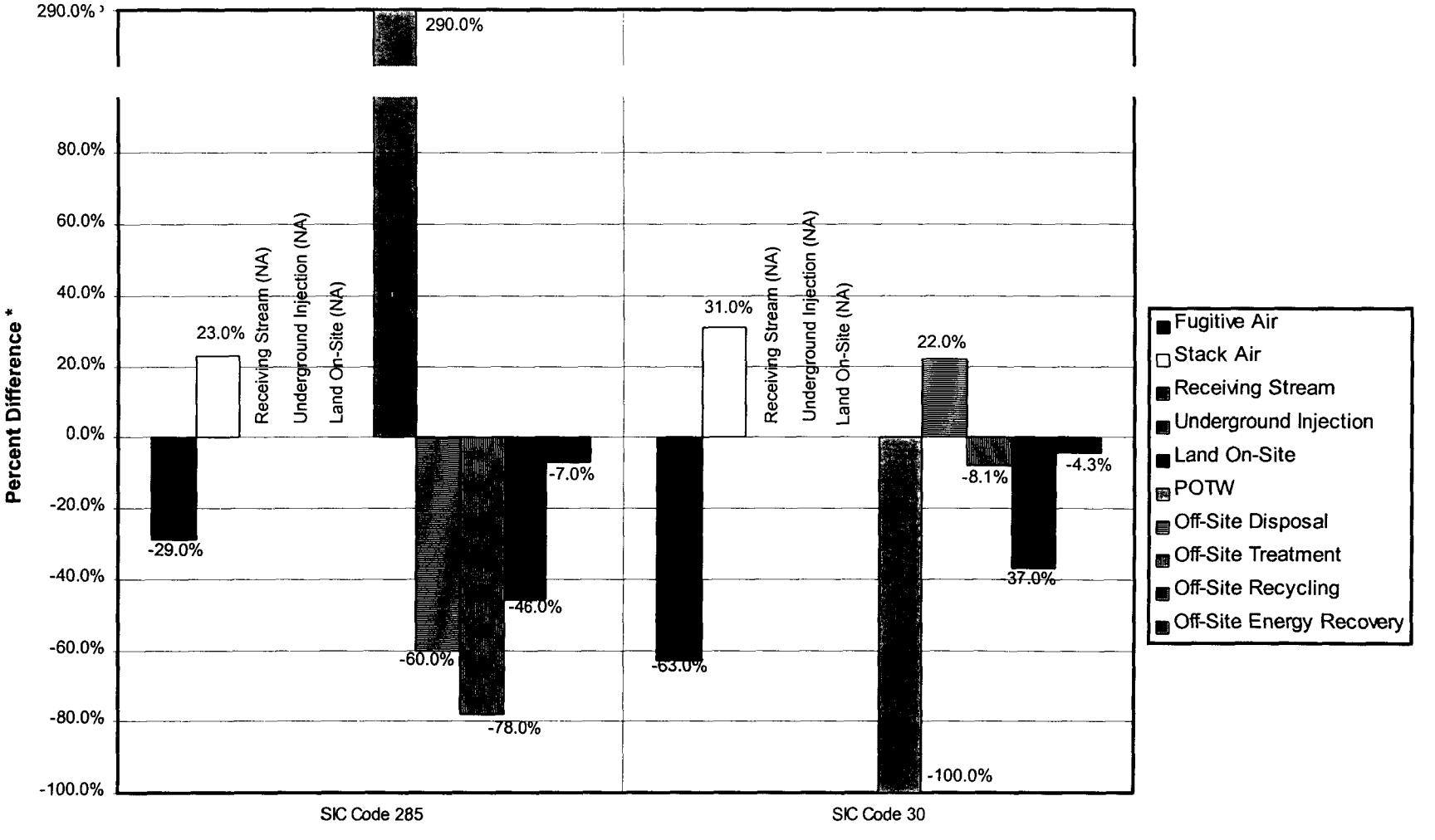
Figure 5-2. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 25 and 281 Surveyed for Reporting Year 1994



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-1 and 5-3.

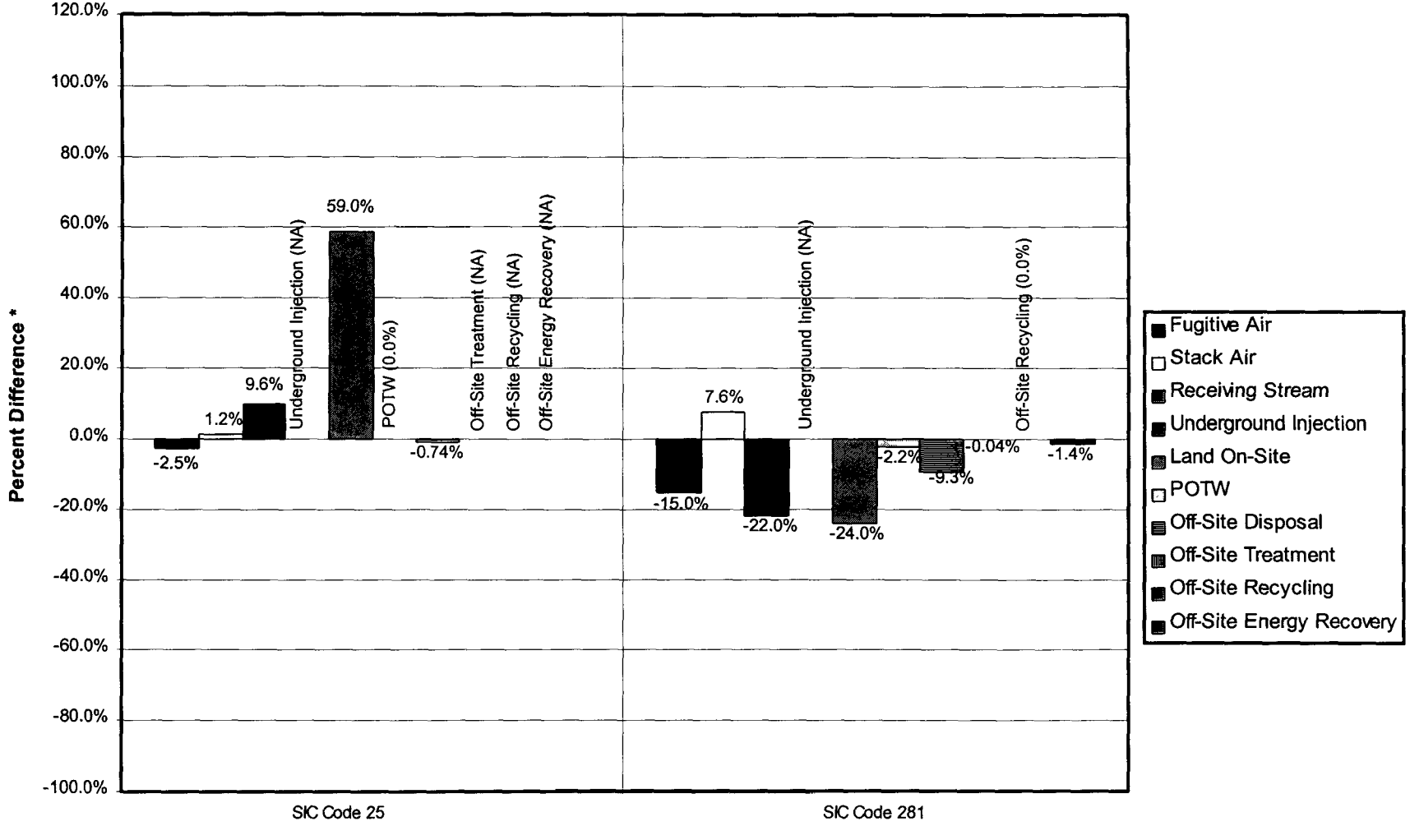
Figure 5-3. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 285 and 30 Surveyed for Reporting Year 1994



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables Tables 5-5 and 5-6.

Figure 5-4. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 26 and 286 Surveyed for Reporting Year 1995



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-9 and 5-11.

Table 5-13

Summary of RY 1995 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 26 and 286 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	20	22	-7.6%
Stack Air	88	86	2.4%
Receiving Stream	2.1	2.0	7.7%
Underground Injection	NA	NA	NA
Land On Site	0.19	0.12	59%
POTW	125	128	-2.2%
Off-Site Transfers	169	171	-1.2%
Total	405	410	-1.2%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 5-14

Summary of RY 1994 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 25, 281, 285, and 30 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	47	93	-49%
Stack Air	350	300	15%
Receiving Stream	1.7	1.7	5.1%
Underground Injection	15	38	-61%
Land On Site	0.0044	0.0044	0.0%
POTW	0.77	0.86	-11%
Off-Site Transfers	98	110	-13%
Total	510	550	-6.7%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 5-15

Summary of RY 1988 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 28, 291, and 34 Through 38 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	470	480	-2.1%
Stack Air	850	740	15%
Receiving Stream	30	3	900%
Underground Injection	0.00	0.00	NA
Land On Site	60	70	-14%
POTW	550	750	-27%
Off-Site Transfers	530	420	26%
Total	2,490	2,463	1.1%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

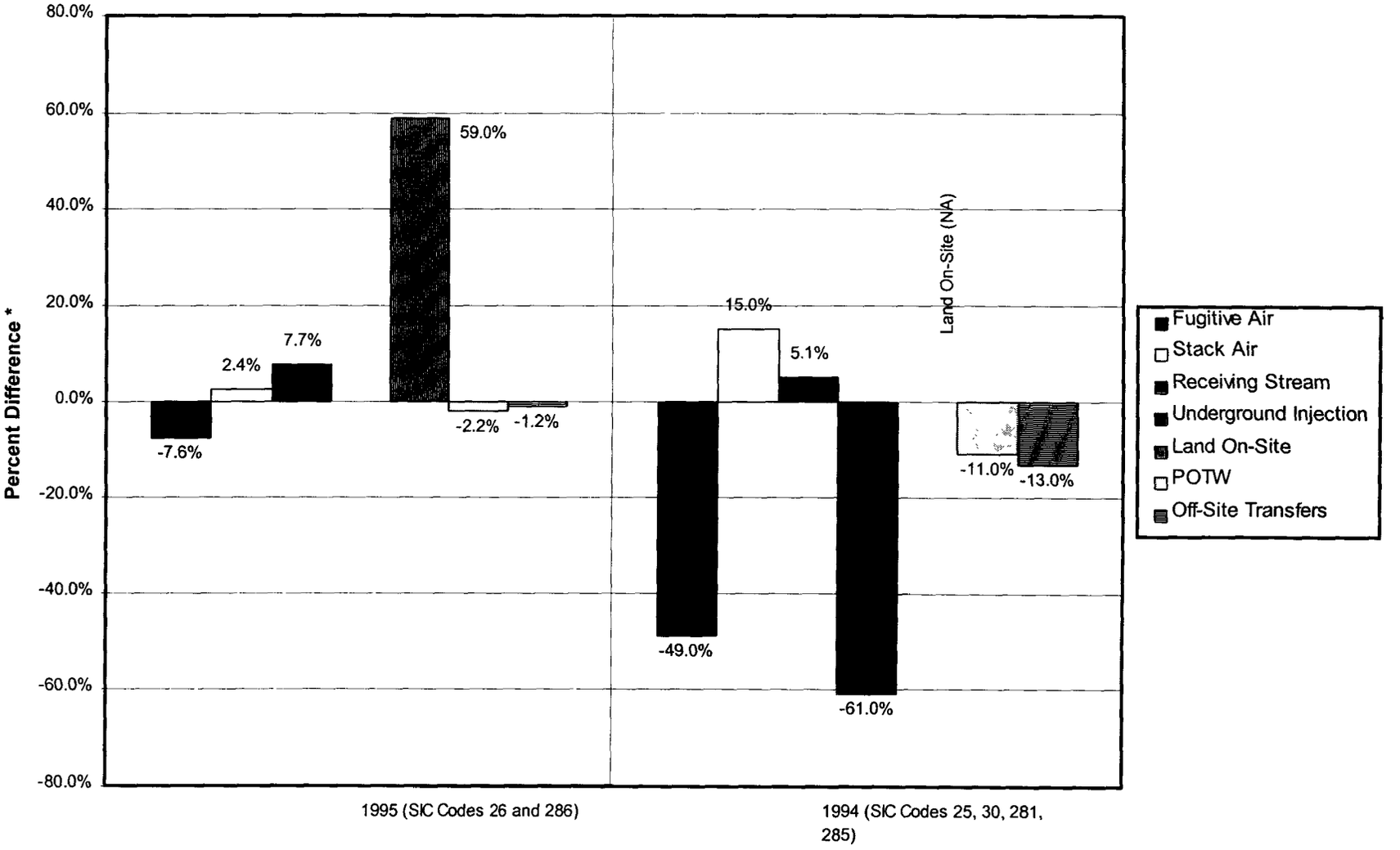
Table 5-16

Summary of RY 1987 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 20 Through 39 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	800	800	0.0%
Stack Air	1,800	1,900	-5.3%
Receiving Stream	9,600	9,900	-3.0%
Underground Injection	3,200	3,200	0.0%
Land On Site	2,400	2,700	-11%
POTW	2,200	2,000	10%
Off-Site Transfers	2,600	2,700	3.7%
Total	22,500	23,000	-2.2%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

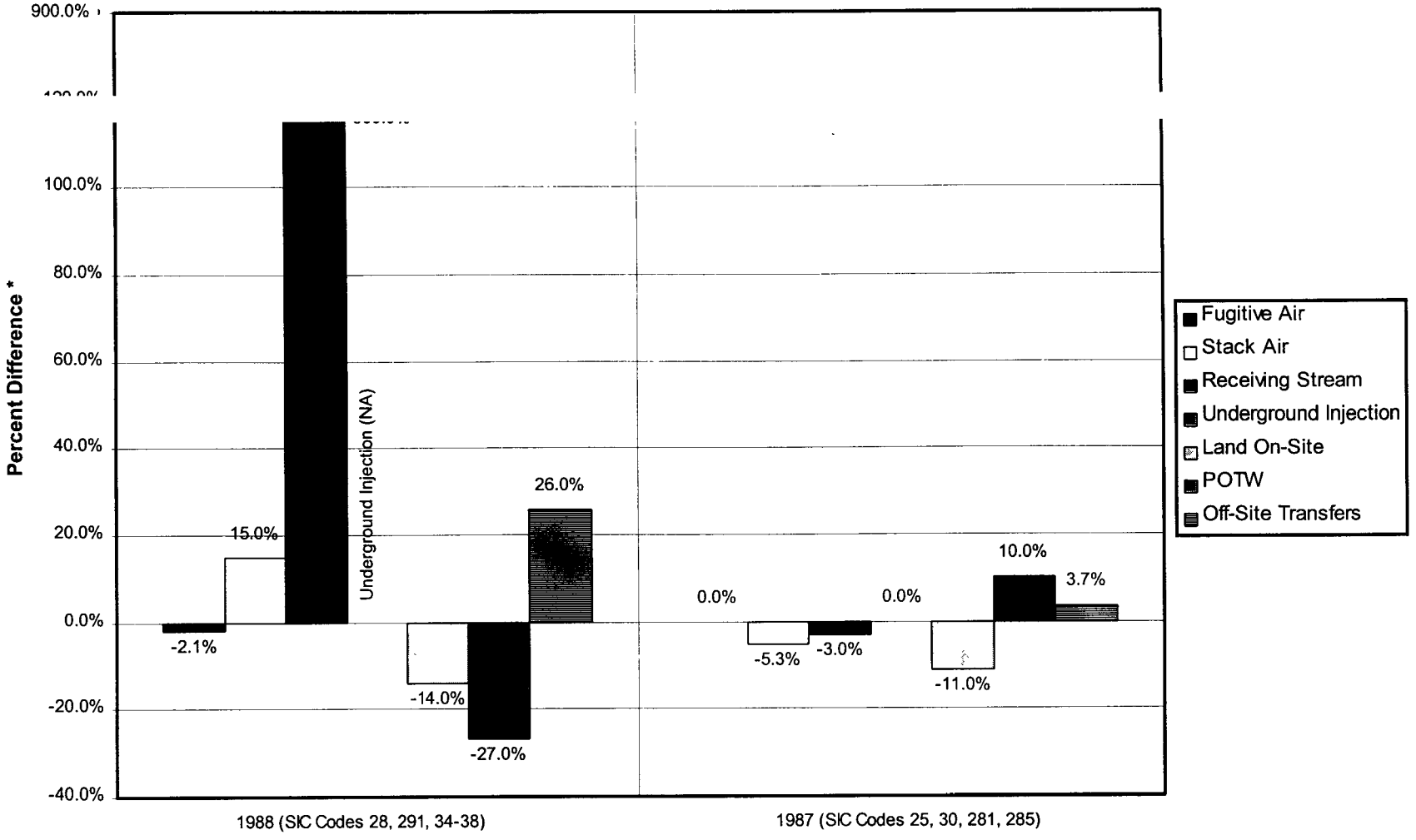
Figure 5-5. Comparison of On-Site Releases and Transfers Off-Site for Waste Management from Reporting Years 1995 and 1994



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-13 and 5-14.

Figure 5-6. Comparison of On-Site Releases and Transfers Off-Site for Waste Management from Reporting Years 1988 and 1987



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-11 and 5-12.

The percent differences in facility and site surveyor total estimates for RY 1987, RY 1988, RY 1994, and RY 1995 are presented in Table 5-17. The percent differences for each reporting year were less than 7 percent.

Table 5-17

Percent Difference of Facility Estimated and Site Surveyor Estimated Total TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1995, RY 1994, RY 1988, and RY 1987 (millions of lbs.)

TRI Reporting Year	Percent Difference*
1995	-1.2%
1994	-6.7%
1988	1.1%
1987	-2.2%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

5.1.3 Analysis of Specific Releases

Analyses of specific on-site releases and transfers off-site for waste management are presented in this section. These analyses only apply to facilities that correctly reported chemical on-site releases and transfers off-site for waste management. Facilities that incorrectly reported an on-site release or transfer off-site for waste management, incorrectly did not report an on-site release or transfer off-site for waste management, or correctly did not report an on-site release or transfer off-site for waste management are not included in the analyses in section 5.1.3. On-site releases and transfers off-site for waste management in this section are analyzed on a total facility basis. For example, if a facility underestimated the release of a chemical by 1,000, but overestimated the release of another chemical by 1,000 lbs, the errors would cancel and would not be identified in this analysis.

5.1.3.1 Fugitive Air Releases

A comparison of the percent difference between facility estimates and site surveyor estimates for fugitive air releases is presented in Table 5-18. It is notable that in SIC Code 30, over half the facilities estimates differed by more than 50 percent from the site surveyor estimate.

Table 5-18

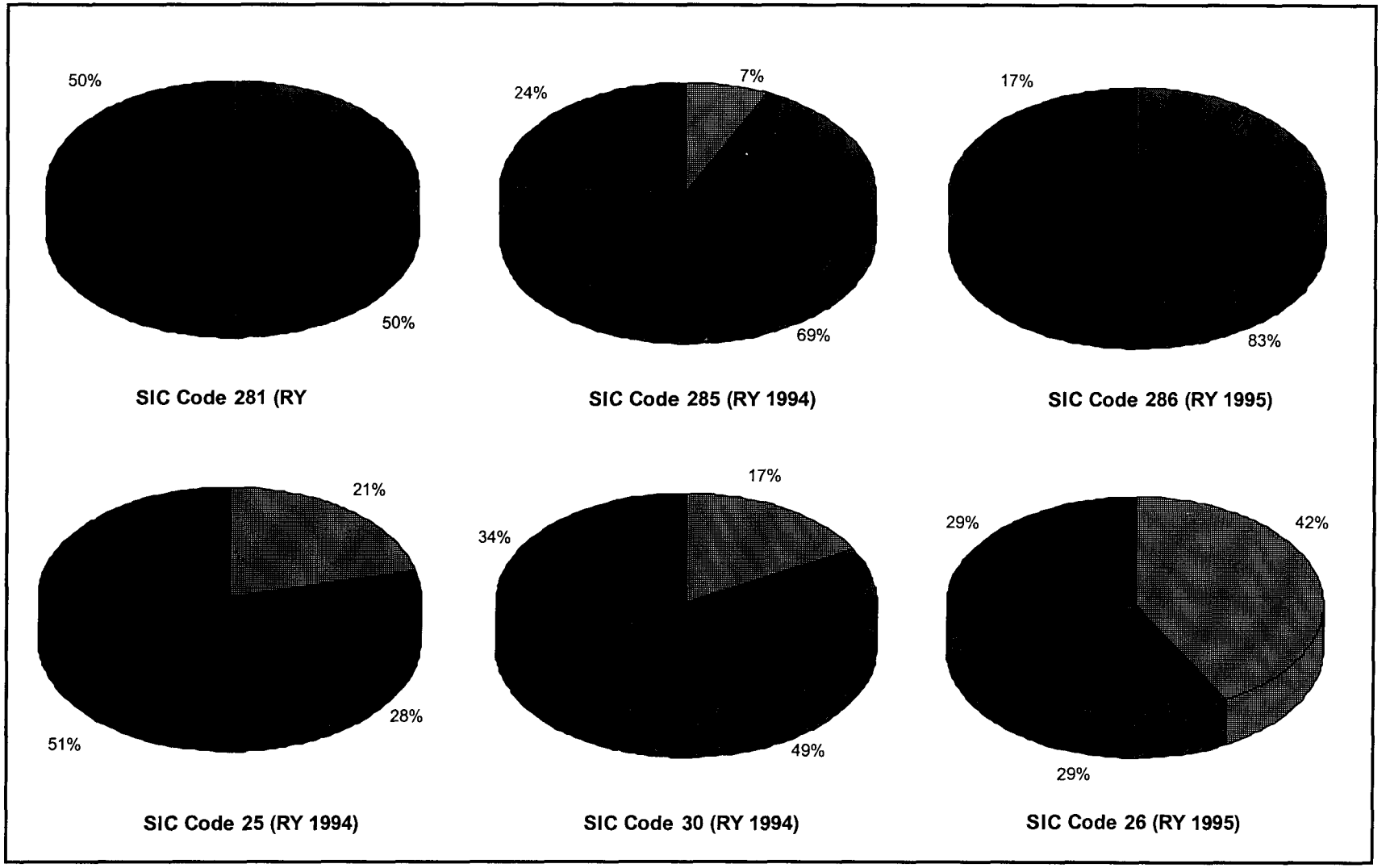
Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Estimates for Fugitive Air Emissions

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	21%	39%	47%	79%	21%
281 (RY 1994)	0%	13%	38%	67%	33%
285 (RY 1994)	7%	7%	12%	69%	31%
30 (RY 1994)	17%	17%	28%	40%	60%
26 (RY 1995)	43%	43%	43%	57%	43%
286 (RY 1995)	0%	0%	50%	83%	17%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.
Percentages are based on survey weighted data.

In Figure 5-7, the facility fugitive air emissions estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

Figure 5-7. Comparison of Facility Estimates and Site Surveyor Estimates for Fugitive Air Emissions



5.1.3.2 Stack Air Releases

A comparison of the percent difference between facility estimates and site surveyor estimates for stack air releases is presented in Table 5-19. It is notable that in SIC Code 285, over half the facilities' estimated releases differed by more than 50 percent from the site surveyor estimate.

