SECTION 2

STATIONARY POINT SOURCES

The point source inventory represents facility-specific data for larger stationary sources. Emissions data for all other source categories are reported at the county level. Point sources typically include large industrial, commercial and institutional facilities. Manufacturing facilities, within the industrial sector, comprise the majority of all reporting point sources. The institutional sector includes hospitals, universities, prisons, military bases, landfills, and wastewater treatment plants.

Unlike other source sector emissions which are estimated by AQMS, point source emissions data are submitted to AQMS by the facilities. Emissions are reported at the process level and include both confined (stack) emission points as well as unconfined (fugitive) emission sources. A key aspect of point source data is the inclusion of facility coordinates to accurately allocate emissions spatially within a county for purposes of performing air dispersion modeling.

The planning and execution of the point source inventory was accomplished in the following chronological manner:

- Define the purposes of the inventory (already defined in Section 1 of this report);
- Establish the reporting criteria and list of facilities to survey;
- Obtain inventory data from facilities;
- Perform administrative and technical review of data received from facilities;
- Seek resubmissions/corrections from facilities based on data review;
- Perform internal data manipulation (i.e., apply rule effectiveness, remove non-reactive VOCs, create summer season weekday emission values); and
- Prepare inventory data files, report, and supporting documentation.

Quality control/assurance is not listed in the chronology above since these activities were performed throughout the point source inventory development process. Quality control/assurance efforts are presented throughout this section and in the quality assurance section of this report.

Since there may be overlap between point sources and stationary non-point source categories, one final activity required of the point source inventory staff is to provide point source back out data where appropriate. Point source back out data includes emissions, throughput, or employees, depending on the non-point source category methodology.

2.1 Reporting Criteria

Based on the purposes of the 2002 inventory, the following criteria were established within the point sources inventory preparation plan (IPP) (DNREC, 2003) for defining the universe of facilities to be surveyed:

- Facilities that held a Title V permit in 2002;

- Any facility with emissions of VOCs greater than 5 TPY for any of the years 1999, 2000, or 2001, as previously reported to the AQMS inventory program;
- Any facility falling into one of the following industry sectors:
  - Hot-mix asphalt plants,
  - Hospitals that use ethylene oxide for sterilization,
  - Electric generating units (EGUs); and
  - Facilities using anhydrous ammonia as a refrigerant;
- Any facility for which AQMS does not have previous inventory data that appears may be a significant source.

Subsequent to establishing these criteria, chrome plating was considered important to the air toxics study due to emissions of hexavalent chromium. A review of the permit and Maximum Achievable Control Technology (MACT) standard files revealed four facilities in Delaware that perform chrome plating. These facilities were included in the overall point source inventory; however, these facilities have no reported ozone precursor emissions and are not included in this inventory.

Prior to the establishment of these criteria, AQMS considered including all facilities within the following additional industry sectors:

- Hazardous waste treatment, storage, and disposal facilities (TSDFs);
- Publicly-owned treatment works (POTWs);
- Bulk petroleum plants;
- Dry cleaners;
- Active and inactive landfills;
- Feed mills (for particulates);
- Concrete plants (for particulates);
- Sand and gravel operations (for particulates); and
- Chrome plating operations (considered after the development of the reporting criteria.)

TSDFs – The number of TSDFs within Delaware has steadily declined in the past ten years and recent inventories indicated emissions were very low. The Solid and Hazardous Waste Management Branch of DNREC was contacted to determine the list of TSDFs within the State. As of 2002, there were three TSDFs operating in Delaware. All three sites were located at facilities that already met other reporting criteria. These facilities were asked to report emissions for their TSDF. Therefore, TSDFs were not included in the point source inventory specifically as an industry sector. Finally, two of the TSDFs were storage only, and have since closed.

POTWs - Other than one Title V permitted facility (Wilmington WWTP), POTWs were considered an insignificant source of criteria and air toxic pollutants. Rather than including POTWs within the point source inventory, throughput data available from the Division of Water Resources NPDES program was used to estimate emissions for each facility, then aggregated to the county level in the stationary non-point source inventory.

Bulk petroleum plants - After reviewing internal records (EPCRA Tier II data) and contacting several bulk plants, AQMS determined that very little throughput at these facilities includes

highly volatile products such as gasoline. Emissions from less volatile products, such as distillate and residual oils, were too small to be considered for inclusion in either the point or stationary non-point source inventories.