Table 5-19

Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Estimates for Stack Air Emissions

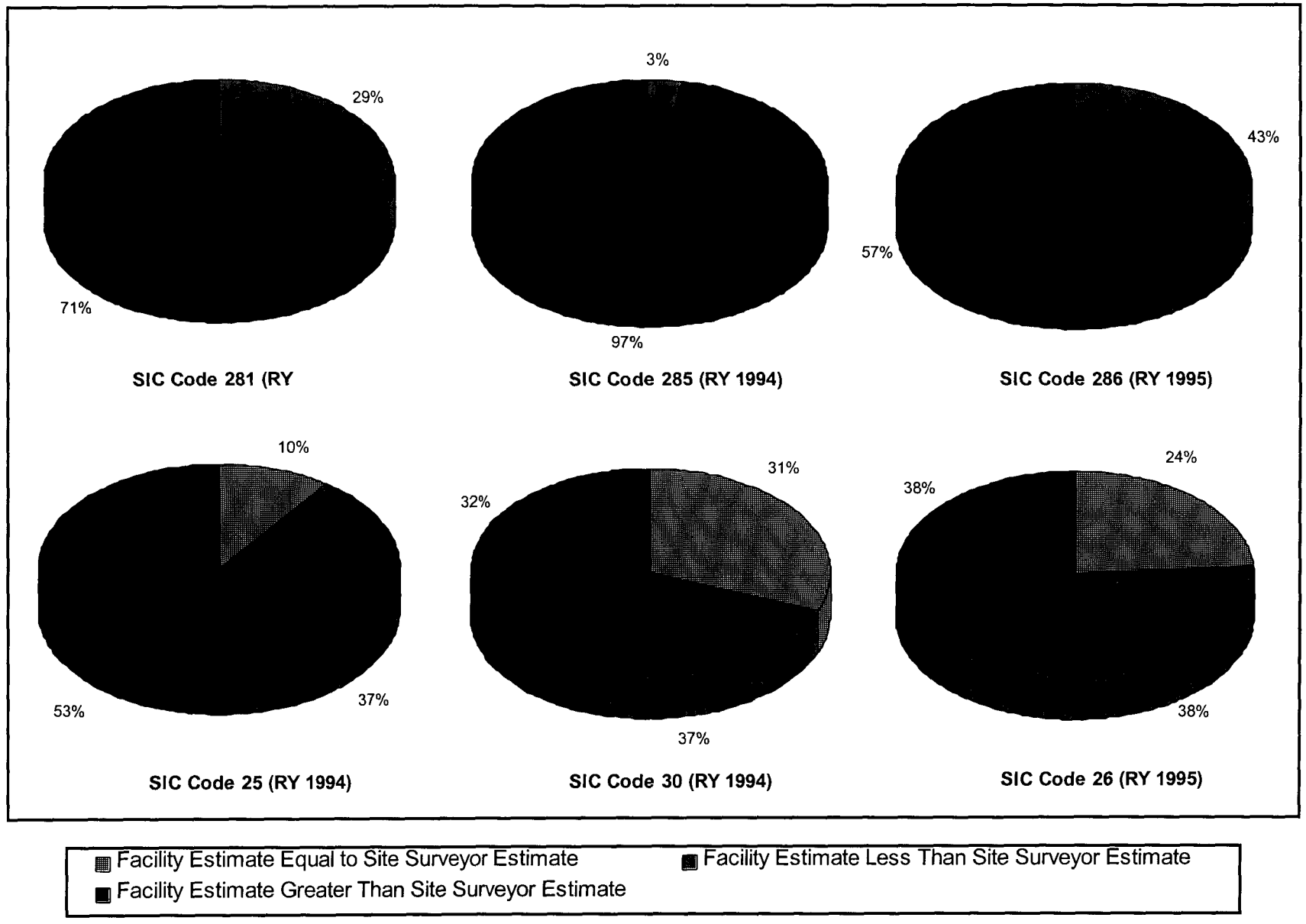
SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	10%	25%	55%	97%	3%
281 (RY 1994)	0%	22%	78%	92%	8%
285 (RY 1994)	0%	28%	28%	37%	63%
30 (RY 1994)	31%	35%	58%	75%	25%
26 (RY 1995)	38%	50%	75%	75%	25%
286 (RY 1995)	0%	14%	14%	57%	43%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.

In Figure 5-8, the facility stack air emissions estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the faciiity and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

In SIC Codes 25, 281, 285, and 286, facility estimates were higher than site surveyors estimates more often than they were equal to or lower than site surveyor estimates. In SIC Codes 26 and 30, facility estimates were equal to, greater than, and less than site surveyor estimates in approximately equal proportions. Site surveyors often encountered facilities that did

Figure 5-8. Comparison of Facility Estimates and Site Surveyor Estimates for Stack Air Emissions



not understand the definition of stack air releases and misclassified fugitive emissions as stack emissions. This appears to be the primary reason most of the SIC Codes surveyed showed an inclination to overestimate stack releases.

5.1.3.3 Discharges to Receiving Streams

A comparison of the percent difference between facility estimates and site surveyor estimates for receiving stream discharges is presented in Table 5-20. SIC Codes 25, 285, and 30 did not have any surveyed facilities with discharges to receiving streams. SIC Code 285 had two facilities which reported discharges to receiving streams. One facility overestimated emissions by 90 percent, and the other facility underestimated emissions by 55 percent.

Table 5-20

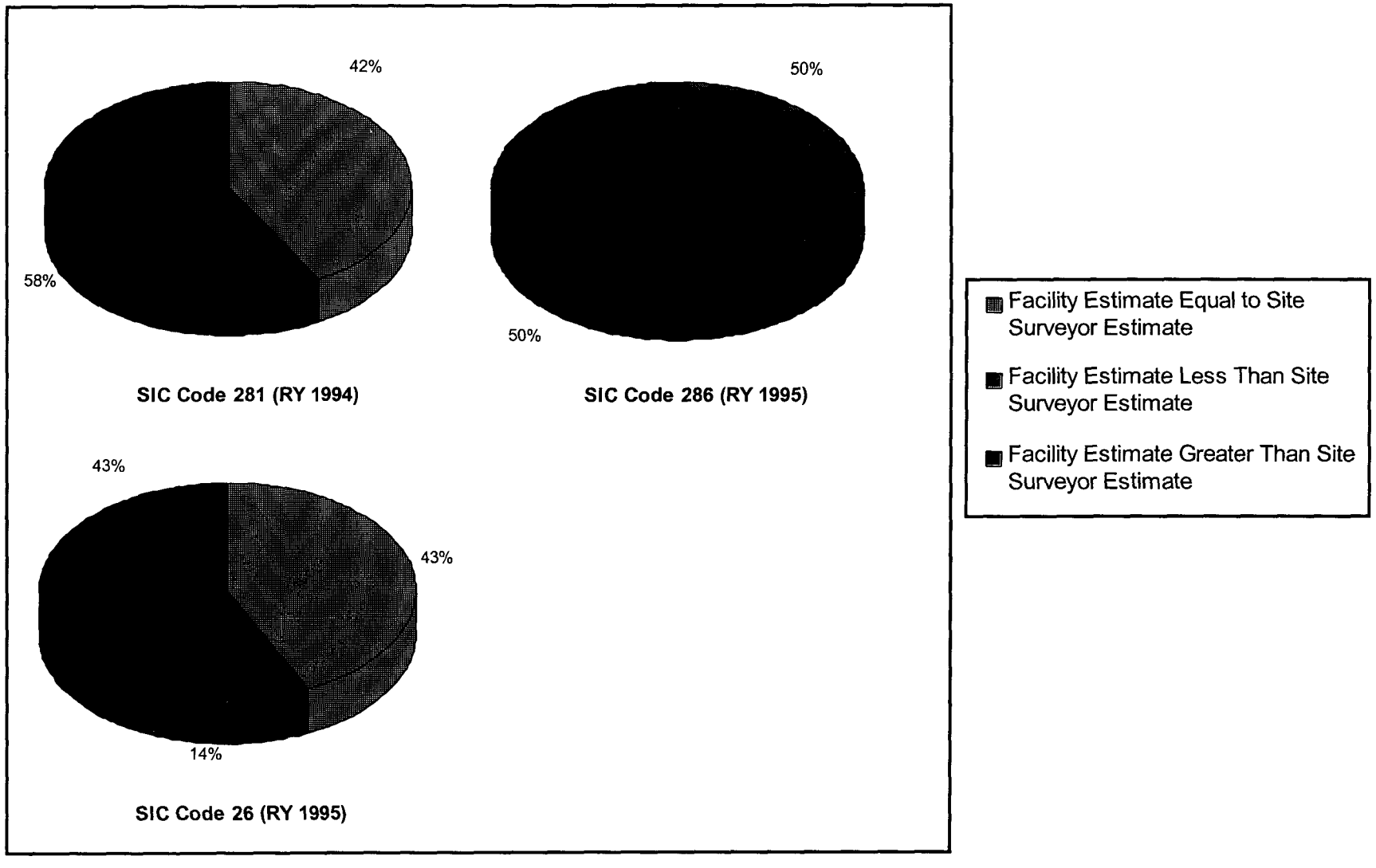
Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Estimates for Discharges to Receiving Streams

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	42%	73%	87%	87%	13%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	43%	43%	72%	86%	14%
286 (RY 1995)	0%	0%	0%	0%	100%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.
NA - Not applicable. There were no releases to receiving streams at the facilities surveyed for this SIC Code.

In Figure 5-9, the facility receiving stream release estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether

Figure 5-9. Comparison of Facility Estimates and Site Surveyor Estimates for Receiving Streams



the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.4 Underground Injection

A comparison of the percent difference between facility estimates and site surveyor estimates for underground injection quantities is presented in Table 5-21. Only two facilities surveyed in SIC Code 281 had releases by underground injection. The facility estimates for these quantities is between 10% and 50% less than the site surveyor estimates. No facilities surveyed in SIC Codes 25, 26, 30, 285, or 286 had underground injection releases.

Table 5-21

Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Estimates for Underground Injection

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	0%	0%	0%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	NA	NA	NA	NA	NA

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.
NA - Not applicable. There were no underground injection amounts at the facilities surveyed for this SIC Code.

5.1.3.5 Releases and Other Waste Management Quantities to Land On Site

A comparison of the percent difference between facility estimates and site surveyor estimates for releases to land on site is presented in Table 5-22. Releases to land on-site occurred at only one site surveyed in SIC Codes 281 and 286, and at three sites surveyed in SIC

Code 26. No sites surveyed in SIC Codes 25, 30, and 285 had releases to land on-site. In Figure 5-10, the facility releases to land on-site are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

Table 5-22

Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Release Estimates to Land On Site

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	100%	100%	100%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	33%	33%	33%	33%	67%
286 (RY 1995)	0%	0%	0%	100%	0%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.
NA - Not applicable. There were no releases to land on site at the facilities surveyed for this SIC Code.

5.1.3.6 Discharges to POTWs

A comparison of the percent difference between facility estimates and site surveyor estimates for discharges to POTWs is presented in Table 5-23. The number of facilities surveyed in SIC Codes 25, 26, 30, 281, 285, and 286 that reported discharges to a POTW are two, zero, four, one, one, and seven, respectively.

Figure 5-10. Comparison of Facility Estimates and Site Surveyor Estimates to Land On-Site

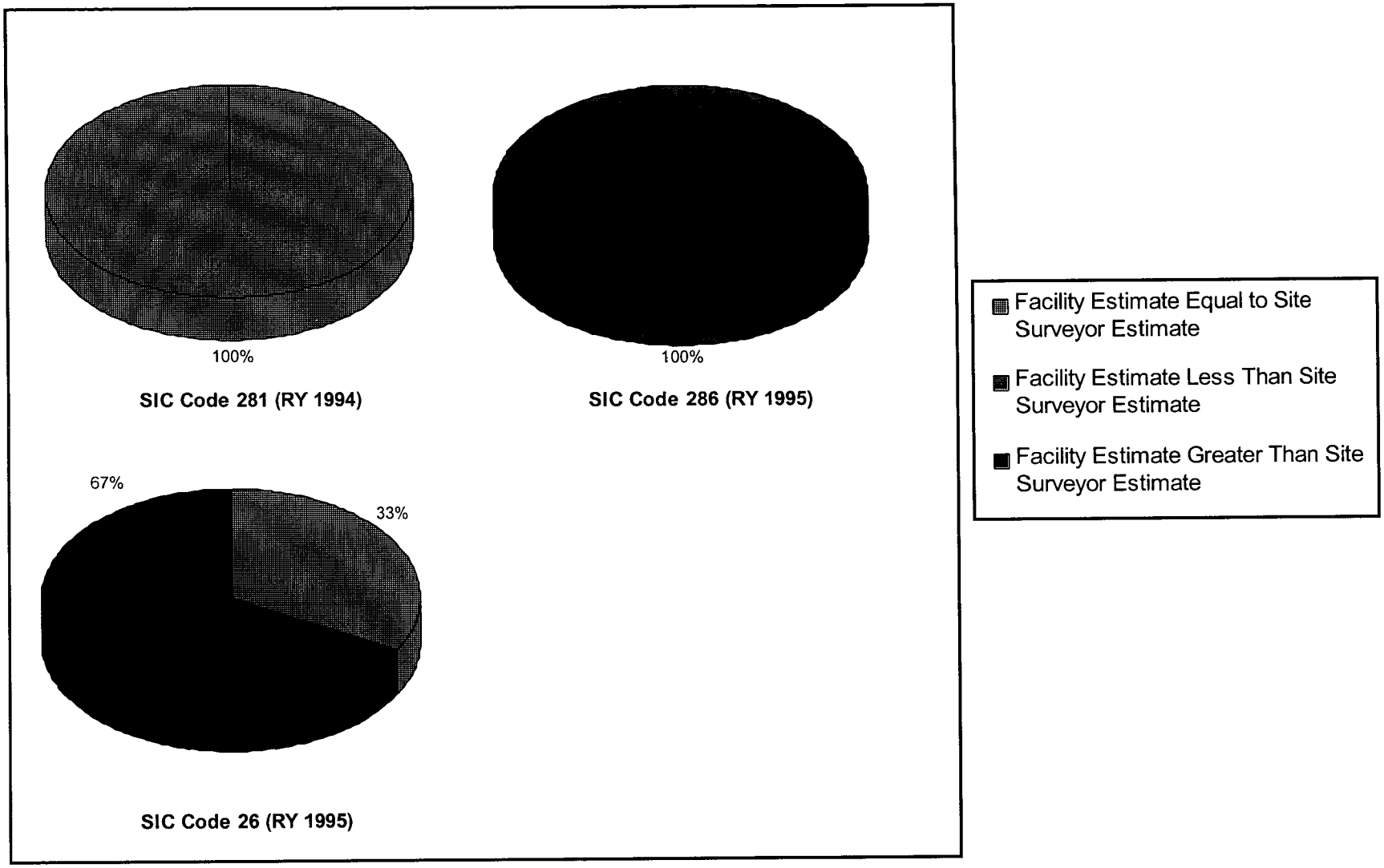


Table 5-23

Comparison of the Percent Difference (PD)[1] Between Facility and Site Surveyor Estimates for Discharges to POTWs

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	73%	73%	73%	27%
281 (RY 1994)	0%	0%	27%	65%	35%
285 (RY 1994)	0%	0%	0%	0%	100%
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	100%	100%	100%	100%	0%
286 (RY 1995)	17%	50%	67%	83%	17%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.
NA - Not applicable. There were no discharges to POTWs at the facilities surveyed for this SIC Code.

In Figure 5-11, the facility discharge to POTW estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.7 Off-Site Transfers for Disposal

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for disposal is presented in Table 5-24. SIC Code 285, representing paint manufacturing facilities, had a high percentage of facilities which disagreed with the site surveyors estimates because most facilities overlooked container residue and other forms of off-site disposal.

Figure 5-11. Comparison of Facility Estimates and Site Surveyor Estimates for Discharges to POTWs

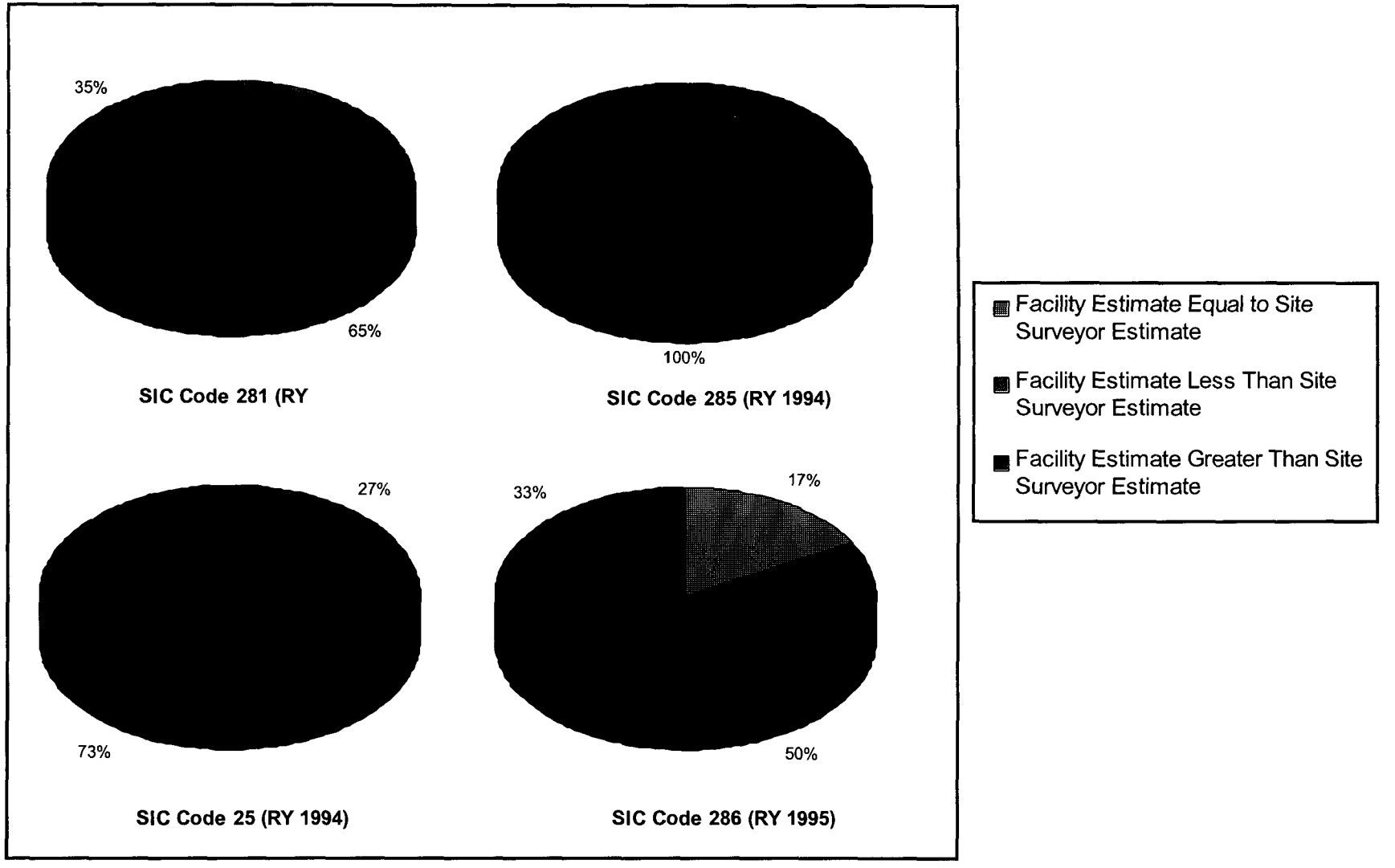


Table 5-24

Comparison of the Percent Difference (PD)[1] Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Disposal

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	15%	78%	78%	100%	0%
285 (RY 1994)	0%	0%	0%	4%	96%
30 (RY 1994)	0%	0%	0%	59%	41%
26 (RY 1995)	50%	100%	100%	100%	0%
286 (RY 1995)	50%	50%	100%	100%	0%

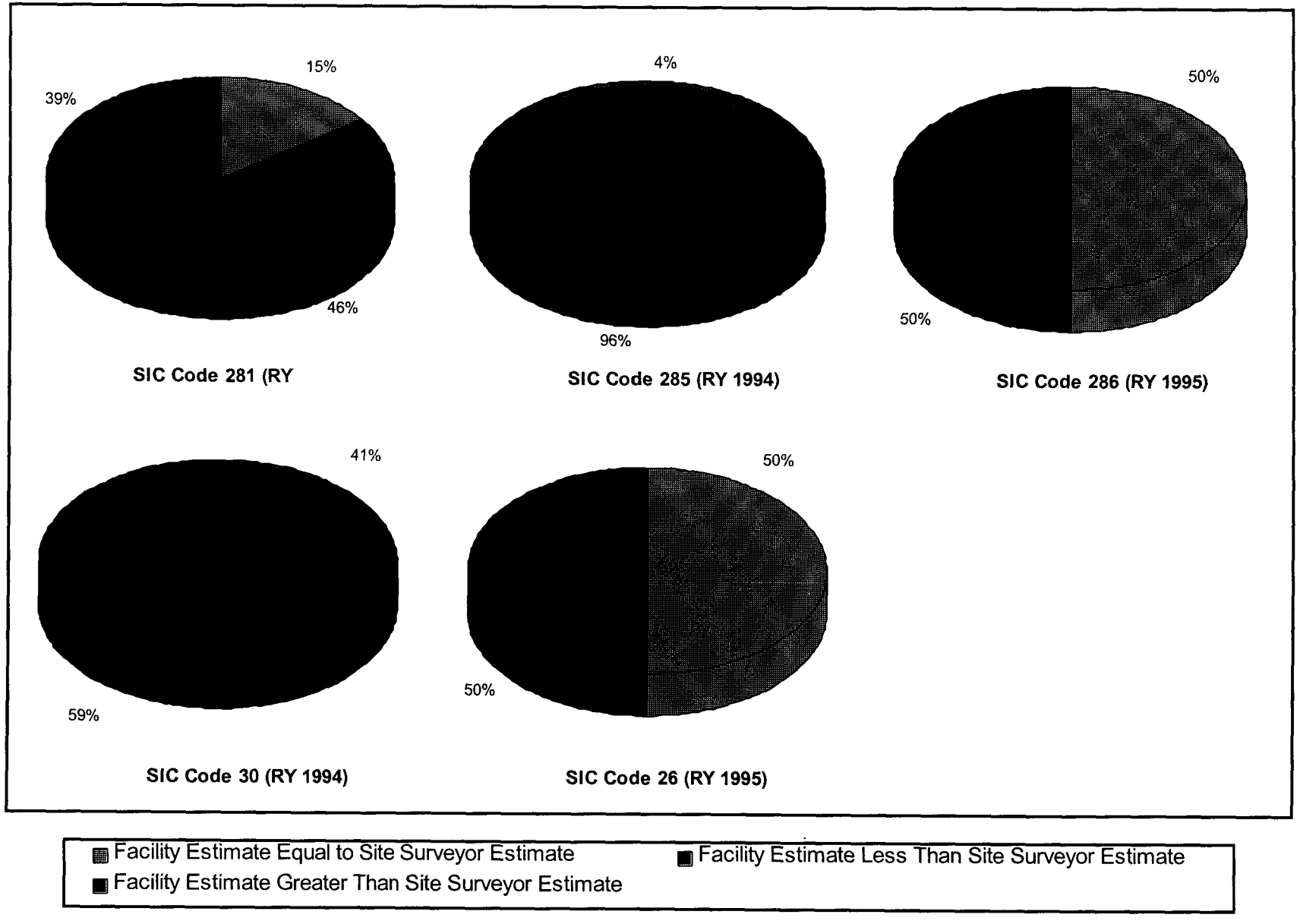
[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.
NA - Not applicable. There were no off-site transfers for disposal at the facilities surveyed for this SIC Code.

In Figure 5-12, the facility off-site transfers for disposal estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.8 Off-Site Transfers for Treatment

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for treatment is presented in Table 5-25. SIC Code 285, representing paint manufacturing facilities, had a total of two facilities with off-site transfers for treatment. These facilities overlooked many of these transfers. Container residue and bad process batches made up the bulk of off-site treatment transfers. As shown in Table 5-21, these two facility estimates were greater than 50% different than the site surveyor estimate. SIC Code 25, representing furniture manufacturing facilities, had three facilities which reported off-site transfers for treatment. These transfers were mainly disposed or recycled by off-site vendors

Figure 5-12. Comparison of Facility Estimates and Site Surveyor Estimates for Transfers Off-Site for Disposal



instead of treated. Therefore, these facility estimates were greater than 50% different than the site surveyors estimates.

Table 5-25

Comparison of the Percent Difference (PD)[1] Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Treatment

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	0%	0%	0%	100%
281 (RY 1994)	22%	38%	65%	65%	35%
285 (RY 1994)	0%	0%	0%	0%	100%
30 (RY 1994)	24%	27%	35%	73%	27%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	40%	80%	100%	100%	0%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-13, the facility off-site transfers for treatment estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.9 Off-Site Transfers for Recycling

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for recycling is presented in Table 5-26.

Figure 5-13. Comparison of Facility Estimates and Site Surveyor Estimates for Transfers Off-Site for Treatment

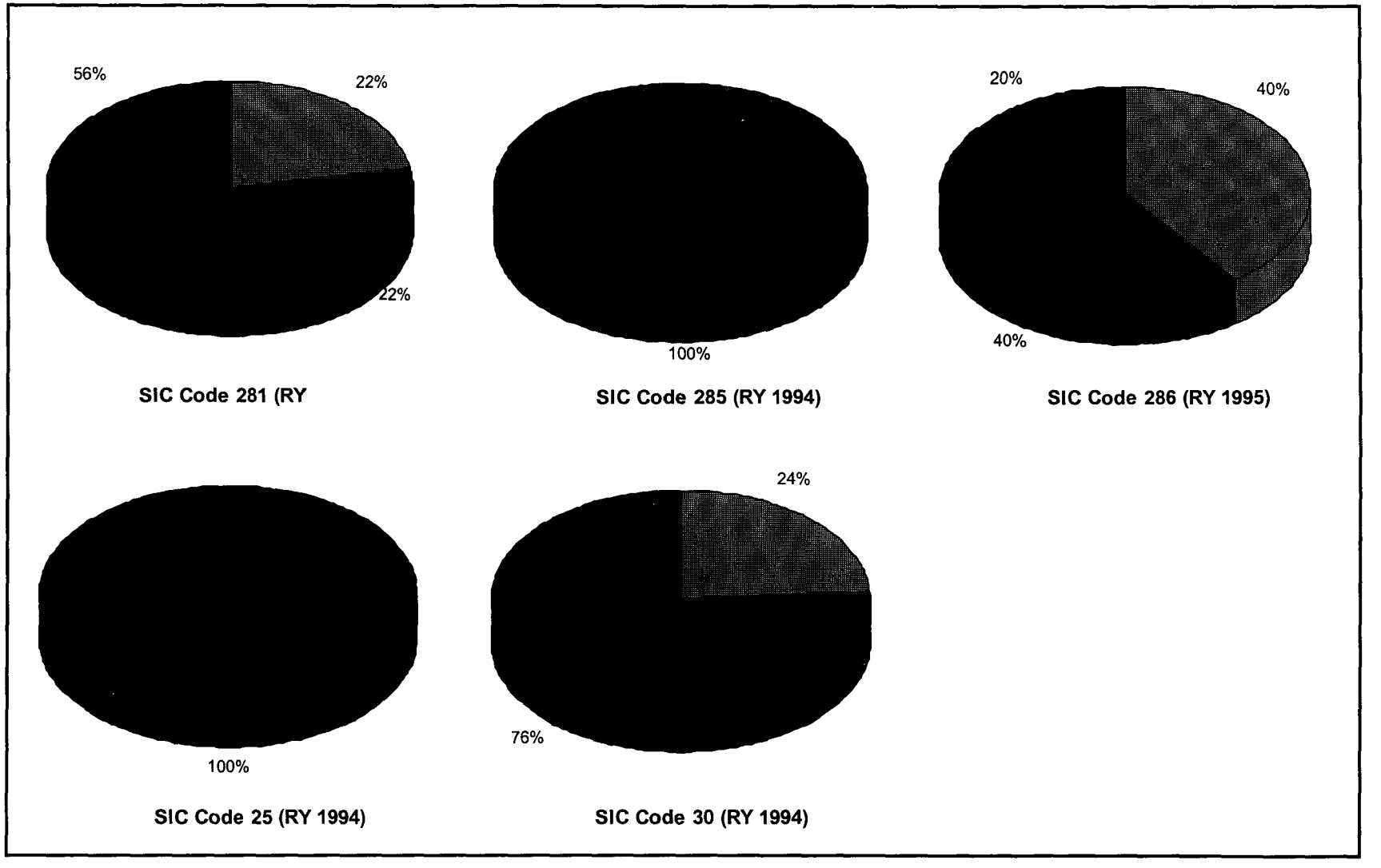


Table 5-26

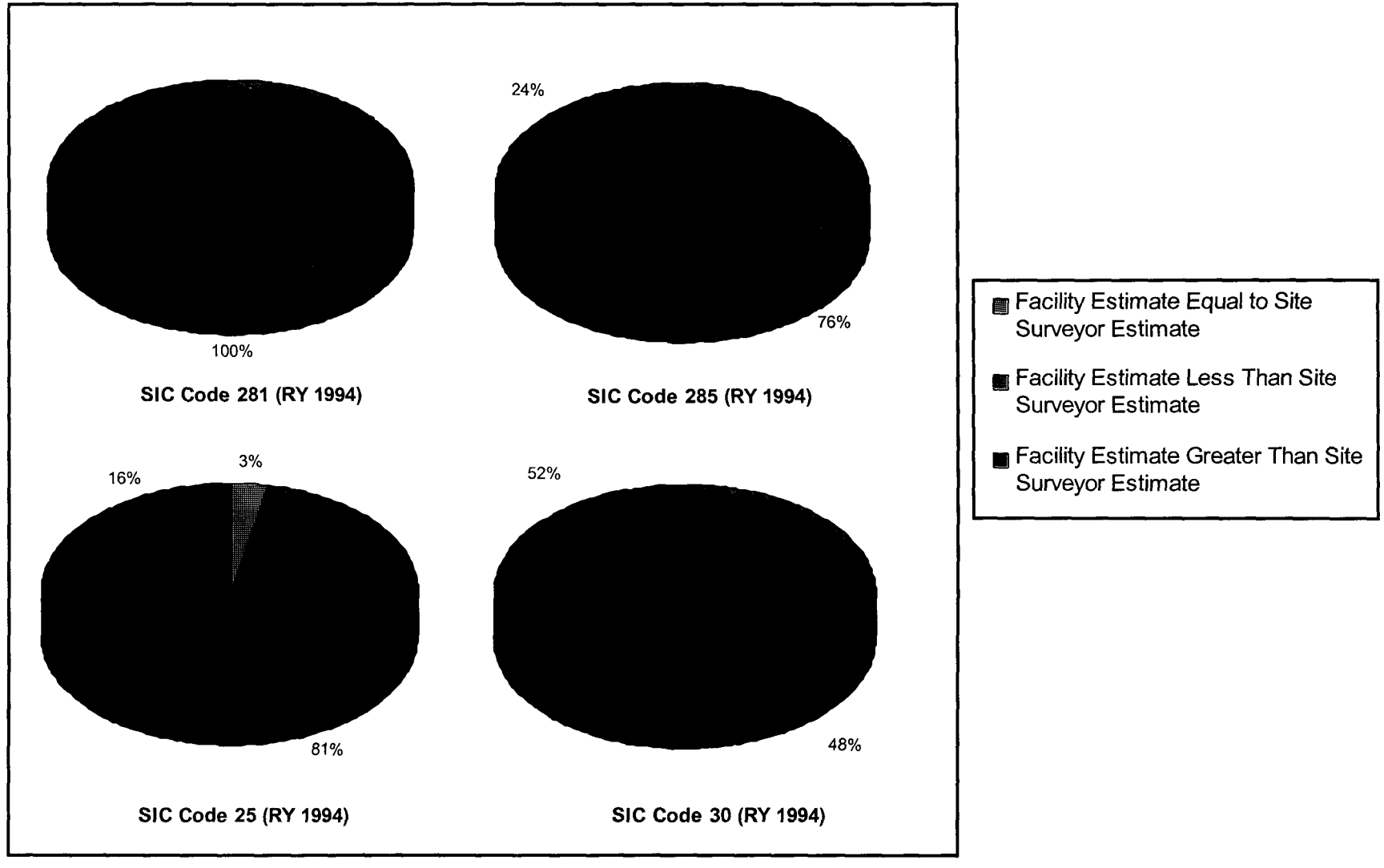
Comparison of the Percent Difference (PD)[1] Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Recycling

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	3%	3%	50%	84%	16%
281 (RY 1994)	0%	0%	0%	100%	0%
285 (RY 1994)	0%	8%	24%	62%	38%
30 (RY 1994)	0%	0%	0%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	100%	100%	100%	100%	0%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-14, the facility off-site transfers for recycling estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates. There is a general tendency among SIC Codes 25, 281, and 285 for facility estimates to be less than site surveyor estimates. Facilities in these SIC Codes tend to overlook solvent remaining in container residue that can be recycled by some off-site vendors.

Figure 5-14. Comparison of Facility Estimates and Site Surveyor Estimates for Off-Site Recycling



5.1.3.10 Off-Site Transfers for Energy Recovery

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for energy recovery is presented in Table 5-27.

Table 5-27

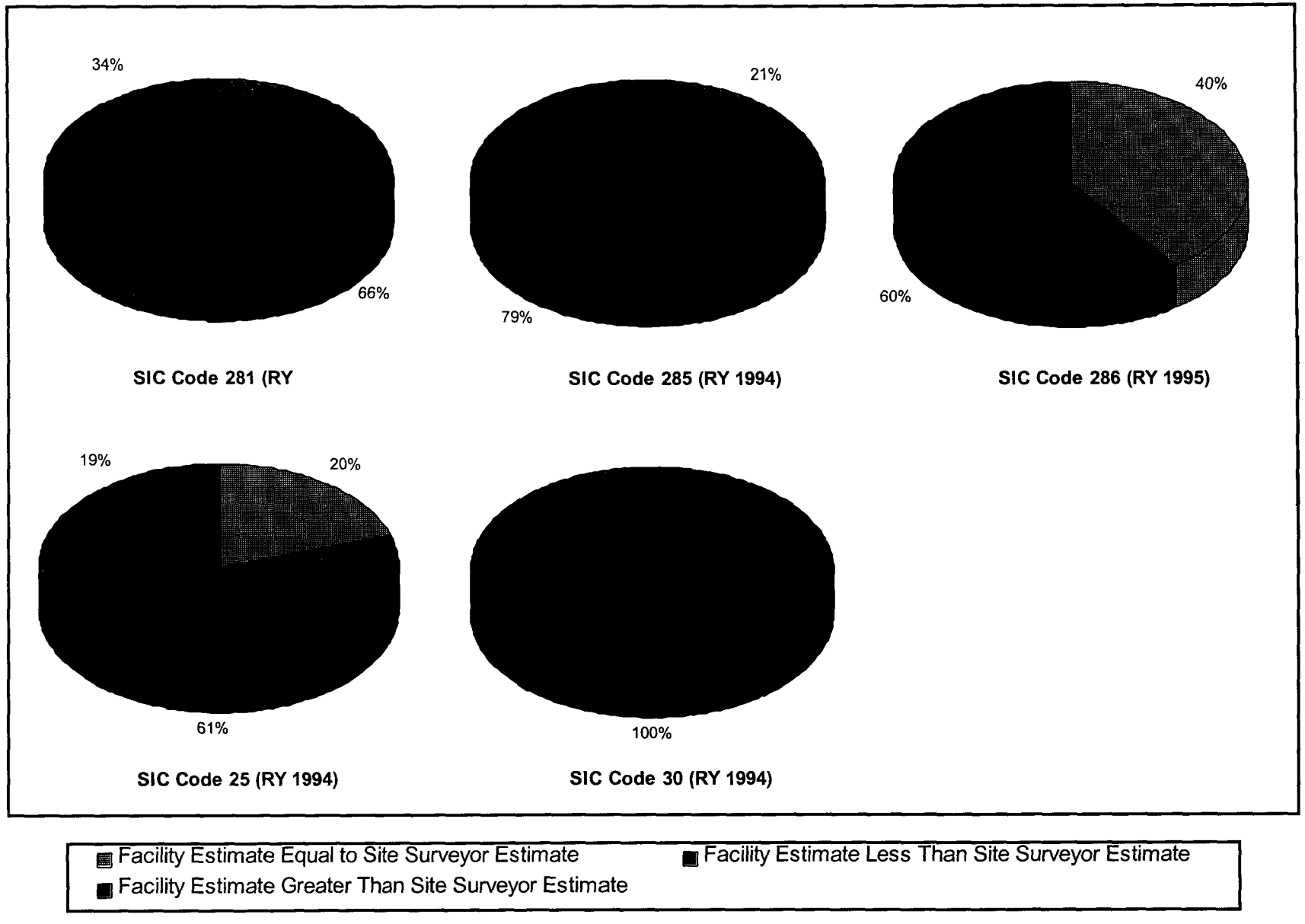
Comparison of the Percent Difference (PD)[1] Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Energy Recovery

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	20%	39%	59%	77%	23%
281 (RY 1994)	0%	0%	0%	0%	100%
285 (RY 1994)	0%	0%	34%	100%	0%
30 (RY 1994)	0%	0%	100%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	40%	40%	80%	100%	0%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-15, the facility off-site transfers for energy recovery estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates. Over half the facilities in SIC Codes 25, 30, 281, and 286 had off-site transfer for energy recovery estimates less than the site surveyor estimates.

Figure 5-15. Comparison of Facility Estimates and Site Surveyor Estimates for Off-Site Energy Recovery



5.2 On-Site Waste Management Activities

5.2.1 On-Site Waste Management Activities by SIC Code

On-site waste management activity quantities as reported by the facilities and the site surveyors were summed for all chemicals to get total facility on-site waste management activity quantities. Total facility on-site activity quantities were scaled and summed for all facilities to get total on-site activity quantities for each SIC Code. The total on-site activity quantities for SIC Codes are presented by activity in Tables 5-28 through 5-33. In general, facility and site surveyor estimates showed better agreement for on-site treatment than on-site recycling for each SIC Code.

Facilities in SIC Code 286 tend to be much larger than those in the other SIC Codes surveyed. The process operations performed in these facilities and the many uses for solvents in these processes create many opportunities for on-site recycling, treatment, and energy recovery, as shown by the large amount of chemicals in Table 5-33.

Table 5-28

Summary of SIC Code 25 TRI On-Site Waste Management Activity Quantities for RY 1994 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	2.36	3.23	-27%
Treatment	5.54	5.26	5.3%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-29

Summary of SIC Code 281 TRI On-Site Waste Management Activity Quantities for RY 1994 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	332	328	1.2%
Treatment	79.7	78.9	1.0%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-30

Summary of SIC Code 285 TRI On-Site Waste Management Activity Quantities for RY 1994 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	3.48	2.95	18%
Treatment	0.00	0.00	NA
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-31

Summary of SIC Code 30 TRI On-Site Waste Management Activity Quantities for RY 1994 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	160	160	-0.09%
Treatment	32.6	33.1	-1.36%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-32

Summary of SIC Code 26 TRI On-Site Waste Management Activity Quantities for Reporting Year 1995 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	0	0	NA
Treatment	258	287	-10%
Energy Recovery	65.6	75.9	-14%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-33

Summary of SIC Code 286 TRI On-Site Waste Management Activity Quantities for Reporting Year 1995 (millions of lbs.)

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	702	3,821	-82%
Treatment	144	223	-35%
Energy Recovery	222	222	0.0%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

The large percent difference in on-site recycling activities in SIC Code 286 is due to one facility misreporting recycling activities. If this facility was excluded from the analysis, the percent difference would be less than 1%.

5.2.2 On-Site Recycling

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site recycling is presented in Table 5-34. SIC Codes 281 and 30 had the best agreement between facility on-site recycling estimates and site surveyor on-site recycling estimates.

Table 5-34

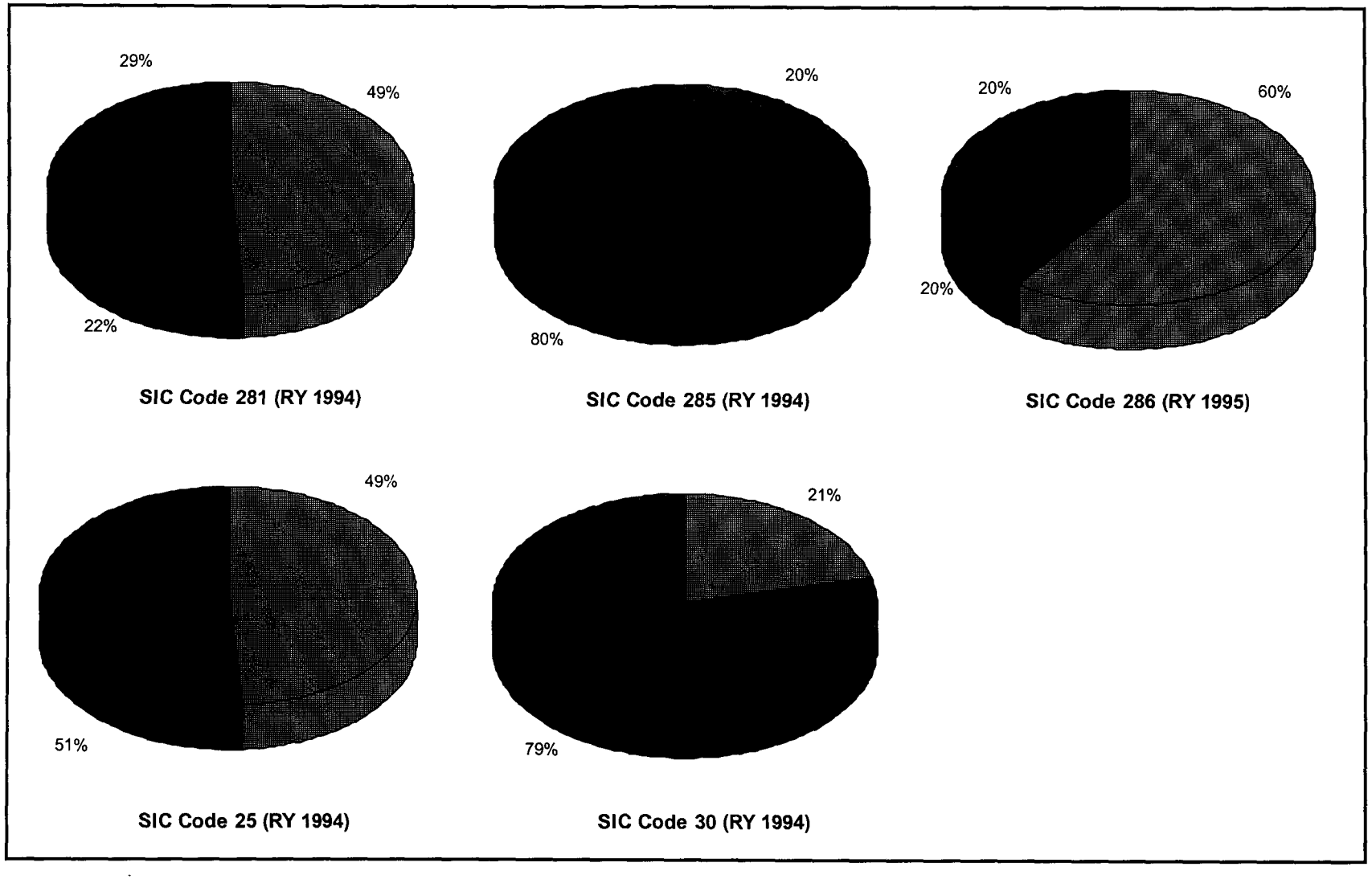
Comparison of the Percent Difference (PD)[1] Between Facility On-Site Recycling Estimates and Site Surveyor On-Site Recycling Estimates

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	49%	49%	49%	80%	20%
281 (RY 1994)	49%	49%	87%	100%	0%
285 (RY 1994)	0%	3%	3%	100%	0%
30 (RY 1994)	21%	100%	100%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	60%	80%	80%	80%	20%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-16, the facility on-site recycling estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

Figure 5-16. Comparison of Facility Estimates and Site Surveyor Estimates for On-Site Recycling



5.2.3 On-Site Treatment

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site treatment is presented in Table 5-35.

Table 5-35

Comparison of the Percent Difference (PD)[1] Between Facility On-Site Treatment Estimates and Site Surveyor On-Site Treatment Estimates

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	0%	100%	100%	0%
281 (RY 1994)	54%	63%	100%	100%	0%
285 (RY 1994)	100%	100%	100%	100%	0%
30 (RY 1994)	0%	0%	100%	100%	0%
26 (RY 1995)	13%	25%	38%	63%	37%
286 (RY 1995)	20%	80%	80%	80%	20%

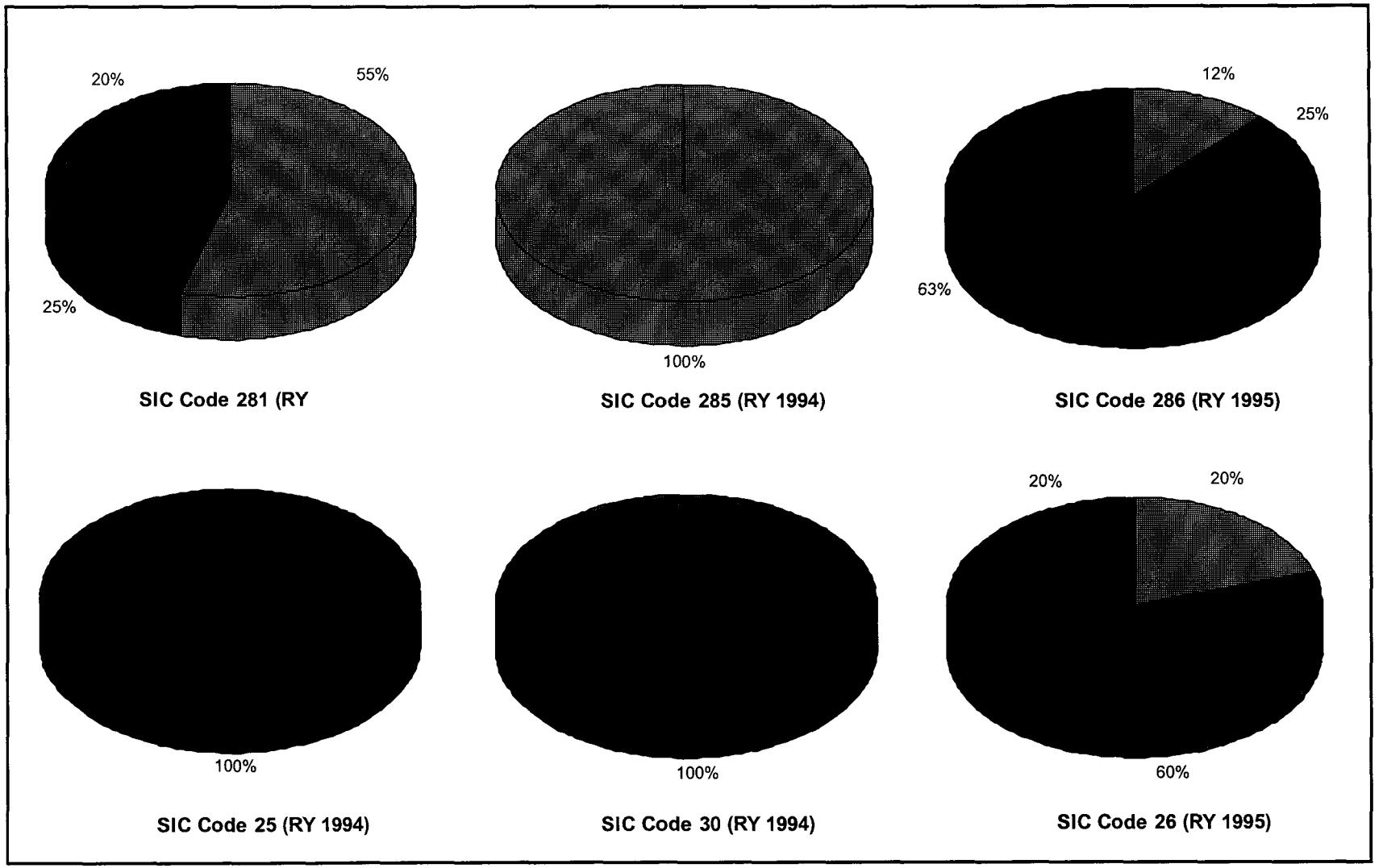
[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-17, the facility on-site treatment estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.2.4 On-Site Energy Recovery

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site energy recovery is presented in Table 5-36. Only six facilities surveyed in SIC Code 281, 286, and 26 performed on-site energy recovery. All facility

Figure 5-17. Comparison of Facility Estimates and Site Surveyor Estimates for On-Site Treatment



estimates were equal to the site surveyor estimates except for one facility in SIC Code 26. No facilities surveyed in SIC Codes 25, 285, or 30 performed on-site energy recovery.