Dry cleaners – Dry cleaners in Delaware predominantly use perchloroethylene as the cleaning solvent. Perchloroethylene is a negligibly-reactive VOC, and is not included in the VOC emissions from dry cleaners within this ozone precursor inventory. With more than 80 facilities throughout Delaware, the number of facilities was considered too large and emissions too small to include as point sources. Therefore, dry cleaners were handled as an area source with VOC emissions aggregated to the county level.

Active and inactive landfills – All active municipal solid waste landfills in the State (one per county) and one large inactive landfill are Title V permitted facilities and thus already meet the reporting criteria. The remaining inactive landfills throughout Delaware have not accepted waste for nearly 20 years as of 2002, and VOC emissions from these sites are minimal. Therefore, inactive landfills were not included in the point source inventory. County-level estimates of VOC emissions from inactive landfills were included in the non-point source inventory.

Feed mills, concrete plants, and sand and gravel operations – These industry sectors were considered a source of particulate matter, both from material handling processes and fugitive dust (i.e., storage piles). Many large feed mills in Delaware already met the criteria for reporting as a Title V facility due to combustion emissions from process boilers and grain dryers. The lack of quality emissions data (i.e., emission factors) for feed mills persuaded AQMS from inventorying smaller feed mills. Lack of data was also the reason for not further considering concrete plants. Sand and gravel plants were surveyed under the stationary non-point sources inventory, but eventually dropped from it due to lack of useful data.

2.2 Initial List of Facilities

Once the reporting criteria were establish, AQMS point source inventory staff compiled an initial list of facilities to be compared against the reporting criteria. A list of facilities that were Title V (TV) or Synthetic Minor (SM) permitted facilities at the end of 2002 was provided by the Engineering and Compliance Branch of AQMS. AQMS staff included all of these facilities (150) in the initial list.

Facilities within the emission inventory database that were not designated as TV or SM were evaluated against the criterion of five tons of annual VOC emissions in any of the three years prior to 2002. This review resulted in the addition of two facilities to the initial list. As stated previously, four chrome plating operations were added to the list of point sources.

The following additional data sources were reviewed to identify facilities that might have met one or more of the reporting criteria:

- Toxics Release Inventory (TRI, SARA 313) – 1999 through 2001 data;
- Hazardous Chemical Inventory (Tier II, SARA 312) – 2001 data;
- AQMS Accidental Release Prevention (ARP) Program facility list.

AQMS inventory staff reviewed the three most recent years of TRI data, and found that all facilities within TRI with more than five tons per year air emissions of VOC compounds were already included in the initial list due to TV or SM status. However, when the 2002 TRI data were made available in late 2003, AQMS decided to include several facilities for purposes of the air toxics project. In doing so, the individual compounds reported by these facilities to TRI were also reported as VOCs or particulates, as appropriate. The review of TRI data resulted in the addition of four facilities to the initial list.

The Tier II data were reviewed mainly to identify facilities that used anhydrous ammonia. As a result of the passage of the new fine particulate standard, ammonia, which is a precursor to the formation of ammonium sulfates and nitrates, was elevated to the status of a criteria pollutant (similar to how VOCs are viewed in the formation of ozone.) Furthermore, the ARP Program within DNREC maintains a list of facilities that have a significant amount of anhydrous ammonia stored on site, due to the acute hazard ammonia poses should a catastrophic release occur. Finally, telephone listings were reviewed for otherwise unidentified ice suppliers and ice skating rinks. Altogether, 23 facilities not already on the initial list were added to capture potential ammonia emissions.

The complete initial list included 183 facilities. A spreadsheet was developed by AQMS point source staff containing a record of every facility included on the initial list of facilities. The spreadsheet includes the reason the facility was placed on the initial list. For facilities that were inventoried, the spreadsheet indicates which reporting criteria were met. The spreadsheet is included in the supporting documentation contained on a CD accompanying this report.

2.3 Facilities Inventoried

The facilities on the initial list were evaluated using the reporting criteria established in the IPP. As stated previously, additional criteria specifically based on air toxic emissions were included.

Title V facilities are required to report regardless of the amount of emissions. Therefore, all 85 Title V facilities were included in the final list of point sources, unless a facility was closed for the entire 2002 calendar year. The list of Synthetic Minor facilities were evaluated against the reporting criteria. As a result, 28 of the 65 SM facilities were dropped from further consideration since no criterion was met.

Eight facilities thought to be using anhydrous ammonia reported using another type of refrigerant or otherwise did not use anhydrous ammonia. These facilities were not included in the final list of point sources. It is important to note there were several facilities that used anhydrous ammonia as a refrigerant but reported no ammonia system recharge (the approximation used to determine that emissions had occurred) for 2002. These facilities were retained in the final list of point sources, even though emissions are reported as zero.

Three facilities were identified as being closed prior to calendar year 2002. Three non-SM facilities were evaluated against the reporting criteria and were determined to not meet the criteria. Finally, a mobile crusher used at several hot-mix asphalt plants was identified as its own facility in the initial list of facilities. However, since for purposes of the point source inventory,

all emissions must be assigned to a fixed site, emissions from the crusher were assigned to the facility at which it operated the majority of the time.

The final list included 140 facilities inventoried. Of these, 121 facilities reported emissions of ozone precursors, and thus are included in the 2002 base year ozone SIP inventory.

2.4 Survey Methods

In October 2002, the AQMS point source inventory staff began developing the survey methods and preparing reporting packages to be mailed to each facility. AQMS used two primary methods to gather information from most facilities for the 2002 inventory. Facilities either used an on-line reporting system or submitted paper activity data reporting forms. These two methods are described in detail below.

2.4.1 Electronic Reporting

Starting with the 2001 reporting cycle, AQMS has offered electronic reporting of emissions data through the Internet. The system is known as Terminal Server Satellite ***i***-STEPS®. Facilities have used Satellite ***i***-STEPS® software for reporting since 1995. Prior to the 2001 reporting cycle, facilities were given the Satellite ***i***-STEPS® software and a database containing the emission inventory reporting structure for their facility on magnetic media. The software and database was installed on a computer at the facility. Facilities would create and mail to AQMS a submission diskette containing their inventory data. With on-line reporting, the software and database remains on DNREC's server. The Internet provides the connection to the user's computer.

For the 2001 inventory year, AQMS offered a one-day training to facility representatives to provide guidance on how to use the new on-line reporting system and to reacquaint facilities with the Satellite ***i***-STEPS® reporting scheme. ***i***-STEPS® is the point source emission inventory data management system that AQMS has used since 1992 and is currently licensed to DNREC by MACTEC Federal Programs.

For the 2002 reporting cycle, the Terminal Server Satellite ***i***-STEPS® application was updated with the latest FIRE and AP-42 emission factors. Satellite ***i***-STEPS® is capable of calculating emissions based on information supplied on process throughput, operating schedule, and controls. A database specific to each facility was generated based on previously submitted inventories and other information (i.e., permitting files). Information expected to remain the same from year to year was pre-populated in the database, while throughput and emissions data were zeroed out. Facilities were expected to update pre-populated information as necessary and enter 2002 data for fields that were zeroed out.

2.4.2 Activity Data Reporting Forms

AQMS had learned over the years that staff at some smaller facilities had limited or no access to the Internet, had no experience with Internet reporting, or in some cases were lacking in computer skills. For these facilities, the process of using Satellite ***i***-STEPS® was cumbersome and sometimes resulted in late reporting and incomplete or erroneous data. For those facilities

with uncomplicated processes, AQMS developed one to two-page activity data report forms to simplify the reporting process. The activity data supplied by facilities, such as operating schedule and monthly throughputs, were used by AQMS staff to calculate emissions based on FIRE emission factors or material balance methodologies.

Activity data reporting forms were developed for the following processes:

- Boilers;
- Stationary diesel engines;
- Hot-mix asphalt production;
- Ammonia refrigeration;
- Ethylene oxide sterilization; and
- Chrome plating.

For facilities that used the activity data forms, AQMS already had detailed process and stack information on file. The activity data report forms are included in the supporting documentation contained on a CD accompanying this report.

2.4.3 Other Methods

In a limited number of cases where on-line reporting or the use of the activity data forms were not appropriate or useful, information was obtained from the facility via telephone, e-mail, fax or site visit. As an example, Metachem Products closed in 2002 and no technical staff was available during the data collection period. However, the president of the company was contacted and was able to provide 2002 production figures. AQMS staff calculated emissions for 2002 for non-combustion processes by scaling the reported 2001 emissions based on production level ratios.

Emissions data for seven facilities were obtained solely from TRI reports. These facilities were included in the 2002 inventory as a result of the DATAS project. For six of these facilities, the reported TRI chemicals were VOCs. These facilities were retained in the ozone precursor SIP inventory.