Table 5-36

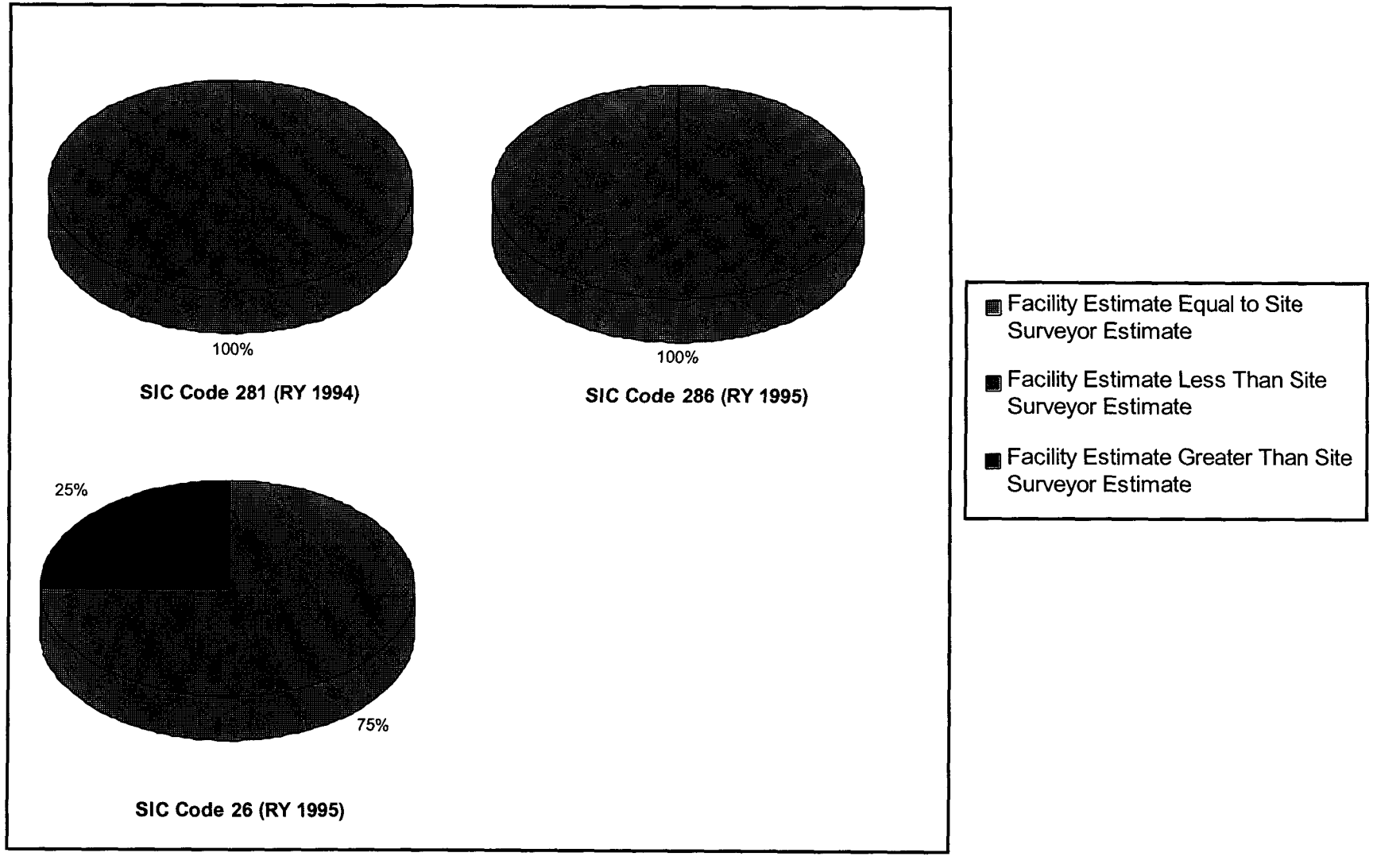
Comparison of the Percent Difference (PD)[1] Between Facility On-Site Energy Recovery Estimates and Site Surveyor On-Site Energy Recovery Estimates

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	100%	100%	100%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	75%	75%	75%	100%	0%
286 (RY 1995)	100%	100%	100%	100%	0%

[1]PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.
NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

In Figure 5-18, the facility on-site energy recovery estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

Figure 5-18. Comparison of Facility Estimates and Site Surveyor Estimates for On-Site Energy Recovery



5.3 Production Ratio/Activity Index

The production ratio/activity index is a pollutant specific measure that relates the changes in business activity between subsequent reporting years. The production ratio/activity index can be estimated using several methods. The methods are presented below:

- TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year;
- TCPV - the ratio of production volume in the current reporting year to the previous reporting year;
- TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year;
- HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year;
- WT - an activity index or production ratio based on a weighted average of data from several processes; and
- OTH - any other estimation method.

Figure 5-19 and Table 5-37 present the distribution of use for each method that was reported by the facilities, by SIC Code. Site surveyors reviewed the method used by each facility to determine whether it was the most appropriate. Table 5-38 presents the frequency that site surveyor's agreed with the facility's choice of method. As shown on the table, facilities which used a method not listed (as noted by the "other" category), could have used a better method to determine the production ratio. Table 5-39 presents the distribution of the most appropriate method as observed by site surveyors.

As shown on Table 5-38, the site surveyor disagreed most often with the "other" basis of estimate. Most production ratios can be accurately accounted for using the amount of chemical manufactured or used from one year to the next, or the change in production volume. Facilities would have more accurate activity indices if one of these three bases was used for ratio estimation.

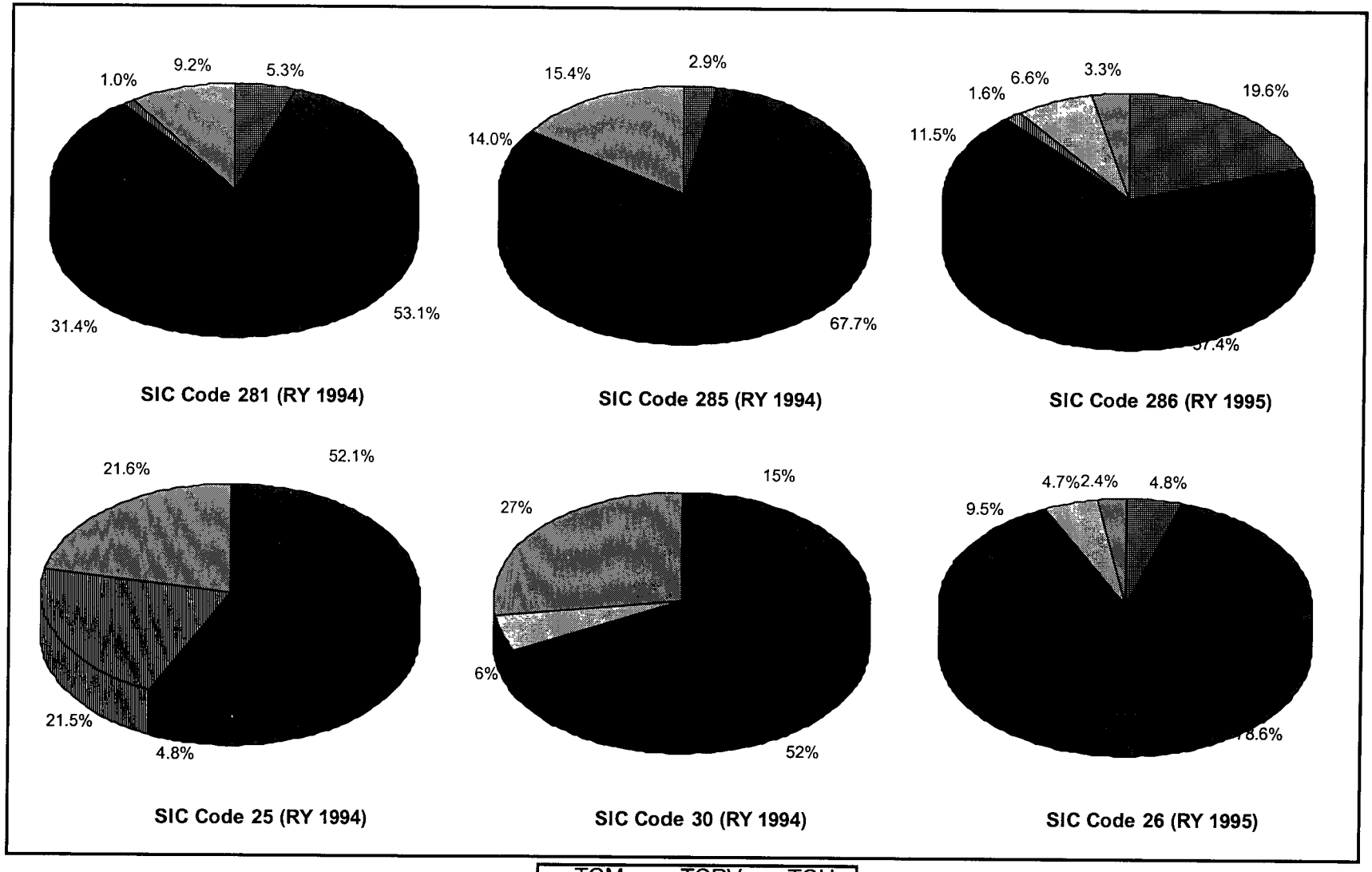
Table 5-37

Method of Estimate Used by Facilities to Calculate Production Ratio

SIC Code	Percent of Facilities Using TCM	Percent of Facilities Using TCPV	Percent of Facilities Using TCU	Percent of Facilities Using HR	Percent of Facilities Using WT	Percent of Facilities Using OTH
25 (RY 1994)	0%	52.1%	4.8%	21.5%	0%	21.6%
281 (RY 1994)	5.4%	53.6%	31.7%	0.0%	0%	9.3%
285 (RY 1994)	2.9%	67.7%	14.0%	0%	0%	15.4%
30 (RY 1994)	0%	14.9%	52.3%	0%	5.7%	27.1%
26 (RY 1995)	4.8%	78.6%	9.5%	0%	4.7%	2.4%
286 (RY 1995)	19.6%	57.4%	11.5%	1.6%	6.6%	3.3%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.
TCPV - the ratio of production volume in the current reporting year to the previous reporting year.
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.
HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.
WT - an activity index or production ratio based on a weighted average of data from several processes.
OTH - any other estimation method.

Figure 5-19. Method of Estimate used by Facilities to Calculate PR/AI



The data for this Figure is shown in Table 5-37.

Table 5-38

Percent of Time Surveyor Agreed with Facility Basis of Production Ratio Estimate

SIC Code	Facility Basis of Estimate	Percent of Time Surveyor Agreed with Basis
25 (RY 1994)	TCPV	61%
25 (RY 1994)	TCU	100%
25 (RY 1994)	HR	100%
25 (RY 1994)	OTH	51%
281 (RY 1994)	TCM	100%
281 (RY 1994)	TCPV	99%
281 (RY 1994)	TCU	100%
281 (RY 1994)	HR	100%
281 (RY 1994)	OTH	15%
285 (RY 1994)	TCM	100%
285 (RY 1994)	TCPV	100%
285 (RY 1994)	TCU	100%
285 (RY 1994)	OTH	0%
30 (RY 1994)	TCPV	89%
30 (RY 1994)	TCU	100%
30 (RY 1994)	WT	0%
30 (RY 1994)	OTH	48%
26 (RY 1995)	TCM	100%
26 (RY 1995)	TCPV	91%
26 (RY 1995)	TCU	100%
26 (RY 1995)	WT	100%
26 (RY 1995)	OTH	0%

Table 5-38 (Continued)

Percent of Time Surveyor Agreed with Facility Basis of Production Ratio Estimate

SIC Code	Facility Basis of Estimate	Percent of Time Surveyor Agreed with Basis
286 (RY 1995)	TCM	100%
286 (RY 1995)	TCPV	100%
286 (RY 1995)	TCU	100%
286 (RY 1995)	HR	0%
286 (RY 1995)	WT	100%
286 (RY 1995)	OTH	50%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.
TCPV - the ratio of production volume in the current reporting year to the previous reporting year.
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.
HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.
WT - an activity index or production ratio based on a weighted average of data from several processes.
OTH - any other estimation method.

Table 5-39

Method of Estimate That Should Have been Used by Facilities to Calculate Production Ratio

SIC Code	Percent of Facilities that Should Use TCM	Percent of Facilities that Should Use TCPV	Percent of Facilities that Should Use TCU	Percent of Facilities that Should Use HR	Percent of Facilities that Should Use WT	Percent of Facilities that Should Use OTH
25 (RY 1994)	0%	31.7%	31.0%	21.5%	4.8%	11.0%
281 (RY 1994)	5.8%	53.2%	39.5%	0.0%	0%	1.5%
285 (RY 1994)	2.9%	83.1%	14.0%	0%	0%	0%
30 (RY 1994)	0%	13.3%	73.6%	0%	0%	13.1%
26 (RY 1995)	7.0%	72.0%	16.3%	0%	0%	0%
286 (RY 1995)	19.4%	58.0%	14.5%	0%	0%	1.6%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.
TCPV - the ratio of production volume in the current reporting year to the previous reporting year.
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.
HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.
WT - an activity index or production ratio based on a weighted average of data from several processes.
OTH - any other estimation method.

5.4 Source Reduction Activities

The following discussion reviews how accurately facilities indicate source reduction activities on Form Rs. Starting in reporting year 1991, EPA required facilities to include on their Form R reports information describing source reduction activities that were implemented to reduce the quantity of Section 313 chemicals in waste. This information offers users of the data insight into how often industrial facilities reduce pollution at the sources. To assess the accuracy of source reduction entries in the TRI database, analyses in this section address three questions:

- Are the source reduction activities that facilities indicate on Form Rs legitimate?
- Why do facilities make errors when claiming source reduction?
- Do facilities consistently report source reduction activities on Form Rs?

It should be noted that this section focuses only on source reduction activities that facilities indicate on "Form Rs." Form As do not include fields for reporting source reduction.

5.4.1 Errors in Classifying Source Reduction

To identify errors commonly made by facilities and reasons why facilities made these errors, site surveyors determined during each visit whether facilities indicate source reduction activities that were consistent with definitions of source reduction presented in the EPCRA Section 313 reporting instructions. In cases where facilities did not claim source reduction activities, site surveyors generally did not determine whether facilities overlooked source reduction activities. Accordingly, the most recent site survey data are sufficient for evaluating whether source reduction activities currently loaded in the TRI database are legitimate, but the data are not sufficient for determining the total number of source reduction activities that should have been reported.

Table 5-40 summarizes how often source reduction activities were used on EPCRA Section 313 chemicals and how often these claims were made in error. For reference, Table 5-41 indicates the source reduction activities most commonly used on EPCRA Section 313 chemicals in the selected SIC Codes. The data in these tables suggest that facilities in the furniture manufacturing industry (SIC Code 25), organic chemicals industry (SIC Code 286) and plastics manufacturing industry (SIC Code 30) claim source reduction much more frequently than facilities in the inorganic chemical manufacturing industry (SIC Code 281), paper industry (SIC Code 26), and paint manufacturing industry (SIC Code 285). Modifications to spray application and surface coating processes account for a majority of the source reduction activities claimed by furniture manufacturers. Employee training and improved maintenance account for a majority of the source reduction activities claimed by organic chemical manufacturers. No specific group of source reduction activities were as prevalent for the other industries.

The data also indicate that, of the source reduction activities claimed by rubber and plastic manufacturing facilities, nearly three fourths were claimed in error. Many rubber and plastic manufacturing facilities claimed that a reduction in the number of toxic chemical supplies was source reduction even though the reduction in suppliers did not decrease the amount of toxic chemicals purchased or used. The frequency of errors was notably lower for furniture manufacturers and inorganic chemical manufacturers, and no errors were identified in the source reduction activities claimed by paint manufacturers, organic chemical manufacturers, and paperboard facilities.

5.4.2 Sources of Errors Made When Claiming Source Reduction

Specific reasons for erroneously classifying source reduction activities differ from one facility to the next. In general, however, most errors resulted from facilities not understanding exactly what activities constitute source reduction. Site surveyors noted several examples supporting this hypothesis:

Table 5-40

Errors in Source Reduction Activity Classifications

Reporting Year	SIC Code	Frequency with which facilities claim source reduction activities		Frequency with which facilities make errors when claiming source reduction	
		Total number of source reduction activities claimed by the selected facilities	Estimated percent of Form Rs submitted by facilities in SIC Code with source reduction claimed[a]	Number of source reduction activities claimed in error by the selected facilities	Estimated percent of source reduction activities that are claimed, but in error[a]
1994	25	48	33 %	8	27 %
	281	24	14 %	6	22 %
	285	30	21 %	0	0 %
	30	21	32 %	14	78 %
1995	26	3	5.9%	0	0%
	286	36	30.1%	0	0%

[a] Percents in this column were calculated using the weighting factors discussed in Section 2.6.3.

Table 5-41

Most Common Source Reduction Activities Claimed by the Selected Facilities

SIC Code	Source Reduction Code	Description	Percent of Chemicals at Selected Facilities that used this Code
25	W72	Modified spray systems for coating applications	16.9%
	W73	Substituted materials used for coating applications	10.0%
	W74	Improved application techniques for surface coating	9.5%
	W39	Miscellaneous spill and leak prevention	9.0%
	7 others	Many different descriptions	8.5%
	W21	Ensuring materials are used before reaching their shelf-life	0.5%
281	6 others	Many different descriptions	6.2%
	W25	Instituted programs to exchange unwanted materials	4.0%
	W39	Miscellaneous spill and leak prevention	4.0%
	W82	Modified composition of products	4.0%
	W52	Modified equipment, layout, or piping	3.0%
285	3 others	Many different descriptions	13.3%
	W42	Substituted raw materials	10.9%
	W13	Improved maintenance scheduling and recordkeeping	7.1%
	W39	Miscellaneous spill and leak prevention	7.1%
	W14	Changed production schedule to minimize changeovers	5.5%
	W52	Modified process equipment, layout, or piping	5.5%
30	5 others	Many different descriptions	12.6%
	W32	Improved practices for loading and unloading chemicals	0.7%
26	W58	Process modifications	5.9%
286	W13	Employee training and improved maintenance	23.3%
	5 others	Many different descriptions	9.6%
	W36	Spill and leak detection program	5.5%
	W51	Recirculation within processes	5.5%
	W19	Reuse of materials	5.5%

- An organic chemical manufacturing facility installed a new pollution control mechanism to remove ammonia from a waste stream. The facility considered the new device as source reduction, but the site surveyor noted that the facility already accounted for the new device as "treatment" and should not have claimed the device as source reduction.

- Due to decreased demand for a particular product, a paint manufacturing facility purchased less of a glycol ether solvent. The facility claimed this reduced usage of raw materials as source reduction, but the site surveyor did not consider decline in production demand as source reduction.

- A furniture manufacturing facility claimed source reduction after installing a new software system to track purchases of Section 313 chemicals. Although this system helped the facility make more accurate threshold determinations, the site surveyor noted that the software did not reduce amounts of hazardous chemicals that were purchased. Therefore, the site surveyor concluded that installing the new software was not source reduction.

Because errors in claiming source reduction resulted primarily from facilities misinterpreting definitions, EPA can help minimize similar errors in future reporting years by preparing revised reporting instructions that clarify which activities should, and should not, be classified as source reduction.

5.4.3 Feedback from Facilities

The accuracy of source reduction data depends to a great extent on how facilities choose to implement the reporting requirements. Although the survey instrument did not include explicit fields for documenting feedback from facilities regarding source reduction, site surveyors noted several relevant comments made by facility contacts:

- Some facilities noted that source reduction codes do not inform those who access TRI data of the extent to which emissions are reduced by source reduction. These facilities, therefore, saw little benefit from claiming source reduction activities on their Form Rs.

- Some facilities found the list of source reduction codes cumbersome, noting that the list contains too many codes or that definitions of specific codes are too vague.

- Some facilities chose to not claim on their Form Rs legitimate source reduction activities because the activities caused only marginal reductions in overall releases.

- Facilities seem confused about whether source reduction activities should be reported only for the first year in which they were implemented or for every year thereafter. This confusion leads to inconsistent reporting practices among the facilities that claim source reduction. This confusion stems from discrepancies in Agency guidance. The agency guidance document states that source reduction activities should be reported only in the first year of implementation while the Pollution Prevention Act states that each annual report will identify the source reduction practices used with respect to each chemical for which the report is submitted.

These comments from facilities stress that, for a variety of reasons, facilities often choose to not report legitimate source reduction activities. Therefore, the total number of source reduction activities currently logged in the TRI database may understate the extent of pollution prevention efforts adopted by industrial facilities.

5.4.4 Overall Accuracy of Source Reduction Data

Site surveyors found that facilities in the selected industries frequently misinterpreted definitions of source reduction and should not have claimed roughly 30 percent of all source reduction activities reported to TRI in 1994 and 1995. Observations made by site surveyors and feedback provided by facilities both suggest that many facilities did not claim legitimate source reduction activities on their Form Rs, but the current site survey data are insufficient for evaluating how often this occurs. Accordingly, the quality of source reduction data in the TRI database is compromised by omissions and erroneous submissions of source reduction information, and TRI data, therefore, may not be an accurate measure of the extent of pollution prevention efforts for many industries.

Because the primary cause of errors in reporting source reduction seems to be due to facilities misinterpreting definitions, EPA can help improve the accuracy of source reduction data by preparing TRI reporting instructions that clearly define which activities are, and are not, considered to be source reduction.

6.0 PREPARATION OF THE FORM R

Site surveyors interviewed facility personnel during each site visit to obtain general information regarding completion of the Form R reports and to identify trends among the surveyed facilities. The information obtained during these interviews included quantitative information such as facility size (the number of employees at the facility), time to complete Form Rs, the types of personnel primarily responsible for preparing the Form R reports, and the types of references used by these personnel. In addition, qualitative feedback was obtained on the Form R Instructions, the Automated Form R (AFR), the TRI Hotline, use of the Form A beginning in RY 1995, and suggestions for additional guidance that EPA should develop to assist facilities in release and other waste management quantities estimation and Form R preparation.

6.1 Facility Personnel and References

Table 6-1 identifies the percentage of facilities visited in a particular size range (based on number of employees) for each SIC Code group. As can be seen from the table, most of the inorganic chemical and paint manufacturing facilities had fewer than 50 employees, while the furniture, paper, organic chemicals, and plastics related industries had between 50-499 employees on average. In general, the size of the facilities visited for the RY 1994 and RY 1995 analysis were smaller than those visited in the RY 1987 and RY 1988 site visits.

Table 6-2 lists the types of personnel identified by the facility as being primarily responsible for preparing the Form R reports for each SIC Code group included in this analysis. As can be seen on the table, facility and corporate environmental staff most often completed the reports for each of the source categories visited. A brief description of each staff type identified in the table follows:

- Facility Environmental - In most cases, this is a full-time position for an on-site employee whose primary responsibility is dealing with environmental issues.

- Corporate Environmental - This person would have environmentally-related responsibilities for more than one individual facility and may or may not be physically located at the facility.

- Facility Staff - This is an employee whose responsibilities extend beyond the environmental arena. This staff type was primarily found to be preparing the Form R reports at facilities that had fewer than 50 employees.

- Consultant/Contractor - This includes personnel contracted outside the company to prepare the facility's Form R report.

- Safety Personnel - This staff type is similar to Facility Environmental. This person may have responsibilities including complying with Environmental Health and Safety issues as well.

- Other - This is anyone who filled out the Form R that does not belong to one of the previously described staff types.

Table 6-1

Number of Employees at Visited Facilities

Percentage of Facilities with a given Number of Employees[a]									
	RY 1987	RY 1988		RY 1994				RY 1995	
Employee Range	SIC Code 20-39	SIC Code 28, 291	SIC Code 34-38	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
10-49 employees	17	45	7	4	77	61	19	0	40
50-499 employees	62	48	42	82	23	39	81	70	60
>500 employees	21	7	51	14	0	0	0	30	0

[a]The 1987 and 1988 data are raw percentages of the facilities actually surveyed and are not scaled up to represent the entire SIC Code. The 1994 and 1995 data are scaled data which are weighted to represent the entire SIC Code.