Regardless of the survey methods used to obtain data from facilities, all data were entered into one database within ***i***-STEPS®.

2.5 Data Collection

Reporting packages were mailed in March 2003 to facilities identified as meeting one of more of the established reporting criteria. Two Synthetic Minor facilities that were sent reporting packages were subsequently dropped from further consideration based on conversations with the facilities.

Some facilities were identified for inclusion in the point source inventory after the initial reporting cycle began. These included one ammonia refrigeration facility, four chrome plating operations, and seven TRI reporting facilities. The TRI facilities were not contacted by AQMS point source inventory staff. Emissions data were obtained from the DNREC TRI database.

Table 2.1 provides the number of facilities inventoried by each survey method.

Table 2-1. Inventory Methods

Inventory Method Used	Number of Facilities
On-line reporting	86
Activity data report forms	44
Toxics Release Inventory	7
Other methods	3
Dropped from inventory[a]	3

[a]Dover Downs Entertainment and Kuehne Chemical. Tilcon mobile crusher was removed as a separate facility and allocated to one of Tilcon's facilities.

2.5.1 On-line Reporting

Terminal Server Satellite ***i***-STEPS® software reporting packages were sent to 82 facilities by certified mail on March 7, 2003. An additional six facilities received the mailing over the next month. Two of the 88 facilities receiving the reporting packages for on-line submissions were subsequently handled through the use of activity data report forms and one facility was dropped from further consideration (Kuehne Chemical). Finally, one facility (Pinnacle Foods), that originally received activity data reporting forms, reported using the on-line system.

The reporting package contained a cover letter and five pages of instructions. The reporting package is included in the supporting documentation. The instructions contained information on how to access the Terminal Server Satellite ***i***-STEPS®, user initials and passwords, AQMS contact information, information specific to the 2002 inventory, and an AQMS web page address where additional inventory documents were available. These documents included:

- *Issues, Updates and FAQs for Terminal Server Satellite **i**-STEPS®*;
- *Common Errors and Useful Information*;
- A power point presentation of the 2001 emission inventory training; and
- A detailed, 23-page set of instructions that provided information about the emission inventory structure and each data element.

A database was set up and customized for each facility based on the process structure previously established for the facility. For new facilities using Satellite ***i***-STEPS®, the reporting structure was created by AQMS point source inventory staff with input from the facility. The database was pre-populated with general information about the facility, as well as a few other data elements not expected to change from year to year, such as stack parameters and design capacity. Other data elements were left blank or zeroed out, such as annual process rate, percent sulfur and ash of fuel burned, operating schedule, throughputs, capture and control efficiencies, and emission estimates.

Generally, it was the large, complex facilities with multiple processes that reported on-line. For facility representatives new to emissions inventory reporting or who had not reported in some time, AQMS inventory staff worked with them to understand the inventory structure. In three

instances this included an on-site visit by AQMS staff. Assistance by phone or e-mail in completing the inventory was offered on an on-going basis for many facilities. Representatives from five facilities visited the AQMS offices seeking assistance. Terminal Server Satellite ***i***-STEPS® on-line reporting allowed point source inventory staff to work with a facility simultaneously on-line to resolve any issues a facility may have encountered.

The inventory information requested from facilities for the 2002 inventory is described in several EPA publications including *Emission Inventory Requirements for Ozone State Implementation Plans and Emissions Inventory Guidance* (EPA, 1991a) and *Emissions Inventory Improvement Program (EIIP), Volume II* (EPA, 1997). Facilities were requested to speciate non-combustion VOC emissions, allowing AQMS staff to back out any non-reactive compounds from the reported VOC total when necessary. All emissions were reported at the process level. Facilities were required to provide emission calculations and documentation in the Notes window within Terminal Server Satellite ***i***-STEPS® or in writing when submitting their certified emissions.

Terminal Server Satellite ***i***-STEPS® has built-in system checks for out of range values as well as relational errors. Field specific data entry checks were done by the software at the time the data was entered or when an attempt was made to save the data. The system prompted the user to make the needed corrections. In most cases a record could not be saved until all edit checks were satisfied. System functions and checks include:

- Data can be entered through the use of look-up tables;
- Data entered directly must match information in the look-up table;
- Total percent quarterly throughputs must be between 95 and 101;
- Alpha-numeric checks;
- Enforced relational database integrity;
- Mandatory field alerts;
- Stack assignment check (each process must have an assigned stack); and
- Automated emissions calculations.

Once a facility completed entering its data and information, the user had the ability to run the following reports:

- Group level emissions (facility summary);
- Process unit level emissions summary; and
- Detailed report (contains all entered and calculated data).

Facilities used the three reports to verify data they have entered and the emissions reported and/or calculated by the Terminal Server Satellite ***i***-STEPS®. Reports could be displayed to the screen or created as an Adobe Acrobat pdf file which is then automatically e-mailed to the user.

The process summary report provided emissions of each criteria pollutant for each process within an emissions unit. The detailed report lists the data following the Terminal Server Satellite ***i***-STEPS® structure and contains all information that the facility entered as well information the system used to organize the inventory information or calculate emissions.

The facility summary report tabulates criteria pollutant emissions for each emission unit with a facility total at the bottom. This report also served as the emission certification page and thus contains a signature area for the "Responsible Official". When AQMS received a signed copy of this report, indicating the facility had completed the reporting process, AQMS set the Terminal Server Satellite ***i***-STEPS® to read-only for the facility.

Examples of the three reports are included on the CD accompanying this report.

2.5.2 Activity Data Reporting Forms

Activity data reporting packages were sent by certified mail to 37 facilities on March 14, 2003. An additional eight facilities received the mailing over the next several months. Two facilities that originally were expected to report on-line reported using the activity data forms. Conversely, one facility switched from activity forms to on-line reporting. One facility receiving the activity data reporting forms was dropped from further consideration and the Tilcon mobile crusher, which reported using the activity data forms, was removed as a separate facility.

The reporting packages included a cover letter, general facility information page, and the appropriate activity data reporting form(s) for each facility. The general facility information sheet contained preprinted general information about the facility. This information included facility name, mailing address, contact name, SIC and NAICS codes and phone and fax numbers. Facilities made corrections and returned these sheets along with their activity reports.

Those facilities targeted for ammonia refrigeration and chrome plating received activity data reporting forms only for ammonia usage and chrome plating activity, respectively. AQMS did not request data on any other processes that these facilities might have (i.e., a heater or boiler). All other facilities were mailed the appropriate activity data reporting forms for all emission processes at these facilities. Assistance in completing the activity reports was offered on an on-going basis. Assistance was given via telephone calls, e-mail, facsimile and on-site visit.

2.6 Inventory Tracking

A log book was maintained to record and track the reporting status of the 133 facilities receiving a reporting package. The log book contained the facility name and identification number, the facility contact, the date the reporting package was mailed to the facility, the certified mail return receipt number and date it was returned, the original due date, an extension date, if given, the date the submission was received by AQMS, and notes on phone or e-mail communications with the facility.

In addition to the 2002 inventory log book, a Microsoft® Excel spreadsheet was maintained to track each facility from the initial mailing through all tracking and review steps including the final QA/QC process. Communications with facilities are noted in the spreadsheet, especially when facilities failed to meet their deadlines. On several occasions facility management was contacted by AQMS to resolve difficulties and get the reporting process back on track. Besides two facilities that were dropped from further consideration, all facilities supplied either complete emissions data on-line or activity data on hard copy reporting forms.

2.7 Administrative Review

As soon as submissions were received, the review process began. The Administrative Completeness Determination (ACD) was performed as the first step in the review process. The ACD consisted of a one-page checklist which begins the audit trail associated with the review process. The ACD checklist was developed by the AQMS point source inventory staff over many years as a QA/QC tool for ozone SIP inventories. A checklist is completed and maintained in each facility file. An ACD is prepared for all facilities, whether Terminal Server Satellite ***i***-STEPS® or the activity data reporting forms were used to prepare their submission.

2.7.1 On-line Submissions

The ACD performed on on-line submissions included the following steps:

Review cover letter - Facilities were asked to identify in their cover letter any operational changes and the impact such changes had on emissions. AQMS staff reviewed the cover letter noting any significant changes and highlighted it for future reference.

Emissions comparison - The 2002 facility-wide reported emissions for each criteria pollutant were compared to the 1999 Periodic Emission Inventory or to the most current information available. Significant differences between the two years were identified, investigated, and documented. Reviewing past and present detailed reports, process additions and deletions were compared, identified and highlighted for further investigation. If sufficient information was not provided in the cover letter, the facility was contacted to explain the differences. Emission comparisons and operational changes were compiled within a text document, which is included in the supporting documentation.