Table 6-2

Types of Personnel Completing the Form R

Percentage of Facilities using a Particular Staff Type to Prepare their Form R[a]									
	1987	1988		1994				1995	
Staff Type	SIC Code 20-39	SIC Code 28, 291	SIC Code 34-38	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Facility Environmental	47	29	38	31	53	24	43	80	60
Corporate Environmental	29	28	11	31	17	25	14	10	0
Facility Staff	11	37	21	25	38	67	36	10	50
Consultant/Contractor	10	1	15	12	12	18	13	0	0
Safety Personnel	2	5	15	8	14	1	9	0	0
Other	1	0.00	0.00	0.00	6	8	0.00	0	0

[a]Totals may equal more than 100 percent due to facility personnel identifying themselves as more than one staff type. The 1987 data are raw percentages of the facilities actually surveyed and are not scaled up to represent the entire SIC Code. The 1988, 1994, and 1995 data are scaled data which are weighted to represent the entire SIC Code.

Table 6-3, Figure 6-1, and Figure 6-2 identify the references most commonly used by facilities to prepare their Form R reports. As can be seen on Table 6-3, more than 90 percent of the facilities visited used the TRI Reporting Form R instructions for RY 1994 and RY 1995 as compared to less than half who used the reference for preparing their RY 1988 Form R reports. In addition, a higher percentage of facilities are now using Trade Association Materials, Privately Sponsored Seminar Materials, computer programs, and EPA Sponsored Training Workshops than were used in the past. SIC Code 26, sampled for RY 1995, relies heavily on guidance from NCASI, a pulp and paper research organization, in completing Form Rs and documenting release calculations. EPA Sponsored Training Workshops have also contributed to increased use of EPA's compilation of air pollutant emission factors document, AP-42. The increased use in workshop or other training materials and computer programs is due to the greater availability of such resources than were available in the past.

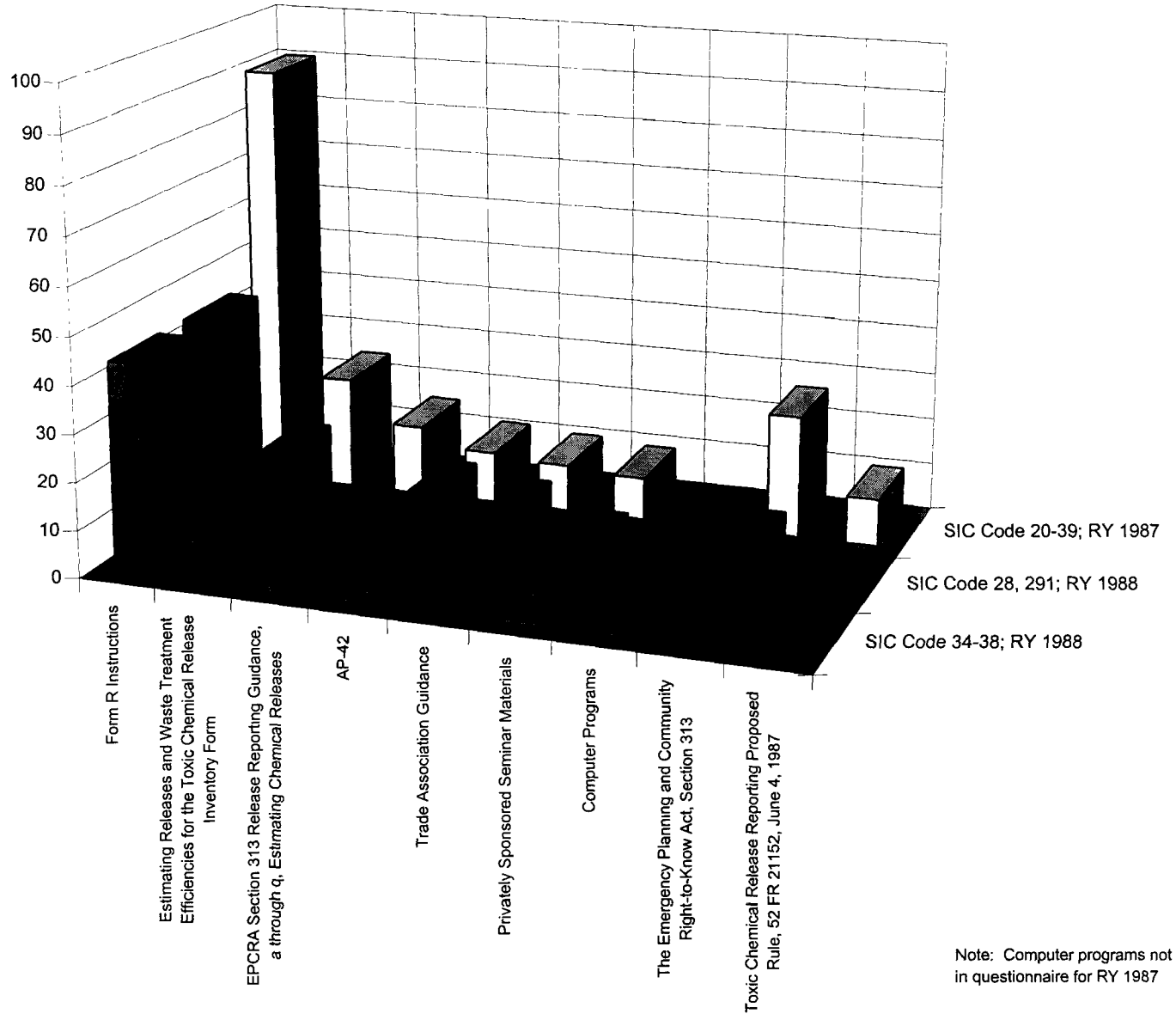
Table 6-3

Common References Used to Compile the Form Rs

Percentage of Facilities using a Particular Reference[a]									
	1987	1988		1994				1995	
Reference	SIC Code 20-39	SIC Code 28, 291	SIC Code 34-38	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
TRI Reporting Form R Instructions	90	44	44	91	93	96	100	90	100
The Emergency Planning and Community Right-to Know Act, Section 313	26	9	13	N/A	N/A	N/A	N/A	N/A	N/A
Estimating Releases and Waste Treatment Efficiencies for TRI	24	17	9	22	8	22	11	20	10
EPCRA Section 313 Release Reporting Guidance, Estimating Chemical Releases	15	0	8	10	9	1	0	10	10
Compilation of Air Pollution Emission Factors, AP-42	11	12	3	15	17	33	5	20	60
Toxic Chemical Release Reporting Proposed Rule, 52 FR 21152, June 4, 1987	10	3	7	N/A	N/A	N/A	N/A	N/A	N/A
Industry Trade Association Materials	10	10	9	12	13	24	9	90	20
Privately Sponsored Seminar Materials	9	5	7	16	7	26	7	0	10
EPA Sponsored Training Workshop	N/A	N/A	N/A	13	32	27	38	20	10
Computer Programs	N/A	3	3	30	23	15	39	40	40

[a]Totals may equal more than 100% as facilities often used more than one reference. The 1987 data are raw percentages of the facilities actually surveyed and are not scaled up to represent the entire SIC Code. The 1988, 1994, and 1995 data are scaled data which are weighted to represent the entire SIC Code N/A means the reference was not listed in the questionnaire in this reporting year and was not specifically listed by any of the facilities.

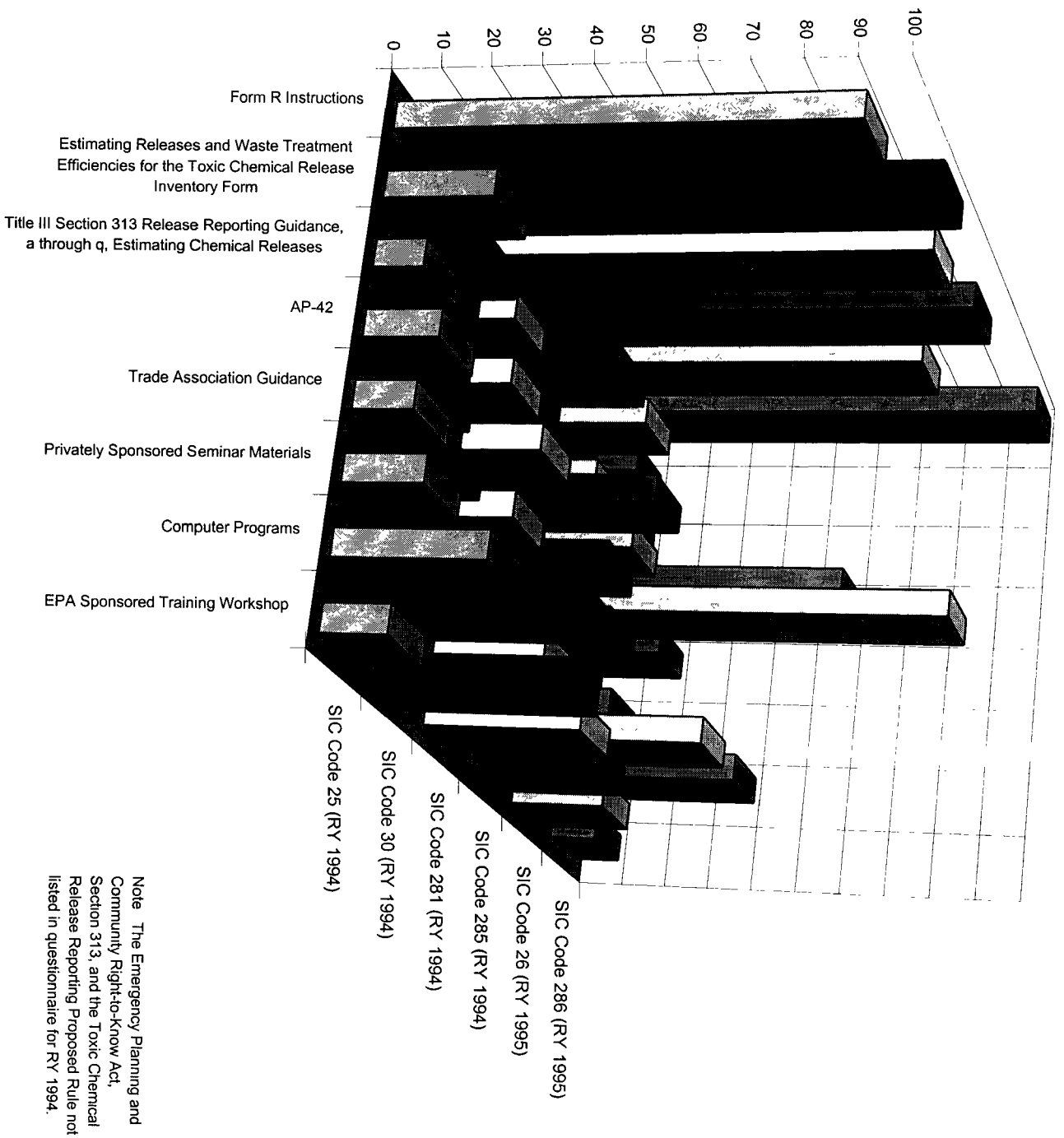
Figure 6-1. Common References Used to Compile Form Rs for RY 1987 and RY 1988



Note: Computer programs not listed in questionnaire for RY 1987

Data for this figure can be found on Table 6-3.

Figure 6-2. Common References Used to Compile Form Rs for RY 1994 and RY 1995



Note The Emergency Planning and Community Right-to-Know Act, Section 313, and the Toxic Chemical Release Reporting Proposed Rule not listed in questionnaire for RY 1994.

Data for this figure can be found on Table 6-3.

6.2 Amount Of Time Needed To Prepare Form R Reports

Tables 6-4, 6-5, and 6-6, and Figures 6-3, 6-4, and 6-5 show the number of hours required to collect the necessary data and complete all the Form Rs for facilities surveyed in RY 1988, RY 1994, and RY 1995, respectively. Section 8 of the Form R was added after RY 1987 and RY 1988 Form Rs were completed. Thus, one would expect an increase in the amount of time needed to collect the necessary data and complete the Form Rs in the 1994 and 1995 reporting years. Even so, as was the case with the RY 1988, in RY 1994 the majority of facilities reported taking less than 24 hours to complete all of their Form Rs. There was even an observed decrease in the percentage of facilities reporting taking over 100 hours to complete their Form Rs in RY 1994. Facilities surveyed in RY 1995 tended to be larger and had more Form Rs than the facilities surveyed in previous years. Thus, the amount of time needed to fill out all Form Rs was greater in RY 1995, as shown in Table 6-6.

In order to take the number of Form Rs filled out by the facilities surveyed into consideration when calculating the average time required by facilities to fill out Form Rs, an analysis was done which divided the maximum number of hours in the range checked by the number of Form Rs filled out by the facility. The number of hours needed to fill out each Form R is presented by SIC Code and reporting year in Table 6-7.

Table 6-4

Number of Hours Required to Complete all the Form Rs for RY 1988

Time Estimate	Percentage of Facilities	
	SIC Codes 28 and 291[a]	SIC Codes 34-38
≤8 hours	32	71
9-24 hours	6	5
25-40 hours	6	24
41-160 hours	25	
>160 hours	15	

[a] Totals do not equal 100% because not all facilities reported the time estimate. These data are scaled data which are weighted to represent the entire SIC Code.

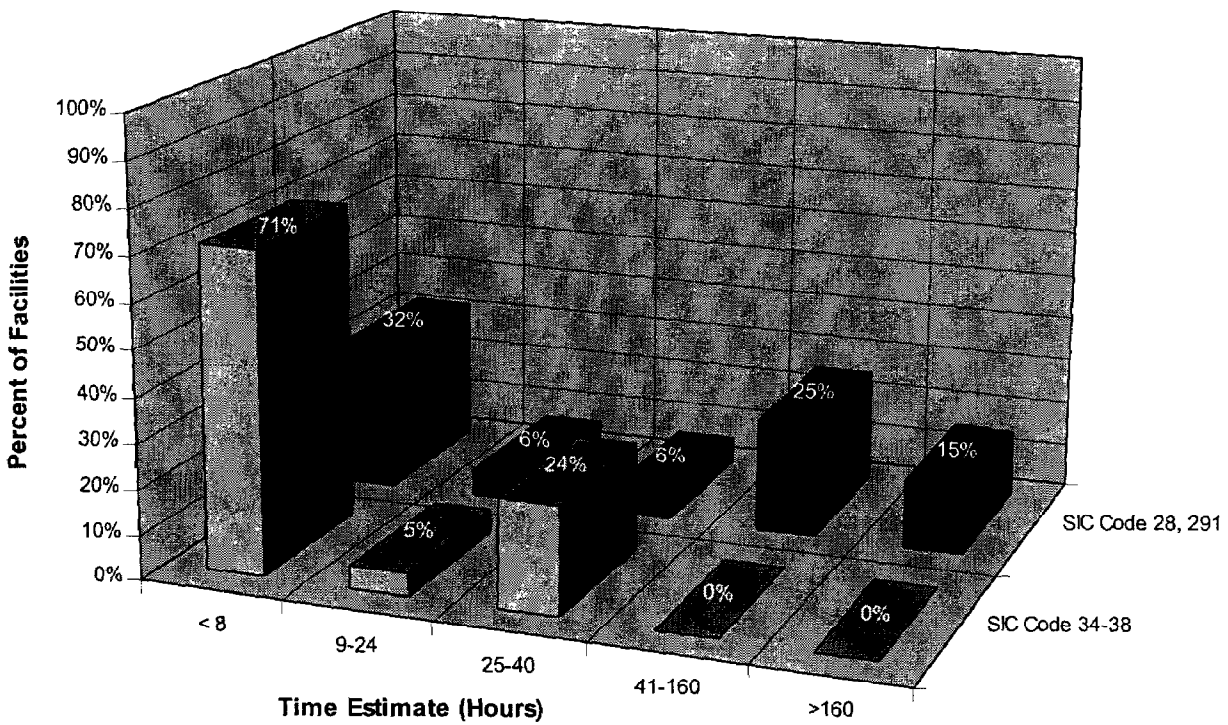
Table 6-5

Number of Hours Required to Complete all the Form Rs for RY 1994

Time Estimate	Percentage of Facilities			
	SIC Code 25[a]	SIC Code 281	SIC Code 285	SIC Code 30
≤20 hours	42	63	61	56
21-50 hours	48	19	38	42
51-100 hours	6	12	0	2
100-200 hours	0	6	1	0
>200 hours	0	0	0	0

[a] Totals do not equal 100% because not all facilities reported the time estimate. These data are scaled data which are weighted to represent the entire SIC Code.

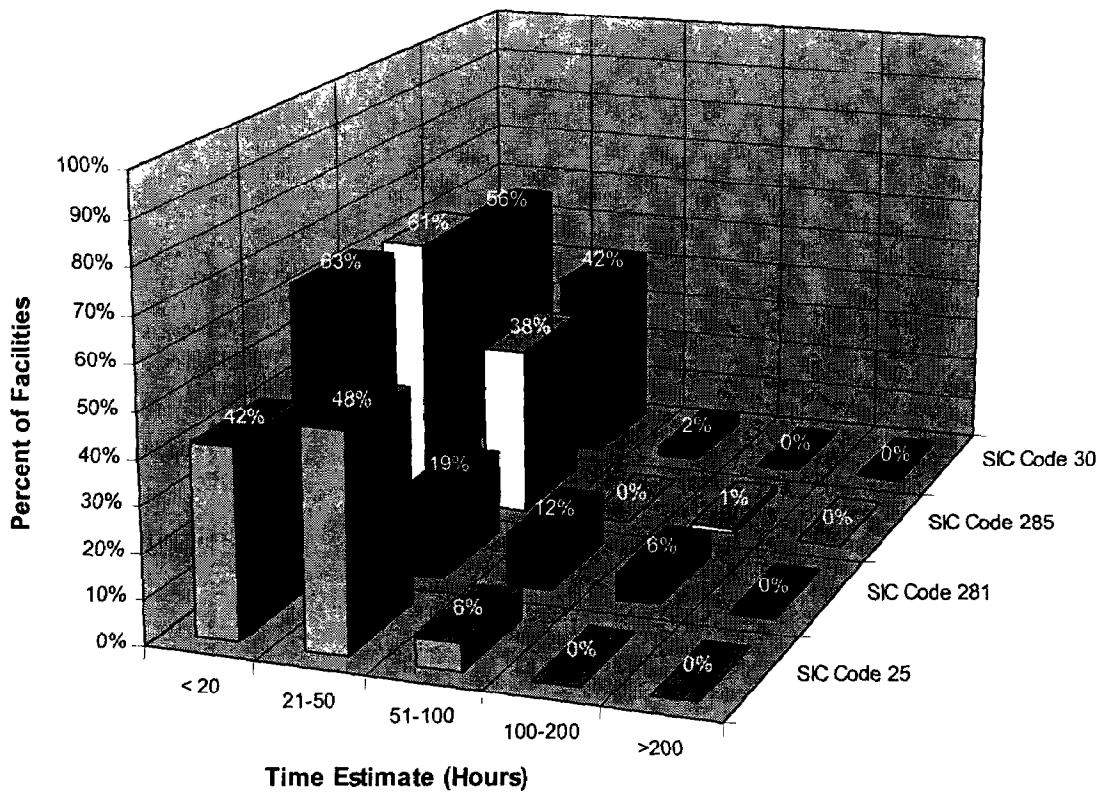
Figure 6-3. Time Needed to Complete Form R in RY 1988 for SIC Code Groups 28 and 291, and 34 - 38



May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 6-4.

Figure 6-4. Time Needed to Complete Form R for RY 1994 for SIC Code Groups 28, 25, and 30



May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 6-5.

Table 6-6

Number of Hours Required to Complete all the Form Rs for RY 1995

Time Estimate	Percentage of Facilities	
	SIC Code 26	SIC Code 286
≤8 hours	20	20
9-20 hours	10	0
21-40 hours	40	10
41-100 hours	20	60
>100 hours	10	10

These data are scaled data which are weighted to represent the entire SIC Code.

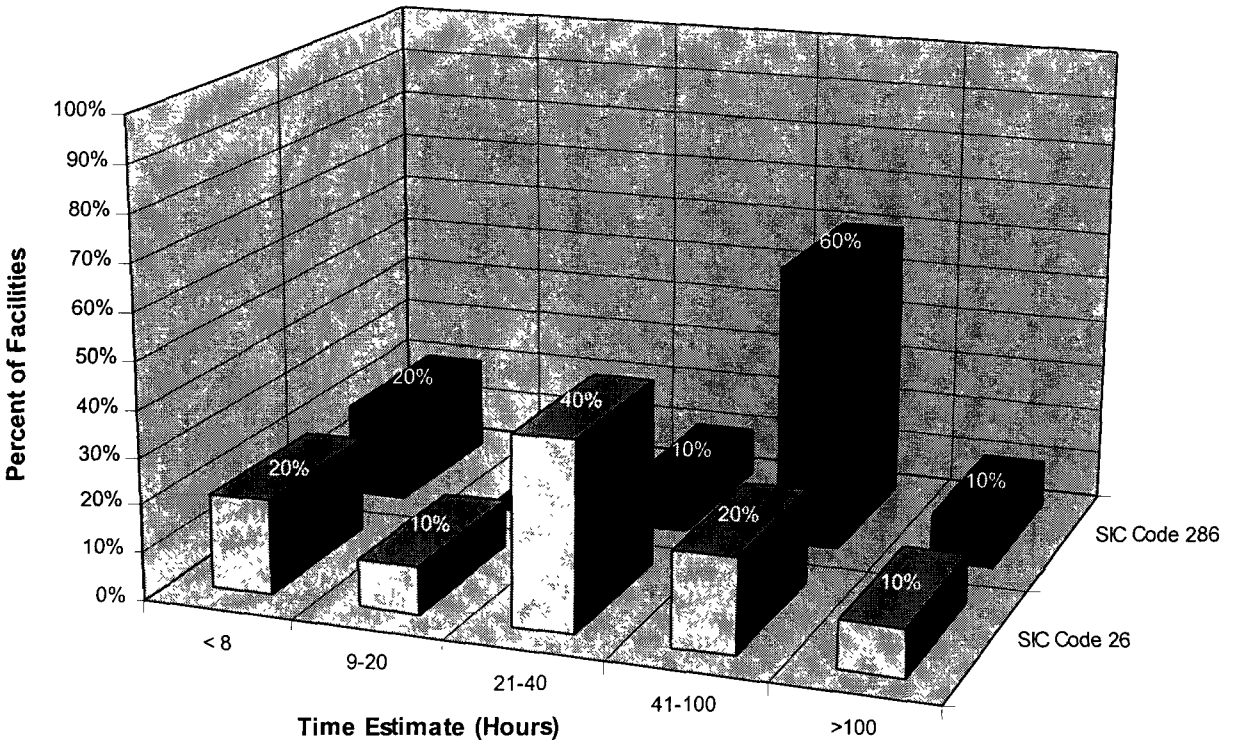
Table 6-7

Average Number of Hours Needed to Complete a Form R

SIC Code	Time Estimate (Hours)
25 (RY 1994)	12.9
281 (RY 1994)	9.9
285 (RY 1994)	11.5
30 (RY 1994)	13.4
26 (RY 1995)	9.4
286 (RY 1995)	8.8
RY1994 Overall	11.7
RY 1995 Overall	9.0

These data are scaled data which are weighted to represent the entire SIC Code.

Figure 6-5. Time Needed to Complete Form R in RY 1995 for SIC Code Groups 26 and 286



May not add up to 100% because not all facilities reported the time estimate

Data for this figure can be found in Table 6-6.

It is recognized that the average time needed per Form R is a function of the maximum number of hours in the lowest range checked. (The lowest range is different for facilities surveyed in RY 1994 and RY 1995.) However, the time estimates listed represent an average range, and are significantly lower than the 43 hours needed per Form R listed in the 1995 EPCRA Section 313 reporting instructions.

6.3 Use of the Hotline

For RY 1994 and RY 1995, 33 percent and 50 percent, respectively, of the facilities visited reported calling the hotline. Figure 6-6 shows the percentage of facilities calling the hotline for each of the SIC Codes included in this analysis.

As can be seen by Figure 6-6, personnel at approximately half of the inorganic chemical (SIC Code 281) and paint and allied products (SIC Code 285), paperboard (SIC Code 26), and organic chemical (SIC Code 286), facilities called the hotline, compared to approximately one-fourth for the furniture (SIC Code 25) and plastics manufacturing facilities (SIC Code 30).