Accidental releases - Facilities were asked to identify accidental releases either through the assignment of a separate accidental release process or an explanation in their cover letter as to the accounting of the release(s) in their inventory. Throughout 2002, AQMS staff created a file of accidental releases for which DNREC received knowledge through incident reports and news articles. This information was checked against accidental releases identified in the emission inventory reports.

Other ACD checks – AQMS staff verified that the emission certification report (facility summary) was signed by the Responsible Official. Any request for confidential business information was forwarded to the AQMS paralegal staff for review. The tracking spreadsheet was updated to include any communications with the facilities and to document when the ACD was completed for each facility and when all issues, if any, were resolved. The completed ACD, cover letter, signed emissions summary page, submitted supporting calculation sheets, notes and other correspondence (i.e., e-mails) were placed in the facility file.

2.7.2 Activity Data Reporting Forms

Activity data report form information was used to update facility general information and calculate emissions. Information from the activity reports were entered into the Terminal Server

Satellite ***i***-STEPS® database by AQMS staff. The database maintained an audit trail (user identification and date stamp) of data added to the system.

For some activity data, emissions were equated directly to the activity data based on a mass balance approach. For example, all ethylene oxide (EO) used by hospitals for sterilization was assumed to be released to the atmosphere. Therefore, EO emissions were equated to EO purchased. Other activity data were used by the database to calculate emissions based on emission factors contained in the database. Fuel combustion throughputs for small boilers and generators were used in this way. Once emissions were estimated for a facility that reported activity data, the 2002 emissions could be compared to data from previous years.

All Title V permitted facilities are required to submit a signed emissions certification report as part of their permit requirements. For those Title V facilities that reported activity data, the AQMS point source inventory staff generated the emissions summary page based on emissions calculated within ***i***-STEPS® and mailed it to the facility for signature by the Responsible Official. The ACD was not complete until the signed emissions summary page was returned to AQMS and the signature verified. The date the emissions summary page was mailed to a facility was documented within the tracking spreadsheet, as well as the due date for receiving the signed document. Finally, the actual date it was received was recorded.

The tracking spreadsheet was updated to include any communications with the facilities and to document when the ACD was completed for each facility and when all issues, if any, were resolved. The completed ACD, signed emissions summary page, notes and other correspondence (i.e., e-mails) were placed in the facility file. The tracking spreadsheet is included in the supporting documentation accompanying this report.

2.8 Reported Data and Estimating Emissions

The 2002 stationary point source inventory included all criteria pollutants and their precursors (VOC, NO_x, CO, SO_2, PM_{10}-PRI, $PM_{2.5}$-PRI, and NH_3) and all hazardous air pollutants (HAPs). AQMS requested non-combustion HAP data from facilities for the purpose of identifying non-reactive VOCs important to the ozone precursor inventory and to serve as a check for VOC totals.

AQMS required facilities to report data to the process level, identified by an eight-digit Standard Classification Code (SCC). Key data reported included SCC identification, product or fuel throughput, operating schedule, control equipment information (type, capture efficiency and control efficiency), stack parameters (height, diameter, flow rate, velocity and temperature), and emission factors, if FIRE factors were not used. Monthly activity data (throughputs and operating schedules) were reported to provide the temporal resolution needed to calculate summer season daily emissions of VOC, NO_x and CO. Data collected was consistent with EPA's *Procedures Volume I* (EPA, 1991b), the Consolidated Emissions Reporting Rule (EPA, 2002), *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Air Quality Standards (NAAQS) and Regional Haze Regulations* (EPA, 2005) (hereafter referred to as *Emissions Inventory Guidance*), and EIIP documents.

2.8.1 Emission Estimation Methods

Annual emissions could either be calculated within ***i***-STEPS® using uncontrolled emission factors, throughput data, and control data, or outside the system using mass balance, stack tests, or other means. Terminal Server Satellite ***i***-STEPS® allowed for the use of nine emission estimation methods, which are presented in Table 2-2.

Table 2-2. *i*-STEPS® Emission Estimation Methods

***i*-STEPS® Method Code**	**Basis for Emissions Estimate**
1	Stack test data[a]
2	Material balance
3	Use of emission factor outside of ***i***-STEPS® or use of EPA TANKS software
4	Best engineering judgment
5	State or local agency emission factor
6	New construction/not yet operational (zero emissions)
7	Source closed/operation ceased (zero emissions)
8	***i***-STEPS® default emission factor
9	Facility-supplied emission factor

[a] includes Continuous and Predictive Emission Monitoring

Annual emissions are calculated by the database when Method Codes (MC) 8 or 9 is designated. The monthly fuel or process throughput rates obtained from the facility are summed to an annual rate and then applied to the relevant emission factor, either the system default (MC8) or one supplied by the facility (MC9). This calculation produces an annual emissions estimate in tons per year. Annual emissions may be calculated outside of ***i***-STEPS® with only the annual emissions entered in ***i***-STEPS®. Annual emissions calculated outside of ***i***-STEPS® are identified in the database by MC1 through MC4. Facilities were asked when deriving annual emissions from stack tests to take into consideration operating conditions during the stack tests, such as load and control efficiency, and be aware when stack test conditions were not representative of operating conditions in 2002.

For MC8 or MC9, emissions are calculated by the database through the use of a default or facility-supplied emission factor using the following equation for pollutant x:

$$E_a = [(Q_a) * (EF_x) * (FP) / 2000] * (1-CE_x)$$

$$E_d = (Q_a) * (PQ_{ss} /100) / D_{ss}$$

where:

E_a = Annual emissions, tons per year
E_d = Summer season daily emissions, pounds per day
Q_a = Annual process throughput
EF_x = Emission factor for pollutant x

FP	=	Fuel parameter, such as percent sulfur or ash content
CE_x	=	Overall capture and control efficiency
PQ_{ss}	=	Percent summer season throughput
D_{ss}	=	Days operated in the summer season (June, July, and August)

When a facility chooses MC8 for a process, ***i***-STEPS® automatically selects the emission factor associated with the process SCC and calculates the emissions. For MC9, facilities were required to document facility-supplied emission factors. The emission factor must be documented by the facility or otherwise verified by AQMS. If not, AQMS replaced it with the current ***i***-STEPS® SCC emission factor. Facilities may choose to calculate emissions outside of ***i***-STEPS® and enter the emissions using MC3. If an emission factor is used by the facility to calculate the emissions, the factor must be documented by the facility or otherwise verified by AQMS. If not, AMQS changed the record to an MC8.

i-STEPS® is programmed to calculate summer season weekday daily emissions for VOC, NO_x, and CO at the process level. The calculation method involves applying the percentage of annual throughput for the June 1 through August 31 ozone season to the annual emissions estimate. The resulting value is divided by the number of days a process is operated during the ozone season, and then multiplying by 2000 lbs/ton to report daily emissions in pounds. If the emissions were not calculated by the system because of missing or erroneous data needed for the calculation, the system prompts the user to make the necessary corrections.

2.9 Technical Review

Once issues from the completeness determination were resolved, the technical review would begin. The detailed report was the principal document used for the technical review. As with the ACD, the detailed report was printed for each facility and maintained in the facility file. The report included information necessary to check process-level annual emissions and summer season daily emissions for VOC, CO, and NO_x. The report allowed AQMS inventory staff to identify missing, suspicious or conflicting data. Any critical issues were identified and noted on the report. Corrections were made on the report as well as within the database.

Questionable data, missing information, and the correction of errors were handled in several ways. In all cases the AQMS staff maintained a paper or electronic trail of changes made by staff or the facility. When a problem was identified, such as missing data, a typographic error, or other simple errors in the data, a phone call or e-mail to the facility was usually sufficient to resolve and document the issue. Usually no other correspondence was needed. For submissions where there were extensive problems, a facility usually met with AQMS staff to outline the issues and to develop ways to address the problems.

An example of a detailed report is provided in the supporting documentation. The detailed report contains the following information:

- General facility information
- Narrative descriptions of the following: group/point, process, SCC, SCC units, and pollutant;

- Design capacity and standard design capacity units;
- Operating schedule, percent quarterly throughputs, and fuel sulfur and ash content;
- Monthly and annual throughputs provided in the SCC units described;
- Process-level annual emissions for all pollutants for each process;
- Stack ID and parameters;
- Emission calculation method;
- Abatement equipment information, including capture and control efficiencies for each pollutant;
- Calculations and documentation entered by the facility into a Notes field; and
- A summary page of facility-wide annual emissions for each pollutant in the facility's database.

The detailed report contains six sections, including facility general, group/point (emissions unit), process unit (including stack information), process unit controls, process unit emissions and a facility emissions summary. The review of each section is described in detail below.