Most of the respondents in RY 1994 and RY 1995 (86 percent) indicated that the hotline response was helpful. However, several facilities stated that they had difficulty in getting through to speak to an operator, and in some cases the answers provided were not consistent. The majority of facilities stating that the hotline was not helpful reported being unable to get through to an operator.

6.4 Comments on the Form R Instructions

Surveyors also interviewed facility personnel in an effort to gain general comments on the Form R instructions. One commenter suggested that tabs or a "quick reference guide" be included in the instructions to allow for easy navigation through the separate sections of the report. Other areas of the report which were stated as being unclear included how to

submit a revised form and how to distinguish or document off-site transfers for repackaged materials.

Table 6-8 shows the number of respondents who identified a particular aspect of the chemical specification information as being unclear.

Table 6-8

Comments on the Form R Chemical Specific Instructions for RY 1994

Subject Area	Number of Respondents stating a Subject Area was unclear					
	RY 1994				RY 1995	
	SIC Code 25	SIC Code 281	SIC Code 285	SIC Code 30	SIC Code 26	SIC Code 286
Toxic Chemical Identity	0	1	0	1	1	0
Mixture Component Identity	1	0	0	0	0	0
Activities and Uses of the Toxic Chemical	1	2	1	0	1	1
Releases to the Environment On-Site	1	1	0	0	0	0
Transfers in Waste to Off-Site Locations	1	1	0	0	0	0
On-Site Waste Treatment Methods and Efficiency and On-Site Energy Recovery and Recycling Methods	0	1	1	0	2	3
Source Reduction and Recycling Activities	1	1	0	1	2	2

The general comments received on the Form R instructions are summarized for each SIC Code as follows:

SIC Code 25 - Furniture Manufacturing (RY 1994)

- One facility needed more information on estimating pollutant releases for a material when only a range of concentration is provided on the MSDS.

- The definitions for material usage type (manufactured, processed, otherwise used) are unclear. In addition, more clarification is needed on estimating production ratio.

SIC Code 281 - Inorganic Chemicals Manufacturing (RY 1994)

- Several facilities requested more details on identifying and quantifying treatment, recycling, and repackaging activities. More examples would be helpful.

- More guidance is needed on estimating future releases needed for Section 8.

SIC Code 285 - Paint Manufacturing (RY 1994)

- Need assistance in estimating releases associated with wastewater treatment plant discharges.

SIC Code 30 - Rubber and Plastics Manufacturing (RY 1994)

- Several facilities had questions on how to determine production ratio/activity index.

SIC Code 26 - Paper and Paperboard Manufacturing (RY 1995)

- Many facilities reported that the guidance for ammonia threshold and release calculations are unclear.

- One facility would like clarification on the definitions of energy recovery, treatment and recycling.

SIC Code 286 - Organic Chemicals Manufacturing (RY 1995)

- The definitions for material usage type (manufactured, process, otherwise used) are unclear.

6.5 Comments on the Automated Form R (AFR)

Approximately half of the facilities surveyed for RY 1994 and RY 1995 used the AFR to help them prepare their Form R's. The majority of those that used the form stated that it was helpful, with only a handful stating that it was not helpful. This information is shown graphically in Figure 6-6.

The types of feedback provided on the AFR is summarized as follows:

- In general, the AFR is easy to use and does help minimize errors. In particular, it's nice that the common data (such as facility name) is maintained from year to year and only the release information needs to be updated. Several commenters stated that it seems to be getting better with each release version.
- Several commenters who attempted to use the AFR could not get it running on their systems. This was more common with Windows NT users. Windows NT does not seem to properly interface with the AFR.
- There were numerous instances of individuals having difficulties in printing their reports once finished.
- One commenter stated that it took 6 weeks for a phone call requesting assistance in using the AFR to be returned.
- The AFR could use more range checks, error checks, and look up tables. In addition, transcription errors cannot be caught using the AFR.

Figure 6-6. Percent of Facilities Calling the Hotline by Industry for RY 1994 and RY 1995

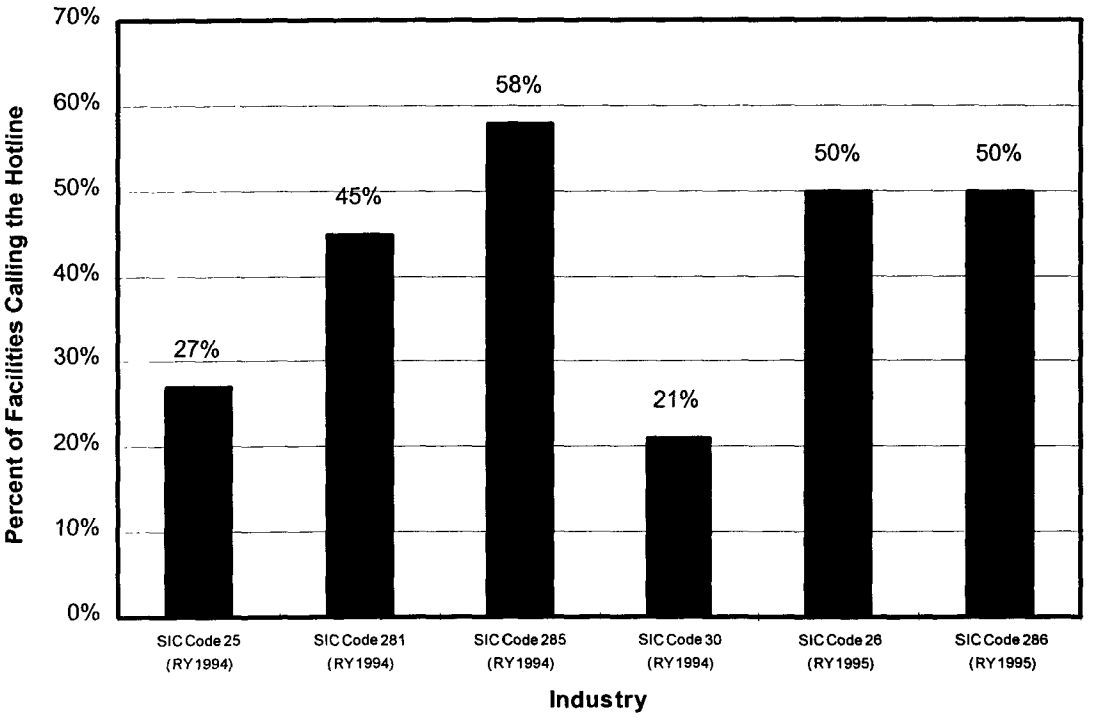
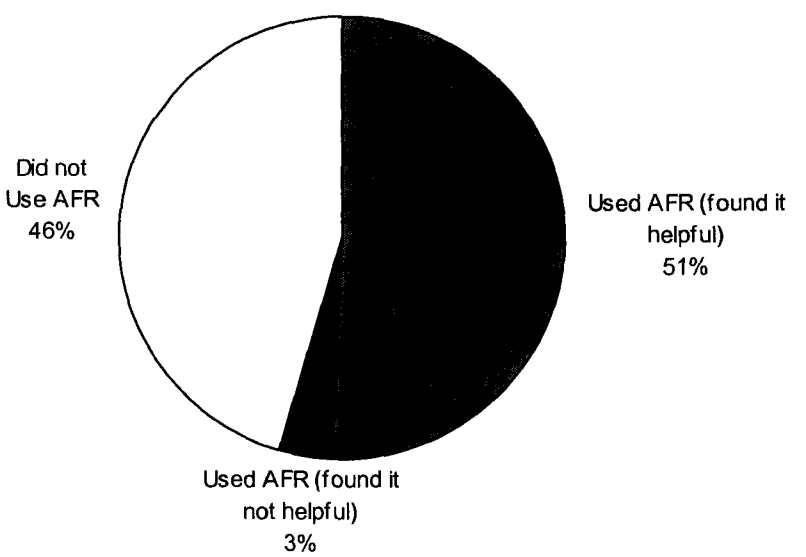


Figure 6-7. Percent of Facilities using the Automated Form R for RY 1994 and RY 1995



6.6 Comments on Use of the Form A

In general, facilities like the new Form A and found it easy to use. However, results show that some facilities incorrectly used the Form A when they should have used the Form R. Facilities must use the Form R if they manufacture, process, or otherwise use at least 1 million pounds of the toxic chemical. Some facilities did not realize this upper limit existed. Also, facilities must use the Form R if their total annual reportable amount is greater than 500 pounds. The annual reportable amount includes those quantities released, including disposed or treated, recovered at the facility from recycle operations, combusted at the facility for the purpose of energy recovery, and transferred off-site for purposes of recycle, energy recovery treatment, or disposal. Some facilities interpreted annual reportable amount to be releases only, and therefore incorrectly used the Form A even when their actual reportable amount was greater than 500 pounds. Some facilities did comment that since they have to estimate their releases and other waste management quantities regardless of which form they use, they might as well complete the full Form R.

7.0 CONCLUSIONS

Overall, the agreement between facility and surveyor estimates was good. General trends noted in the RY 1994 data were that the total releases claimed by the facility for all SIC Codes surveyed were less than the total releases claimed by the site surveyors. RY 1995 data showed that the total releases and other waste management quantities claimed by the facility approximately equaled those quantities claimed by the site surveyors. The percent difference in total releases and other waste management quantities between the facility calculations and the surveyor calculations ranged from 0.8% different in SIC Code 26 (paper and paperboard manufacturing) to 31% different in SIC Code 285 (paint manufacturing). The relatively high percent difference for total releases and other waste management quantities in SIC Code 285 is due to two facilities which did not understand on-site recycling quantities, and, therefore, did not report them. If these two facilities are excluded from the analysis, the percent difference is 20%. Total aggregate releases and other waste management quantities calculated by facilities and site surveyors for all SIC Codes surveyed in RY 1994 and RY 1995 differed by 4%. Engineering calculations and mass balances were the most common methodologies used by facilities to determine releases.

Facilities in all SIC Codes tended to overestimate stack emissions and underestimate fugitive emissions. Many facilities were confused by the definitions of these emissions and misclassified fugitive emissions as stack emissions. Surveyors also identified frequent errors to the classification of transfers to off-site disposal/treatment/energy recovery/recycling.

Significant differences were observed between the quantity of chemicals reported released and otherwise managed by surveyed facilities, scaled to the entire SIC Code, and the quantity of chemicals released and otherwise managed by all facilities in that SIC Code reported in the TRIS database. While the results of the site survey program are useful to identify trends in the data, common errors, and the relative accuracy of the data, this finding suggests the absolute magnitude of releases and other quantities managed as waste or errors in these estimates at the surveyed facilities should not be used to represent the entire SIC Code.

TRI site survey results apply to aggregate data only, that is, some of the apparent data accuracy comes from the cancellation effects of under- and over-reporting of releases. The accuracy referred to here is not "true accuracy" but a measure of how well facilities used best available data and estimation techniques. The results of the site survey, therefore, should not be used to evaluate the accuracy of the data from an individual facility or a single release stream.

Evaluation of the threshold calculations performed revealed that for 90% of the chemicals across all SIC Codes surveyed threshold determinations were correctly determined. Five percent were incorrectly reported as exceeding thresholds, and five percent were incorrectly omitted from Form R reporting. Comparison of the 6 SIC Codes surveyed for RY 1994 and RY 1995 reveal that SIC Codes 25 (furniture manufacturing), 26 (paper manufacturing), and 30 (rubber and plastic manufacturing) facilities had the best accuracy for determining thresholds, as 98% of the toxic chemicals thresholds were correctly determined. SIC Code 281 (inorganic chemical manufacturing) facilities were the least accurate in correctly determining thresholds, as 84% of the toxic chemicals were correctly determined.

Evaluation of on-site activities revealed that organic chemical manufacturing facilities (SIC Code 286) do much more on-site treatment and recycling than facilities in the other SIC Codes surveyed. In general, the site surveyors agreed with the facilities releases and other waste management estimates for most on-site activities.

The increasing number of trade association conferences and amount of EPA and trade association guidance has increased the quality of TRI reporting. Some industries, like the pulp and paper industry, have developed their own guidance manuals for facilities in their association to use in filling out the TRI reports. Other industries, such as the paint manufacturing industry, seem to know less about TRI reporting, estimation techniques, and the documentation requirements. In such industries, additional guidance on the amount and types of documentation needed for accurate TRI reporting, and the methodologies used to estimate releases and other waste management activities would help reduce the number of errors in threshold determinations and release estimates.

8.0 RECOMMENDATIONS

This section presents several recommendations for the EPCRA Section 313 program based on the results and conclusions of the RY 1994 and RY 1995 data quality assessment based on site surveys. Improvements in reporting guidance and in the reporting instructions, as well as facilities' experience in completing Form R reports for the previous reporting years will continue to improve the data quality in the TRI database. Recommendations for continued improvement of the TRI database are listed below.

8.1 Additional Guidance Concerning Form R Instruction and Documentation

General recommendations noted by site surveyors for all SIC Codes include introducing and explaining the Question/Answer document and sixteen guidance documents currently available from EPA in the front of the TRI instructions. Many facilities and trade associations did not read the entire TRI instruction booklet and, therefore, were not aware these documents existed. Specific comments from facilities in each of the SIC Codes visited are as follows:

SIC Code 25 - Furniture Manufacturing (RY 1994)

- Better definitions are needed in order to distinguish between manufacture, process, and otherwise use activities.
- There were several comments with the general sentiment that the EPA and State and Local agencies should attempt to consolidate environmental reporting and standardize acronyms and definitions for terms such as "fugitive" emission sources. One specific suggestion was for a "Dummies guide to environmental reporting."

SIC Code 30 - Rubber and Plastics Manufacturing (RY 1994)

- EPA should develop "a good, clean web-site" for TRI data. The commenter stated that the TRI CD-ROM was helpful and possibly could serve as the structure for a web site.

- More information was requested on determining production ratio. This was specifically requested for those EPCRA Section 313 Chemicals produced as by-products or where the production ratio is determined by something other than the annual production ratio of the final product.

SIC Code 281 - Inorganic Chemicals Manufacturing (RY 1994)

- One commenter stated that much of the information reported as part of the Form R could be obtained by EPA from other sources such as Title V Air Pollution permits.

- One general comment from several commenters was that more information is needed on estimating fugitive emissions from sources such as wastewater treatment and mixing tanks.

- Facility Personnel also requested more guidance on classifying and quantifying recycling and source reduction activities.

SIC Code 285 - Paint Manufacturing (RY 1994)

- An industry-specific guidance manual was requested, including examples specific to chemicals and release types associated with paint manufacturing.

- One consultant who worked on the Form R preparation felt that the estimation release guidance could be geared to a more technical audience.

- The guidance is not clear on what "working losses" are for storage tanks. Another commenter felt that the range of loss factors for paint mixing was too wide.

SIC Code 26 - Paper and Paperboard Manufacturing (RY 1995)

- Some facility contacts said they would have benefited from published treatment or removal efficiencies as well as published partition coefficients.
- Many facilities requested more definitive ammonia reporting guidance.

SIC Code 286 - Organic Chemicals Manufacturing (RY 1995)

- One general comment from some facilities was that greater availability of the guidance manuals was needed. Facility contacts suggested industry specific guidance, targeting (and listing) specific SIC Codes be posted on the Internet.

8.2 Additional Guidance Concerning Threshold Determinations

Although the nature and extent of threshold determinations varies from one industry to the next, some general lessons can be learned from the mistakes identified by the site surveyors. Table 8-1 lists common errors made by facilities when determining thresholds and offers several recommendations to avoid making such errors in the future. These recommendations may also be useful to EPA when developing future releases of TRI reporting instructions.

8.3 Additional Guidance Concerning Release and Other Waste Management Quantity Estimates

Table 8-2 lists common errors made by facilities in all SIC Codes surveyed when estimating releases and other quantities managed as waste, and offers several recommendations to avoid making such errors in the future.

Table 8-1

Recommendations for Avoiding Errors in Threshold Determinations

Error Observed in Determining Thresholds	Recommendation for Avoiding Error in Future TRI Reporting Years
Facility did not document results of threshold determinations.	Reporting instructions should emphasize that documentation requirements apply to both threshold determinations and release estimates.
Facility assumed Section 313 chemicals exceeded thresholds, rather than calculating annual usages and comparing these to reporting thresholds.	Facilities should be informed that assuming thresholds are exceeded, rather than calculating annual usages for Section 313 chemicals, is a common source of errors in TRI reporting. Reporting instructions should encourage facilities not to assume thresholds are exceeded, even for chemicals used in very large or very small quantities.
Facility overlooked Section 313 chemicals that were purchased in mixtures.	Facilities should carefully review the most recent MSDS for every mixture brought on site to identify all Section 313 chemicals used during a reporting year.
Facility considered only raw materials used for production and overlooked chemicals used for other purposes.	Facilities should take a systematic approach to identify all chemicals and mixtures used in production and non-production capacities, including catalysts, underground injection well treatment chemicals, wastewater treatment chemicals, and the like.
Facility environmental staff was unaware that certain Section 313 chemicals were used at the plant.	Facilities should implement measures, such as chemical usage logs or hazardous chemical inventories, to ensure that environmental staff are aware of all Section 313 chemicals used in industrial applications.
Facility did not account for EPA's most recent releases of threshold determination guidance.	EPA should enhance outreach efforts to ensure that all facilities are aware of revised reporting guidelines well in advance of submission deadlines.

Table 8-2

Recommendations for Avoiding Errors in Identifying Release Types and Sources

Observed Error	Recommendation for Avoiding Error in Future TRI Reporting Years
Fugitive emissions from general indoor air reported as stack emissions when released from a single building vent	Stack and fugitive releases need to be better defined, especially regarding general room air that is simply moved to one release point on top of the building (without air pollution control devices). Note: Many state definitions are exactly opposite the TRI definition in this instance.
Use of outdated SOCMI emission factors	Instructions should note that SOCMI factors have been updated.
Overlooked stack emissions from storage tanks, or reporting these emissions as fugitives.	Instructions should emphasize this potential release source and briefly discuss the definition of loading, working, and breathing losses from tanks (and the methodology to calculate them).
Overlooked container residue	Instructions should emphasize that even a "RCRA empty" drum is expected to contain a residual (possibly up to two inches) and that it must be considered for TRI reporting. Also, note that on-site drum rinsing and disposal of the rinsate will result in a release.
Overlooked coincidental manufacturing	Instructions should indicate that if coal and/or fuel oil are used in boilers/burners there is a potential for coincidental manufacture (and release) of various EPCRA Section 313 Chemicals (such as H_2SO_4, HCl, and HF).
Incorrectly reporting release disposition for off-site transfers	Instructions should emphasize that facilities should attempt to determine the type of receiving facility that is accepting the transfers.

Table 8-2 (Continued)

Recommendations for Avoiding Errors in Identifying Release Types and Sources

Observed Error	Recommendation for Avoiding Error in Future TRI Reporting Years
Questions over catastrophic releases	EPA should provide guidance as to what quantity and frequency designate a release for Section 8.8.
Questions over on-site recycling	EPA should provide a definition of recycling and include examples of streams that can be considered as being recycled in Sections 7 and 8. An example would be used solvents. Specifically, is a "used" solvent that is collected and processed in the next batch considered recycled/reused, or does it have to be separated first (e.g., distilled or filtered). This is not clear in the current guidance.
Questions over source reduction	EPA should consider shortening the list of codes for source reduction and should provide definitions for each code.
Questions over on-site treatment	EPA should provide definitions for each code and clarify whether separation technologies should be considered (for example, many facilities were unsure if a water scrubber that simply moved a EPCRA Section 313 Chemical from the air to a water stream should be considered as treatment).
Questions over energy recovery	EPA needs to define situations for energy recovery. Examples that came up included pulp mills which use Kraft recovery boilers. The main purpose is to generate stream, but at the same time waste material that contains EPCRA Section 313 Chemicals is being burned and destroyed. Some people argued that the BTU value was high enough to claim energy recovery. Other people argued that the intent for throwing certain wastes into the boiler was to destroy (and treat) the EPCRA Section 313 Chemicals.

Table 8-2 (Continued)

Recommendations for Avoiding Errors in Identifying Release Types and Sources

Observed Error	Recommendation for Avoiding Error in Future TRI Reporting Years
Overlooking On-Site Recycling: One facility noted that although they employ considerable on-site recycling activities (to recover/reuse expensive raw materials that contain EPCRA Section 313 Chemicals); they do not report them for TRI because claiming recycling would require them to register as a hazardous waste treatment facility for their state.	There needs to be a consistent definition between states and TRI for recycling. EPA and state agencies should discuss this situation and provide appropriate guidance.
Questions over Section 8 amounts.	Facilities would like a simple formula for releases in each block of Section 8. (e.g., Section 8.1 = 5.1 + 5.2 + 5.3 + 6.2 (disposal only)). This will cut down on errors and double counting.
There needs to be clarification of the treatment definitions in Sections 7 and 8 of the Form R.	The definitions in the two sections are currently different, and this can cause problems when reporting. Confusion occurs when: 1) chemicals go through a treatment system but are not destroyed - facilities need direct guidance to claim "0" efficiency, and then what to put in Section 8 (0 or NA); 2) facilities may report the amount sent to treatment vs the amount treated. This is confusing because facilities are supposed to report the amount sent to energy recovery and the amount sent to recycling, but not the amount sent to treatment (they should correctly report the amount treated instead).
There needs to be clarification on how to calculate production ratio for "otherwise used" chemicals.	Facilities often used quantities purchased or released from year to year rather than an activity index, even though the guidance specifically states not to do this.

Appendix A

SURVEY INSTRUMENT

Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

1997
(TRI REPORTING YEAR 1995)
TRI DATA QUALITY
SURVEY INSTRUMENT

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

FACILITY FACT SHEET

Date of Visit: _____ through _____

Facility Name: _____

Facility Address: _____

_____

City: _____

State: _____ Zip Code: _____

Mailing Address (if different from street address): _____

_____

Telephone: _____ Fax: _____

Facility Contact: _____

Site Surveyors: _____

_____

Pre-visit Telephone Contact: _____

Reviewers: _____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

PRE-VISIT
TELEPHONE CONTACT

TECHNICAL REVIEW

1. How many Form R (reporting year 1995) chemical reports were submitted for this facility?

   _____

2. How many 313 chemicals were identified by this facility, but not reported, for reporting year 1995?

   _____

3. Did the facility submit any revised Form R chemical reports for reporting year 1995?

   YES....☐ NO...☐ *(Skip to Q.5)*

4. List the chemicals which had revised chemical reports.

   _____

   _____

   _____

   _____

5. Did the facility submit any withdrawal requests to EPA for the reporting year 1995?

   YES....☐ NO...☐ *(Skip to Q.7)*

6. List the chemicals which had withdrawal requests.

   _____ Approved ☐ Denied ☐

   _____ Approved ☐ Denied ☐

   _____ Approved ☐ Denied ☐

   _____ Approved ☐ Denied ☐

7. How many full-time equivalent employees did the facility have in 1995? _____

   NOTE: If there were less than 10 full-time equivalent employees in 1995, do not visit this facility. Terminate discussion with facility at this time.

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

8. Briefly describe the industrial processes performed at this facility in 1995.

_____

_____

_____

_____

9. Has the facility's process operations significantly changed since 1995 (including equipment, chemicals, feedstock, etc.)?

YES.....☐ NO....☐ *(Skip to Q. 11)*

10. Briefly describe any process changes.

_____

_____

_____

_____

11. Has the facility implemented any new treatment, disposal, energy recovery, recycling or source reduction activities since 1995?

YES.....☐ NO.....☐ *(Skip to Q. 13)*

12. Briefly describe any new treatment, disposal, energy recovery, recycling or source reduction activities.

_____

_____

_____

_____

LOGISTICS

13. Will the facility be operating under typical conditions at the time of the visit?

YES....☐ NO.....☐

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

14. What personal protective equipment will be needed to participate in a facility tour?

Hard Hat ☐

Safety Boots ☐

Safety Glasses ☐

Respirator ☐

Other: _____

_____

15. How long is a typical tour? If unknown, how many square feet does the facility occupy? _____
(Consider this information when planning the type and duration of tour that would be most useful).

16. Hotel recommendation: _____

_____

17. Directions to facility: _____

_____

_____

_____

18. Time to meet: _____

19.1 Is a confidentiality agreement required to be completed for this facility?

YES...☐ NO....☐ *(Skip to Q. 20)*

19.2 Has a confidentiality agreement been completed?

YES...☐ NO....☐

20. Will the person who completed the Form R and all supporting materials be available during the site visit?

YES...☐ NO....☐ Alternate Contact: _____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

21. Describe the type and quantity of supporting material available for the Form R calculations.

_____

_____

_____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

SECTION 1.0
REPORT PREPARATION

1.1 Who prepared the release estimates in the facility's Form R chemical reports? *(Check all that apply)*

Facility Environmental Staff ..... ☐

Corporate Environmental Staff ..... ☐

Facility Staff ..... ☐

Consultant/Contractor ..... ☐

Safety Department Staff ..... ☐

Other, specify_____ ☐

1.2 Check all EPA documents and other references used to estimate releases and control efficiencies.

NONE.....☐

TRI Reporting Form R and Instructions, 1995 Version
(EPA 745-K-95-051) ..... ☐

Estimating Releases and Waste Treatment Efficiencies for the TRI ("Green Book")
EPA 560/4-88-002 ..... ☐

Title III Section 313 Release Reporting Guidance
EPA/560-4-88-004 a through q, Estimating Chemical Releases ..... ☐

Compilation of Air Pollution Emission Factors, AP-42 ..... ☐

Industry Trade Association Materials/Seminars ..... ☐

Privately Sponsored Seminar Materials ..... ☐

EPA-Sponsored Training Workshops ..... ☐

MSDSs ..... ☐

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Computer Programs (list)_____ ☐

_____

Other _____ ☐

_____

_____

1.3 What is your estimate of the time needed to fulfill the reporting requirements of Section 313 for 1995? Please include familiarization with the regulation and reporting instructions, completion and internal review of the reporting forms, and documentation of all information in your reports.

≤ 8 Hours ..... ☐

9 - 20 Hours ..... ☐

21 - 40 Hours ..... ☐

41 - 100 Hours ..... ☐

> 100 Hours ..... ☐

1.4 Did you find the 1995 Form R reporting instructions useful?

YES.....☐ NO....☐

1.5 Did you feel any section of the instructions provided with the Form R were unclear?

YES....☐ NO.....☐ *(Go to Q. 1.6)* NA....☐ *(Skip to Q. 1.6)*

1.5.1 Check the appropriate section below and briefly explain the difficulty encountered.

Facility Reporting Determination ..... ☐

_____

_____

Part I. Facility Identification Information ..... ☐

_____

_____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Part II. Chemical Specific Information *(Circle number of all that apply)* ..... ☐

1. Toxic Chemical Identity
2. Mixture Component Identity
3. Activities and Uses of the Toxic Chemical
4. Maximum Amount On-Site
5. Releases to the Environment On-Site
6. Transfers in Waste to Off-Site Locations
7. On-Site Waste Treatment Methods and Efficiency and On-Site Energy Recovery and Recycling Methods
8. Source Reduction and Recycling Activities

1.6 Did you call the Emergency Planning and Community Right-to-Know Hotline?

YES....☐ NO....☐ *(Skip to Q.1.7)*

1.6.1 Did you find the operator's response helpful?

YES....☐ NO....☐

If no, explain _____

1.7 Have you ever received any assistance from EPA Regional or headquarters staff to prepare the Form R reports?

YES....☐ NO....☐

1.8 Has EPA or your state ever contacted you with questions about any of the reported estimates (excluding computer generated notices)?

YES....☐ NO....☐

1.9 Has the facility received any Notices of Significant Error, Notices of Noncompliance, or Notices of Technical Error from EPA or the state for any 1995 reports?

YES....☐ NO....☐

1.10 Does the facility use any computer software to track toxic chemicals brought on site, used, or identified in MSDSs?

YES....☐ NO....☐

If yes, identify: _____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

1.11 Did you use the Automated Form R (AFR) electronic reporting to submit your Form Rs?

YES....☐ NO....☐ *(Skip to Q.1.12)*

1.11.1 Did you feel the AFR helped to reduce any errors on the Form R?

YES....☐ NO....☐

1.11.2 Describe any comments on the use of the AFR.

_____

_____

_____

_____

1.12 Are there additional guidance manuals that EPA should develop to provide more clarification on Form R reporting?

YES....☐ NO....☐

_____

_____

_____

_____

1.13 If a Form R was completed and the total annual reportable amount was less than 500 pounds, why did the facility <u>not</u> complete the short form for the alternate threshold reporting?

_____

_____

_____

_____

Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

SECTION 2.0
INTRODUCTION AND FACILITY TOUR
(313 CHEMICALS PRESENT ON-SITE)

2.1 List all chemicals reported on the facility's Form R Chemical Reports.

Chemical Name	CAS #	Not a Section 313 Chemical
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐
________________	|_|_|_|_|_|_|-|_|_|-|_|	☐

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

2.2 List all **Section 313** chemicals not reported on the facility's Form R chemical reports, but documented by the facility.

NONE....☐

Chemical Name	CAS #	Not a Section 313 Chemical
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐
_____	|_|_|_|_|_|_|-|_|_|-|_|	☐

2.3 List **ALL** other Section 313 chemicals not reported or documented, but identified by the surveyor during the site visit.

NONE....☐

Chemical Name	CAS #
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|
_____	|_|_|_|_|_|_|-|_|_|-|_|

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

2.4 List all mixtures identified during the facility tour which may contain Section 313 chemicals.

(a) Mixture Name	(b) Identify Section 313 Chemical Present	(c) Concentration of Chemical[1]	(d) Amount of Mixture Used in 1995[2]	(e) Amount of Section 313 Chemical Used[2]

[1]If concentration of chemical is below de minimis (0.1 wt.% for carcinogens, 1.0 wt.% for all others), do not include mixture in threshold determination.

[2] Complete columns d and e during threshold determination.

Process Diagram(s):

(identify release points **and chemicals**)

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Treatment Unit, Disposal, Energy Recovery, Recycling or Source Reduction Operation(s):

(identify release points **and chemicals**)

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Facility Tour Notes:

Facility Tour Notes (Cont'd):

Chemical Name: _____ Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

CAS # |_|_|_|_|_|_|-|_|_|-|_|

SECTION 3.0
REVIEW OF THRESHOLD DETERMINATION

3.1 How is this chemical employed at the facility? *(Check all that apply)*

	Facility	Reviewer		Facility	Reviewer
3.1.1	☐	☐	**Manufacture**		
			a. Produced at the facility	☐	☐
			b. Imported by the facility	☐	☐
			c. For on-site use/processing	☐	☐
			d. For sale/distribution	☐	☐
			e. By-product	☐	☐
			f. Impurity[1] (% = _____)	☐	☐
3.1.2	☐	☐	**Process** *(incorporative activity)*		
			a. Chemical reactant (raw materials, intermediates, etc.)	☐	☐
			b. Formulation component	☐	☐
			c. Article component	☐	☐
			d. Repackaging	☐	☐

[1]If impurity is present below de minimis concentrations (0.1% for carcinogens, 1% for others), it is exempt from reporting.

Chemical Name: _____ Facility ID: |_|_|_|_|-|_|_|_|_|-|_|_|_|_|

	Facility	Reviewer		Facility	Reviewer
3.1.3	☐	☐	**Otherwise Use** *(nonincorporative activity)*		
			a. Chemical processing aid (added to reaction mixture)	☐	☐
			b. Manufacturing aid (process lubricants, coolants, etc.)	☐	☐
			c. Ancillary use (cleaners, degreasers, lubricants)	☐	☐
3.1.4	☐	☐	**Exempt Uses**		
			a. Used in laboratory activities	☐	☐
			b. Structural component	☐	☐
			c. Routine janitorial/facility grounds maintenance	☐	☐
			d. Personal employee use	☐	☐
			e. Motor vehicle maintenance	☐	☐
			f. Intake water component	☐	☐
			g. Contained in an article	☐	☐

3.2 Was the chemical reported by the facility?

YES....☐ *(Go to Q.3.3)* NO....☐

3.2.1 If no, why did the facility decide this chemical was not reportable?

a. Below threshold ..... ☐

b. Exempt ..... ☐

c. Overlooked chemical ..... ☐

d. Other (specify)_____ ☐

3.3 Are all uses of the chemical exempt from reporting according to the surveyor or are all uses of the chemical a non-aerosol form of sulfuric acid or hydrochloric acid?

YES....☐ *(Go to Q.3.10)* NO....☐ *(Continue)*

3.4 **Does documentation which supports the threshold determination exist? (Documentation is defined as any type of data available at the facility in any form which can be used to recalculate the estimate)**

YES....☐ NO....☐

3.4.1 If no, why not?

a. Documentation cannot be located ..... ☐

b. Documentation was not retained by facility ..... ☐

c. Facility unaware that documentation is required ..... ☐

d. Facility overlooked the chemical *(Skip to Q.3.6)* ..... ☐

e. **Other (specify)** _____ ..... ☐

3.5 What was the basis of estimate used by the facility for the amount manufactured, processed, or otherwise used in 1995? *Check all that apply.*

a. Purchase/inventory records ..... ☐

b. Emission Factors ..... ☐

c. Mass balance ..... ☐

d. Assumed threshold exceeded (no calculations completed) ..... ☐

e. Process recipes ..... ☐

f. Monitoring data ..... ☐

g. Production data ..... ☐

h. Other (specify)_____ ☐

Chemical Name: _____ Facility ID: |_|_|_|_|-|_|_|_|_|-|_|_|_|_|

Chemical Name: _____ Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

3.6 How much chemical did the facility manufacture, process, or otherwise use in 1995?[2]

		Facility	Reviewer
a.	Manufactured	_____ lbs	_____ lbs
b.	Processed	_____ lbs	_____ lbs
c.	Otherwise used	_____ lbs	_____ lbs

d. Facility did not estimate these quantities ..... ☐

3.7 Was the reviewer's estimate of the amount of chemical manufactured, processed, or otherwise used recalculated using available documentation or recreated using other facility data?

a. Recalculated, with no error ..... ☐

b. Recalculated, within a factor of 2 ..... ☐

c. Recalculated, within a factor of 10 ..... ☐

d. Recalculated, greater than a factor of 10 ..... ☐

e. Recreated, with no error ..... ☐

f. Recreated, within a factor of 2 ..... ☐

g. Recreated, within a factor of 10 ..... ☐

h. Recreated, greater than a factor of 10 ..... ☐

i. Facility did not estimate these quantities ..... ☐

3.8 Was a threshold exceeded for this chemical in 1995?

YES....☐ *(This chemical should have been reported. Continue)*

NO.....☐ *(This chemical should not have been reported. Skip to Q 3.10)*

[2]Record calculations and assumptions for the threshold determination on the worksheet in Section 6.0.

Chemical Name: _____ Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

~~3.9 What was the maximum amount of this chemical on-site at any time?[3]~~

	~~Facility~~ ~~Reviewer~~	
~~a. Maximum on site~~	_____ ~~lbs~~	_____ ~~lbs~~

3.10 This chemical was:

a. Correctly reported ..... (Go to Section 4.0) ☐

b. Correctly not reported ..... (Skip to next chemical) ☐

c. Incorrectly reported ..... (Go to Q.3.11) ☐

d. Incorrectly not reported ..... (Go to Q.3.12) ☐

3.11 Why was this chemical incorrectly reported?

a. Facility reported, although amount used was below threshold ..... ☐

b. Facility incorrectly assumed threshold was exceeded ..... ☐

c. Chemical activity was misclassified ..... ☐

d. Threshold quantity was miscalculated ..... ☐

e. Chemical was exempt ..... ☐

f. Chemical has been delisted/modified ..... ☐

g. Other (specify)_____ ☐

_____

(Skip to next chemical)

[3]Record calculations and assumptions for the maximum on-site quantity on the worksheet in Section 6.0.

3.12 Why was this chemical incorrectly not reported?

a. **Chemical activity was overlooked** ..... ☐

b. Chemical activity was misclassified ..... ☐

c. Threshold quantity was miscalculated ..... ☐

d. Other (specify)_____ ☐

_____

(Continue to Section 4.0)

3.13 If the facility completed a short form for this chemical, are the releases less than 500 pounds?

YES....☐ *(Skip to the next chemical and document the release calculations)*

NO.....☐ *(Go to Section 4.0)*

SECTION 4.0

REVIEW OF RELEASE TYPES

Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

Section 4.1 Sources of Chemical Releases and Transfers

In the reviewers opinion, document whether or not the facility should have included releases from the following sources (1):

Chemical Name _____ **CAS #** |_|_|_|_|_|_|-|_|_|_|-|_|	**Fugitive Air**	**Stack Air**	**Receiving Stream**	**Under-Ground Injection**	**Land On-Site**	**POTW**	**Off-Site Transfer**
SOURCE A. ~~Process vents/stacks~~							
B. Pumps/valves/flanges							
C. Volatilization from process areas							
D. Volatilization from treatment areas							
E. Storage tank/stock pile losses							
F. Accidental spills/releases							
G. Waste treatment discharge streams							
H. Stormwater runoff							
I. Process discharge streams							
J. Housekeeping practices/clean-up wastes (i.e., solvent)							
K. Container residue							
L. Treatment sludges, recycling or energy recovery by-products							
M. Combustion by-products							
N. Other _____							

NOTE: COMPLETE ALL ROWS AND COLUMNS.

<u>If a Form R was completed</u>:

(1) Y = Yes, release source should be included in release estimate that surveyor calculates in Section 5 and facility identified this release type.

N = No, release should be included in release estimate but facility overlooked this release type.

NA = This source was not present at the facility for this chemical

<u>If a Form R was not completed</u> (overlooked chemical):

Y = Release source should be included

NA = Release source was not present at the facility for this chemical

SECTION 4.2 (a) and (b)

CODE LIST

Q1

Y	=	Yes
N	=	No
NA	=	Facility overlooked this chemical

Q2

FE	=	Fugitive air
PS	=	Stack air
RS	=	Receiving stream
UI	=	Underground injection
LA	=	Land on site
PW	=	POTW
TOSD	=	Off-site transfer (disposal)
TOST	=	Off-site transfer (treatment)
TOSR	=	Off-site transfer (recycling)
TOSE	=	Off-site transfer (energy recovery)
NA	=	Facility does not have a release to this medium

Q3

Y	=	Yes
N	=	No
NA	=	Facility overlooked this chemical

Q4

FES	=	Releases are only fugitive releases and are not released to a stack.
SFE	=	Releases are to a stack and not released as fugitives.
VPC	=	Chemical is a volatile organic chemical (VOC) and was not reported as an air release.
ACID	=	Mineral acids, which were neutralized, were included.
POTW	=	Wastewater discharge is to a POTW and not a receiving stream.
RECS	=	Wastewater discharge is to a receiving stream and not to a POTW.
ONLAND	=	Releases are to an on-site landfill, not to an off-site landfill.
OFFLAND	=	Releases are to an off-site landfill, not to an on-site landfill.
NOER	=	Off-site energy recovery does not take place in a legitimate energy recovery system.
NOCOMB	=	Toxic chemical does not have a heating value high enough to sustain combustion.
NR	=	Site visit concluded that chemical is not released to this medium.
OTH	=	Other _____
NA	=	Facility correctly identified release type or facility overlooked chemical

CODE LIST (Continued)

Q5	Y	=	Yes
	Y1	=	Yes, but facility incorrectly identified release type
	Y2	=	Yes, but documentation is unclear or incomplete
	N1	=	Documentation cannot be located
	N2	=	Documentation was not retained by facility
	N3	=	Facility unaware that documentation required
	N4	=	Facility overlooked chemical
	N5	=	Facility overlooked this release type
	N6	=	Other _____
	NA	=	Facility does not have a release for this medium

~~Q6~~	~~Y~~	~~=~~	~~Yes~~
	~~N1~~	~~=~~	~~Facility unable to locate data~~
	~~N2~~	~~=~~	~~Facility did not retain data~~
	~~NA~~	~~=~~	~~Monitoring data not used~~

Q7	1	=	Facility derived factors
	2	=	EPA published emission factors
	3	=	Trade association factors
	4	=	Other _____
	NA	=	Emission factors not used

~~Q8~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No~~

~~Q9~~	~~Y~~	~~=~~	~~Yes~~
	~~N1~~	~~=~~	~~Facility misinterpreted de minimis rule~~
	~~N2~~	~~=~~	~~Other _____~~
	~~NA~~	~~=~~	~~Facility does not have de minimis wastestreams~~

~~Q10~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No, facility overlooked treatment~~
	~~NA~~	~~=~~	~~No on-site treatment of this chemical for this release medium occurred~~

~~Q11~~	~~Y~~	~~=~~	~~Yes~~
	~~N~~	~~=~~	~~No~~
	~~NA~~	~~=~~	~~No treatment efficiencies were not used~~

Q12	Y	=	Yes
	N	=	No
	NA	=	Facility does not have a release for this medium

Q13	MP	=	Spent metal plating bath
	CW	=	Cleaning waste
	WTS	=	Waste treatment sludge
	SC	=	Spent catalyst
	SPS	=	Spent process solvent
	OTH	=	Other: _____
			_____
	NA	=	Facility does not have recycling releases

Note: This code list refers to the questions for the Section 4.2(a) and (b) table on page 27 and 28.

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 4.2a Review of Release Types (On-Site Releases)

Chemical Name _____ CAS # |_|_|_|_|_|_|-|_|_|-|_|	**Fugitive Air §5.1**	**Stack Air §5.2**	**Receiving Stream §5.3**	**Underground Injection §5.4**	**Land On Site §5.5**
1. Did the facility identify a release type on the Form R?					
2. Enter surveyor's release types.					
3. Did the facility correctly identify the release type?					
4. If Q.3 is NO, identify the reason that the release type was incorrectly identified, otherwise enter NA.					
5. Is documentation on the facility's release estimate available for review?					
IF Q.5 IS NO OR NA, SKIP TO QUESTION 12					
6. If monitoring data were used, is it available for review?					
7. If emission factors were used, what is the source of the factors?					
8. Was each air or waste stream counted only once in release estimates? (1)					
9. Were all air or waste streams containing ≥1% or ≥0.1% (carcinogens) of the chemical included in release calculations?					
10. Was on-site treatment of this chemical included in release estimates?					
11. Were treatment efficiencies reported consistent with measurement data, vendor specs, or EPA-published efficiencies? (2)					
12. Does the facility have information available to estimate the amount of this chemical released during 1995?					

~~(1) If no, document all streams double counted in release calculations in Section 6.0~~
~~(2) If no, document inconsistency of treatment efficiencies used in Section 6.0~~

Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

Section 4.2b Review of Release Types (Off-Site)

Chemical Name _____ **CAS #** |_|_|_|_|_|_|-|_|_|_|-|_|	**POTW §6.1**	**Off-Site Transfer (disposal) §6.2**	**Off-Site Transfer (treatment) §6.2**	**Off-Site Transfer (recycling) §6.2**	**Off-Site Transfer (energy recovery) §6.2**
1. Did the facility identify a release type on the Form R?					
2. Enter surveyor's release types.					
3. Did the facility correctly identify the release type?					
4. If Q.3 is NO, identify the reason that the release type was incorrectly identified, otherwise enter NA.					
5. Is documentation on the facility's release estimate available for review?					
IF Q.5 IS NO OR NA, SKIP TO QUESTION 12					
6. If monitoring data were used, is it available for review?					
7. If emission factors were used, what is the source of the factors?					
8. Was each air or waste stream counted only once in release estimates? (1)					
9. Were all air or waste streams containing ≥1% or ≥0.1% (carcinogens) of the chemical included in release calculations?					
10. Was on-site treatment of this chemical included in release estimates?					
11. Were treatment efficiencies reported consistent with measurement data, vendor specs, or EPA-published efficiencies? (2)					
12. Does the facility have information available to estimate the amount of this chemical released during 1995?					
13. If appropriate, characterize the recycling stream (*use multiple codes if necessary*).					

~~(1) If no, document all streams double counted in release calculations in Section 6.0~~
~~(2) If no, document inconsistency of treatment efficiencies used in Section 6.0~~

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 4.2c Review of Release Types (On-Site Treatment, Energy Recovery or Recycling)

Chemical Name _____ **CAS #** |_|_|_|_|_|-|_|_|-|_|	**On-Site Treatment (§7A or 8.6B)**	**On-Site Energy Recovery (§7B or 8.2B)**	**On-Site Recycling (§7C or 8.4B)**
1. Did the facility identify an on-site treatment, energy recovery, or recycling method in §7 on the Form R? (1)			
2. Enter surveyor's identification of on-site methods. (2)			
3. Did the facility correctly identify the on-site method? (1)			
4. If Q.3 is NO, identify the reason that the method was incorrectly identified, otherwise enter NA. (3)			
5. For on-site treatment in §8.6B, did the facility only report the quantity of chemical destroyed during treatment? (4)			
6. For on-site recycling in §8.4B, did the facility report the quantity of chemical recovered from recycling? (4)			
7. If appropriate, characterize the recycling stream (*use multiple codes if necessary*): (5)			
8. Describe the type of recycling unit: (6)			

(1)
- Y = Yes
- N = No
- NA = Facility overlooked this chemical

(2)
- TR = On-site treatment
- ER = On-site energy recovery
- REC = On-site recycling
- NA = Facility does not use this on-site method

(3)
- OFFLAND = Releases are to an off-site landfill, not an on-site landfill
- NOER = Off-site energy recovery does not take place in a legitimate energy recovery system
- NOCOMB = Toxic chemical does not have a heating value high enough to sustain combustion
- NR = Toxic chemical is not recycled
- OTH = Other: _____
- NA = Facility correctly identified on-site method or facility overlooked chemical.

(4)
- Y = Yes
- N = No
- NA = Facility did not identify this on-site method

(5)
- MP = Spent metal plating bath
- CW = Cleaning waste
- WTS = Waste treatment sludge
- SC = Spent catalyst
- SPS = Spent process solvent
- OTH = Other: _____
- NA = Facility did not estimate recycling releases

(6) **Identify type of on-site recycling unit used. See §7.C of Form R.**

SECTION 5.0

REVIEW OF RELEASE ESTIMATES

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 5.1 Review of Release Estimates (On-Site Releases)

For each on-site release identified in Section 4.2a (Question 2), complete the following table:

Chemical Name _____ **CAS #** |_|_|_|_|_|_|-|_|_|-|_|	**Fugitive Air §5.1**	**Stack Air §5.2**	**Receiving Stream §5.3**	**Underground Injection §5.4**	**Land On Site §5.5**
1. Enter facility's release estimate (in lbs) (1)	A B C	A B C	A B C	A B C	A B C
2. What method(s) did the facility use to estimate their release? (2)					
3. Based on data available to the facility, is this the most accurate method to determine a release estimate? (3)					
IF Q.3 IS YES, SKIP TO QUESTION 6					
4. What is a better method(s) which could be used to calculate a more accurate release estimate? (2) (4)					
5. Enter the reviewer's release estimate using a more accurate method(s) (5)	A B C	A B C	A B C	A B C	A B C
6. Enter the reviewer's release estimate using the same method(s) as the facility. (5)	A B C	A B C	A B C	A B C	A B C

(1) Range Codes:
- A = 1-10 lbs
- B = 11-499 lbs
- C = 500-999 lbs
- N1 = Release estimate was not included on Form R but should have been, skip to Question 4
- N2 = Facility overlooked this chemical, skip to Question 4
- NA = Facility does not have a release to this medium, do not continue with this medium
- **N3 = Release estimate was included but should not have been, do not continue with this medium but enter facility release (i.e, N3, 100)**

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations **("minor calcs")**
- OJ = Engineering judgement **("guess")**
- OH = Hazardous waste manifests
- O = Other ____
- NA = Facility did not estimate release

(3)
- Y = Yes
- N = No

(4) Document why this method is more accurate in Section 6.0

(5) NA = Facility did not estimate release
[Note: Enter the number that was calculated. Only enter a range, if a range is the most accurate quantity that can be calculated.]
Document release calculations in Section 6.0

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 5.2 Review of Release Estimates (Off-Site)

For each off-site release identified in Section 4.2b (Question 2), complete the following table:

Chemical Name _____ CAS # |_|_|_|_|_|-|_|_|-|_|	**POTW §6.1**	**Off-Site Transfer (disposal) §6.2**	**Off-Site Transfer (treatment) §6.2**	**Off-Site Transfer (recycling) §6.2**	**Off-Site Transfer (energy recovery) §6.2**
1. Enter facility's release estimate (in lbs) (1)	A B C	A B C	A B C	A B C	A B C
2. What method(s) did the facility use to estimate their release? (2)					
3. Based on data available to the facility, is this the most accurate method to determine a release estimate? (3)					
IF Q.3 IS YES, SKIP TO QUESTION 6					
4. What is a better method(s) which could be used to calculate a more accurate release estimate? (2) (4)					
5. Enter the reviewer's release estimate using a more accurate method(s) (5)	A B C	A B C	A B C	A B C	A B C
6. Enter the reviewer's release estimate using the same method(s) as the facility. (5)	A B C	A B C	A B C	A B C	A B C

(1) Range Codes:
- A = 1-10 lbs
- B = 11-499 lbs
- C = 500-999 lbs
- N1 = Release estimate was not included on Form R but should have been, skip to Question 4
- N2 = Facility overlooked this chemical, skip to Question 4
- NA = Facility does not have a release to this medium, do not continue with this medium

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations **("minor calcs")**
- OJ = Engineering judgement **("guess")**
- OH = Hazardous waste manifests
- O = Other ____
- NA = Facility did not estimate release

(3)
- Y = Yes
- N = No

(4) Document why this method is more accurate in Section 6.0

(5) NA = Facility did not estimate release
[Note: Enter the number that was calculated. Only enter a range, if a range is the most accurate quantity that can be calculated.]
Document release calculations in Section 6.0

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 5.3 Review of Form R §8 Data (On-Site Releases or Off-Site Transfers)

Chemical Name _____ CAS # |_|_|_|_|_|_|-|_|_|-|_|	**Quantity Released §8.1B**	**Quantity Used for Energy Recovery Off Site §8.3B**	**Quantity Recycled Off Site §8.5B**	**Quantity Treated Off Site §8.7B**
1. Enter facility's estimate from §8, Column B, on the Form R. (*Enter NA if facility did not estimate*)				
2. Enter facility's basis of estimate. (1)				
3. Calculate the quantity released or transferred using the method in footnote (2).				
4. Are the facility's estimate (Q.1) and the quantity released or transferred from Q.3 the same? (3)				
5. If Q.4 is NO, provide notes or an explanation detailing any differences in the calculation of Section 8 data.				

(1) TECH = Used the following technique:

- Form R §8.1B = [§5.1 + §5.2 + §5.3 + §5.4 + §5.5 + §6.2 (disposal only) - §8.8]
- Form R §8.3B = §6.2 (energy recovery only) - §8.8
- Form R §8.5B = §6.2 (recycled only) - §8.8
- Form R §8.7B = §6.1 + §6.2 (treated only) - §8.8

NOBASE = Data for Section 8 was estimated, basis not provided
OTH = Other: _____

NA = Facility did not estimate; **do not continue with this medium**.

(2) [Note: Use the best release estimate from Section 5.1 and 5.2 of this survey to calculate these quantities.]
Document the calculations in Section 6.0.

(3) Y = Yes
N = No
NA = Facility did not estimate

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 5.4 Review of Form R §8 Data
(On-Site Treatment, Energy Recovery, or Recycling)

For the on-site treatment or energy recovery method(s) identified in Section 4.2c (Question 2), complete the following table. Only recreate on-site recycling estimates that were provided by the facility. Do not estimate on-site recycling releases NOT identified by the facility.

Chemical Name _____ **CAS #** |_|_|_|_|_|_|-|_|_|-|_|	**On-Site Treatment (§7A or 8.6B)**	**On-Site Energy Recovery (§7B or 8.2B)**	**On-Site Recycling (§7C or 8.4B)**
1. Enter the facility's estimate of quantity from §8, Column B, of the Form R. (1)			
2. What method did the facility use to estimate the amount treated, sent to energy recovery, or recovered from recycling? (2)			
3. Based on data available to the facility, is this the most accurate method to estimate the amount treated, sent to energy recovery, or recovered from recycling? (3)			
IF Q.3 IS YES, SKIP TO QUESTION 6			
4. What is a better method which could be used to calculate a more accurate estimate? (2)			
5. Enter the reviewer's estimate using a more accurate method. (4)			
6. Enter the reviewer's estimate using the same method. (4)			

(1)
- N1 = Estimate was not included on Form R but should have been, skip to Question 4.
- N2 = Facility overlooked this chemical, skip to Question 4.
- NA = Facility does not have this on-site method, **do not continue with this medium.**

(2)
- M = Monitoring data or direct measurements
- C = Mass balance calculations
- E = Published emission factors
- OC = Engineering calculations
- OJ = Engineering judgement
- OH = Hazardous waste manifests
- O = Other _____
- NA = Facility did not estimate quantities for this on-site method

Document the method used by the facility and/or alternate methods used in Section 6.0

(3)
- Y = Yes
- N = No
- NA = Facility does not have this on-site method

(4)

Document calculations in Section 6.0.
NA = Facility did not estimate release.

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Section 5.5 Review of Form R §8 Data
(Production Ratio/Activity Index and Source Reduction Activities)

Chemical Name _____ **CAS #** |_|_|_|_|_|-|_|_|-|_| **Production Ratio/Activity Index**	**Production Ratio/Activity Index (§8.9) and Source Reduction Activities (§8.10)**		
1. Enter the facility's estimate from §8.9 of the Form R. (Enter NO if facility did not estimate)			
2. Enter facility's basis of estimate (1).			
3a. Is this estimate based on a variable that most directly affects the quantities of the toxic chemical generated as **"waste"** quantities? (2)	3a.		
3b. If Q.3a is NO, enter surveyor's choice for alternate basis.	3b.		
Source Reduction Activities	**Activity #1**	**Activity #2**	**Activity #3**
4a. Enter the source reduction activity codes from Section 8.10 of the Form R.	4a-1.	4a-2.	4a-3.
4b. Provide a text description of the source reduction activity.	4b-1.	4b-2.	4b-3.
4c. Is this activity "source reduction" (i.e., not recycling, treatment, energy recovery, or disposal) (2)?	4c-1.	4c-2.	4c-3.

(1)

TCM	=	Ratio of amount of the toxic chemical manufactured in 1995 to 1993
TCPV	=	Ratio of production volume in 1995 to 1993
TCU	=	An activity index of the amount of toxic chemical used in 1995 to 1993
HR	=	An activity index of the amount of operating hours for an activity in 1995 to 1993
WT	=	An activity index or production ratio based on a weighted average of data from several processes
OTH	=	Other: _____
		_____
NA	=	The manufacture or use of the chemical began in 1995.

(2)

Y	=	Yes
N	=	No

SECTION 6.0

CALCULATION WORKSHEETS

Facility ID: |_|_|_|_|-|_|_|_|_|-|_|_|_|

THRESHOLD DETERMINATION WORKSHEET

Chemical Name: _____

Description of Use	Amount Manufactured	Amount Processed	Amount Otherwise Used
TOTALS			

Calculations:

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

MAXIMUM AMOUNT ONSITE WORKSHEET

Chemical Name: _____

INSTRUCTIONS: *Calculate the maximum amount of the chemical onsite at any one time during the reporting year. Keep in mind the following:*

- *All storage areas where this chemical may be kept;*
- *The amount of chemical being used at any time; and*
- *The amount of chemical in each waste stream.*

Storage Areas:

Total: _____

Chemical in Use:

Total: _____

Chemical in Waste Streams:

Total: _____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

Total On-Site: _____

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

RELEASE ESTIMATE WORKSHEET

Chemical Name: _____ Release Type _____

CAS # |_|_|_|_|_|_|-|_|_|-|_| SI Page # _____ Question # _____

INSTRUCTIONS: *Record all calculations for release estimates below. ~~in the appropriate sections.~~ Be sure to identify if calculations use the same method as the facility or a more accurate method.*

Appendix B

Introduction

The TRI Site Visit study has two primary objectives. The first objective is to estimate the number of facilities that have made an error in Form R filing. The second objective is to estimate the key reasons for errors among those facilities with one or more filing errors. Rather than sampling from all facilities that have filed a Form R, the sample design focused on three major industry groups -- 1) Chemical manufacturing facilities, refined specifically to SIC codes 286 (Industrial Organic Chemicals), 282 (Plastics Materials and Synthetic Resins, Synthetic Rubber, Cellulosic and Other Manmade Fibers), 281 (Industrial Inorganic Chemicals), and 285 (Paints, Varnishes, Lacquers, Enamels and Allied Products); 2) Rubber and Plastic Products which are covered by SIC code 30; and 3) Furniture and Fixtures which are covered by SIC code 25. Facilities reporting multiple SIC codes will be considered in scope only if all reported SIC codes fall within one of the SIC code-defined industries selected for study. As discussed below, these three industry groups were used as the primary stratifier of the facility sample.

The target sample size is 90 completed facility site visits. This total sample size is allocated to the three primary strata. Because the chemical group is the most important of the three groups, EPA has decided to have an allocation of 40 site visits from this group, and 25 from each of the remaining two groups. While the sampling work has been conducted for all three groups, the initial set of site visits are expected to be restricted to the chemical sector.

Sampling Frame

The sampling frame for the sample was constructed from the 1994 TRI data files (TRIPQUICK). Those firms with more than fifteen Forms R were eliminated from the sampling frame at Radian's request because the site visit to verify the Form R information would be too resource intensive. For SIC codes 25 and 30 none of the facilities were eliminated for this reason, for SIC code 28 six percent of the facilities were removed. The population size of facilities in each SIC code group (after removal of facilities with more than fifteen Forms R) is:

Chemical	1274
Furniture	535
Rubber and Plastics	1872

Use of Two-Stage Cluster Sampling

It would be quite costly to draw a national stratified random sample of facilities, because the facilities would be fairly well scattered across the U.S. In other words, the cost traveling to each of the selected facilities would be high. The more cost-effective approach used here entailed selecting a two-stage cluster sample of facilities. The specifics of the sample selection are outlined below.

The most readily available geographic identification variable in the TRI data file is the three-digit Zip code sectional center of the facility. Three-digit Zip codes cover relatively small areas in urban locations and considerably larger areas in rural locations. Using the TRI data file (eliminating facilities above the Form R threshold), it was possible to sort all of the eligible facilities by three-digit Zip code. Two-stage cluster sampling involves the following steps:

1) Order all of the three-digit Zip codes in ascending Zip code order to introduce some implicit geographic stratification.

2) Determine if any three-digit Zip codes are too small and must be combined with one or more geographically adjacent Zip codes to form a cluster of sufficient size. This was done so that each Zip code cluster included at least two facilities from each of the three SIC codes. Some areas of the U.S. do not have any furniture manufacturing facilities. In order to avoid forming clusters containing a large number of Zip codes, the rule was modified in these areas of the country to allow for the formation of clusters with no furniture manufacturing facilities. A total of 178 clusters were formed.

3) After creating the sampling frame of clusters, it was determined that the cluster consisting of Zips 286-287 in North Carolina contained 61 (11.4%) of the 535 furniture manufacturing facilities in the U.S. This cluster was included in the sample with certainty since it contained more than 10 percent of the total industry facilities, and it was determined that 3 site visits with furniture

manufacturing facilities should take place in this cluster based on its size.

4) A measure of size was assigned to each of the remaining 177 clusters. The composite measure of size, MOS_i, for the i-th cluster was computed using the equation

$$MOS_i = \sum_{j=1}^{3} N_{ij} F_j$$

where N_{ij} is the number of facilities in the i-th cluster in SIC code group j, and F_j is the overall desired sampling fraction for SIC code group j.

5) A systematic probability proportional to size (PPS) sample of 40 noncertainty clusters was drawn from the sampling frame of 177 clusters. The first step in the systematic PPS sample was to cumulate the measure of size, MOS_i, over the 177 clusters. The total cumulative sum of MOS_i for the 177 clusters was then divided by 40, the sample size of clusters, to form a PPS selection interval, K. A random start, R, between one and K was then generated. Forty selection numbers were computed as R, R+K, R+2K, R+3K,.....,R+39K. A cluster was selected if the selection number fell into its sequence of numbers; that is, the selection number was greater than the cumulative sum of all previous clusters, but less than or equal to the cumulative sum including the designated cluster.

6) Overall, the sample consists of 41 clusters -- the 40 noncertainty clusters plus the Zip 286-287 cluster in North Carolina.

Sampling Facilities Within Clusters

After drawing the first-stage sample of geographic clusters, the second-stage sample of facilities was drawn. For each of the 40 clusters, one chemical facility was selected as the primary selection. A minimum of one reserve chemical facility was also drawn from each of the 40 clusters. For rubber and plastics, it was first necessary to draw a random subsample of 25 of the 40 clusters. For each of the 25 clusters, one primary rubber and plastics facility was randomly drawn, and a minimum of one reserve rubber and plastics facility was also drawn. For furniture, it was first necessary to draw a random subsample of 22 of the 40 clusters containing furniture manufacturing facilities. For each of the 22 clusters, one primary furniture facility was randomly drawn, and a minimum of one reserve furniture facility was also drawn. Recall that 3 primary furniture facilities were also drawn from the cluster consisting of Zips 286-287 in North Carolina, making a total of 25 primary selections.

Expected 95-Percent Confidence Intervals

The above design will yield about 40 completed site visits for the chemical group, and 25 from the other two groups. If we assume that 50% of facilities in the chemical group made a filing error, then the 90-percent confidence interval would be approximately plus or minus 13.0 percentage

points for the chemical group. In other words, the chances are 9 out of 10 that the true population percent of facilities with a filing error would be between 37% and 63%. Continuing with this assumption, 20 of the 40 facilities in the chemical group would have a filing error. For estimates of key reasons for filing errors, the 90-percent confidence intervals could be as large as plus or minus 18 percentage points.

For each of the other two groups, if we again assume that 50% of facilities in each of the two groups made a filing error, then the 90-percent confidence interval would be approximately plus or minus 16.5 percentage points for each group. In other words, the chances are 9 out of 10 that the true population percent of facilities with a filing error would be between 33.5% and 66.5%. Continuing with this assumption, 12 or 13 of the 25 facilities in each of the two groups would have a filing error. Using this smaller number of facilities as the basis for estimates of key reasons for filing errors, the 90-percent confidence intervals could be as large as plus or minus 23.7 percentage points for each group.

Appendix C

Dear:

Your facility has been randomly selected by the U.S. Environmental Protection Agency (EPA) to participate in a data quality survey of facilities that submitted 1994 reporting year Form Rs for the Toxic Chemical Release Inventory (TRI) under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA). The purpose of the survey is to evaluate the quality of the data submitted on the Form R chemical reports and to provide feedback to EPA that can be used to improve the reporting instructions, guidance, or the reporting form. Eastern Research Group, Inc. (ERG) is working with EPA to conduct survey visits to approximately 90 facilities randomly selected from the 1994 TRI database in the following SIC Codes: 25, 281, 282, 285, 286, and 30.

Participation in this program is voluntary. However, we believe your participation will provide a valuable evaluation of the threshold calculations and release and transfer estimates for your facility, which will assist you in future Form R reporting.

ERG technical staff members will visit your facility at a date between April and May 1997. Most visits will last 1 to 2 days, depending on the number of chemical reports you submitted and the number of Section 313 chemicals on site. Site surveyors will spend the majority of that time reviewing the methodology and data that your facility used to make threshold calculations and release and transfer estimates for the 1994 reporting year. During the site visit, site surveyors will need your assistance to tour the plant in enough depth to allow them to understand your manufacturing processes and to identify potential release points. The site surveyors will make every effort to minimize disruptions to your schedule while they are on site.

You will be contacted by telephone within the next week to arrange a date for the site visit. The name and location of your facility will not be released to EPA in order to ensure confidentiality of your facility's information. All data collected on this project will be tabulated and reported to EPA in summary form only. At the project conclusion, facility identification information will be destroyed.

Appendix D

① SAMPLE THRESHOLD CALCULATION USING PURCHASING AND INVENTORY DATA:

SECTION 313 CHEMICAL: ETHYLBENZENE

DESCRIPTION OF USE: COMPONENT OF A SOLVENT USED STRICTLY AS A FORMULATION COMPONENT FOR PAINTS

CHEMICAL ACTIVITY: PROCESS

THRESHOLD: 25,000 lbs.

THRESHOLD CALCULATION:

→ DATA AVAILABLE-

1/1/94 INVENTORY: 4,600 lbs. ETHYLBENZENE

12/31/94 INVENTORY: 2,800 lbs. ETHYLBENZENE

PURCHASES DURING 1994: 167,000 lbs. OF SOLVENT CONTAINING

MSDS COMPOSITION: SOLVENT CONTAINS 10-20% ETHYLBENZENE BY WEIGHT

→ CALCULATIONS:

$$\left\{\begin{matrix}\text{TOTAL}\\ \text{ANNUAL}\\ \text{USAGE}\end{matrix}\right\} = \left\{\begin{matrix}\text{BEGINNING}\\ \text{INVENTORY}\end{matrix}\right\} + \left\{\begin{matrix}\text{PURCHASES}\\ \text{MADE DURING}\\ \text{YEAR}\end{matrix}\right\} - \left\{\begin{matrix}\text{ENDING}\\ \text{INVENTORY}\end{matrix}\right\}$$

$$= 4{,}600 \text{ lbs.} + (0.15)(167{,}000 \text{ lbs.}) - 2{,}800 \text{ lbs.}$$

↑ USE MIDPOINT OF CONCENTRATION RANGE

$$= 26{,}850 \text{ lbs.}$$

→ RESULT: THRESHOLD WAS EXCEEDED

2) SAMPLE THRESHOLD CALCULATION ILLUSTRATING REVISED GUIDANCE FOR AMMONIA:

SECTION 313 CHEMICAL: AMMONIA

DESCRIPTION OF USE: AQUEOUS AMMONIA SOLUTION (25% CONCENTRATION) [redacted] USED TO NEUTRALIZE WASTEWATER

CHEMICAL ACTIVITY: OTHERWISE USE

THRESHOLD: 10,000 lbs.

→ DATA AVAILABLE:

PURCHASES DURING 1995: 66,000 lbs. OF AMMONIA SOLUTION

MSDS COMPOSITION: 25%

BEGINNING AND ENDING INVENTORY: NOT AVAILABLE

→ CALCULATIONS:

ASSUME 1995 USAGE APPROXIMATELY EQUALS TOTAL PURCHASES

$\{\text{TOTAL ANNUAL USAGE}\} = (66{,}000 \text{ lbs.})([redacted]\ 0.25) = 16{,}500 \text{ lbs.}$

[redacted] — NOTE THAT [redacted] A 1995 UPDATE TO TRI REPORTING INSTRUCTIONS REQUIRES FACILITIES TO [redacted] CONSIDER ONLY 10% OF AQUEOUS AMMONIA WHEN ESTIMATING THRESHOLDS AND CALCULATING RELEASES

THEREFORE, ANNUAL USAGE $= (16{,}500 \text{ lbs.})(0.10) = 1{,}650 \text{ lbs.}$

→ RESULT: THRESHOLD WAS NOT EXCEEDED

③ SAMPLE THRESHOLD CALCULATION FOR METAL COMPOUNDS:

SECTION 313 CHEMICAL CATEGORY: NICKEL COMPOUNDS

DESCRIPTION OF USE: A MIXTURE CONTAINING 14% NICKEL OXIDE IS USED TO CATALYZE A CHEMICAL REACTION

CHEMICAL ACTIVITY: OTHERWISE USE

THRESHOLD: 10,000 lbs.

THRESHOLD CALCULATION:

→ DATA AVAILABLE:

USAGE: [redacted] THE CHEMICAL REACTORS ARE LOADED WITH 15,000 lbs. OF CATALYST AT ALL TIMES

CONSUMPTION: THE FACILITY REPLACES [redacted] THE CATALYST ROUGHLY EVERY OTHER MONTH (AND TRANSFERS SPENT CATALYST TO A LANDFILL)

→ CALCULATIONS:

$$\left\{\begin{matrix}\text{TOTAL CATALYST} \\ \text{USAGE}\end{matrix}\right\} = \left(15{,}000 \frac{\text{lbs. CATALYST}}{\text{[redacted] CHANGEOVER}}\right)\left(6 \frac{\text{CHANGEOVERS}}{\text{[redacted] YEAR}}\right)$$

$$= 90{,}000 \text{ lbs. CATALYST}$$

$$\left\{\begin{matrix}\text{TOTAL NICKEL} \\ \text{COMPOUNDS USAGE}\end{matrix}\right\} = (0.14)(90{,}000 \text{ lbs.}) = 12{,}600 \text{ lbs NICKEL COMPOUNDS}$$

→ RESULT: THRESHOLD FOR NICKEL COMPOUNDS WAS EXCEEDED (BUT RELEASES [redacted] SHOULD ONLY BE CALCULATED FOR NICKEL, AS OPPOSED TO [redacted])

Sample Calcs Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

RELEASE ESTIMATE WORKSHEET

Chemical Name: Xylene Release Type Fugitive Air

CAS # |_|1|3|3|0|-|2|0|-|7| SI Page # _____ Question # _____

INSTRUCTIONS: *Record all calculations for release estimates below. ~~in the appropriate sections.~~ Be sure to identify if calculations use the same method as the facility or a more accurate method.*

- Facility makes 112,000 lbs (56 tons) of Xylene-containing products [50% Xylene content]
  ↳ Assume Xylene is only solvent
- Emission factor (from AP42 Section 6.4): 30 lbs of fugitive VOC emissions expected per ton of product

Estimate:

$$\left(\frac{30 \text{ lbs. Xylene emitted}}{\text{ton of product}}\right)\left(\frac{56 \text{ tons of product}}{\text{yr.}}\right) = \boxed{\frac{1,680 \text{ lbs. Xylene}}{\text{yr.}}}$$

Note: Facility estimated 40 lbs. of Xylene fugitive emissions (and 400 lbs. of stack emissions), but did not document these estimates - making it impossible to reconcile the numbers.

Facility ID: |_|_|_|-|_|_|_|_|-|_|_|_|

RELEASE ESTIMATE WORKSHEET

Chemical Name: Xylene Release Type Stack Air

CAS # |_|1|3|3|0|-|2|0|-|7| SI Page # _____ Question # _____

INSTRUCTIONS: *Record all calculations for release estimates below. ~~in the appropriate sections.~~ Be sure to identify if calculations use the same method as the facility or a more accurate method.*

- Facility purchased 98,240 lbs. of Xylene last year and processed it into Xylene-containing products. Xylene concentration in these products is 50% by weight.
- Facility produced 112,000 lbs of Xylene-containing products last year. [containing 56,000 lbs of Xylene]
- All Xylene that is not shipped off site as product is emitted as Fugitive or stack emissions. Fugitive emissions of Xylene have been calculated as 1,680 lbs.

Estimate:

98,240	lbs	processed
− 56,000	lbs	product
− 1,680	lbs	Fugitive air emissions

40,560 lbs. Xylene stack emissions

Note: Facility estimated 400 lbs. of Xylene stack emissions (and 40 lbs. of fugitive emissions), but did not document these estimates – making it impossible to reconcile the numbers.

Facility ID: |_|_|_|-|_|_|_|-|_|_|_|

RELEASE ESTIMATE WORKSHEET

Chemical Name: Lead Compounds Release Type Receiving Stream

CAS # |N|4|2|0|_|-|_|_|-|_| SI Page # _____ Question # _____

INSTRUCTIONS: *Record all calculations for release estimates below. ~~in the appropriate sections.~~ Be sure to identify if calculations use the same method as the facility or a more accurate method.*

- The Facility did not report release because chemical was incorrectly omitted.
- Monitoring data show 0.085 mg/L lead in water released From treatment.
- Flow of water released from treatment = 20,000,000 L/yr.

Estimate:

$$\left(\frac{0.085\ mg}{L}\right)\left(\frac{20,000,000\ L}{yr.}\right)\left(\frac{1\ kg}{10^6\ mg}\right)\left(\frac{2.2\ lb}{1\ kg}\right) = \boxed{\begin{array}{l}3.74\ lbs.\ to\\ receiving\ stream\end{array}}$$