2.9.1 Facility General

The detailed report includes the following general information: facility name, facility site identification number, mailing address, year of inventory, Standard Industrial Classification (SIC) Code, American Industry Classification System (NAICS), contact person and phone number. Any questionable information, such as SIC, NAICS or an incorrect inventory year, was noted and resolved.

2.9.2 Group/Point (Emissions Unit)

Group information defines a piece of equipment, a group of related processes, or a particular activity at a facility. Data elements provided in this section of the detailed report are reviewed individually and in context with other information in this section.

A description of the equipment or activity is provided along with the design capacity and design capacity units. If the design capacity is missing for combustion equipment, an attempt is made to determine the design capacity of the equipment by reviewing permits or contacting the facility.

The operating schedule was reviewed for missing or inconsistent data. The days per week and weeks per year values were used to determine reasonableness for the number of days operating during the peak ozone season (June, July and August.) As an example, if the process operating schedule was given as seven days per week, 52 weeks per year, then the number of days operated during the peak ozone season would be expected to be 92 days. Although the three month ozone season contains 92 days, 91 days was used as the maximum number of days in the ozone season. The 91 days have historically been used for Delaware ozone SIP inventories and was consistent with early ozone SIP guidance developed by EPA. Hours per day and normal daily start and end times were also provided. The annual hours operated is calculated by ***i***-STEPS® from the hours per day, days per week and weeks per year the facility enters into the system. A facility could override this calculated value by entering the actual number of hours operated for the year, if the facility had accurate records.

The percent quarterly throughput was corroborated with operating information. ***i***-STEPS® enforced a range of between 95 and 101 percent for the sum of the four quarterly throughputs. A review of the database indicated that all sums of the quarterly throughputs were within the range of 98 to 101 percent. In order to be consistent with the National Emissions Inventory system requirements, the first, second and fourth quarter percent throughputs were adjusted so the total would equal 100 percent. The third quarter (summer season) was not adjusted, since it was assumed the facility would have provided an accurate summer season value.

2.9.3 Process Unit

Information provided in this section of the detailed report was reviewed individually and in context with other information in this section and related sections such as the group/point and stack information sections. Process unit information includes the process description, stack identifier, Source Classification Code (SCC), SCC description, percent sulfur and ash (for combustion units), and monthly throughput for most processes.

The process description field is a text field that is used to better define a process than can be defined by the SCC. A determination was made whether the process description provided by the facility was consistent with the SCC description. As an example, the process description may mention No.6 oil for a piece of combustion equipment; and therefore the SCC description must be for combustion equipment burning No.6 oil.

In most cases monthly throughputs were provided by facilities. ***i***-STEPS® sums the monthly throughputs and stores the value in the annual throughput field. In cases where there were significant changes in the group-level emissions as compared to a previous year, the annual throughputs were compared to previous data. The previous annual throughput is written on the detailed report for future reference. If the comparison of throughput explains the difference in emissions, such as fuel switching, or an increase or decrease in fuel usage, this was noted on the Administrative Completeness Determination page and added to the tracking spreadsheet.

Each SCC has associated standard units as defined by EPA in its master list of SCCs and are contained within ***i***-STEPS®. Facilities are given the option within ***i***-STEPS® to change the units to make them appropriate to the data they are reporting. AQMS staff compared the SCC units as reported by the facility to the standard units. If the two values did not match, AQMS staff determined if the revised units were properly applied in the emission calculations.

2.9.4 Stack Parameters

Each stack has an identification number and description assigned by AQMS. The stack parameters provided in the detailed report include height above ground, stack diameter, and exit gas temperature, velocity, and flow rate. If emissions were considered fugitive, then ***i***-STEPS® requires only a stack identification number, a release point type (fugitive) and a height value. A default of ten feet was used for stack height when no fugitive height was provided.

If no stack information was provided for a process unit, AQMS would use stack information provided for the process in previous years and make the appropriate link within ***i***-STEPS®

between the stack and process unit records. If no previous year stack data existed in the database, a stack record was created and linked to the process based on permit file information or subsequent discussions with the facility. During data entry of the process unit record by facilities, Terminal Server Satellite ***i***-STEPS® flashed a warning message, if a stack had not been identified for the process.

2.9.5 Process Unit Control Equipment

The detailed report contained a section for control information for controlled processes. A control device identification number, an EPA control device code, pollutant-specific capture and control efficiencies, and a description of the abatement equipment provided by the facility are displayed in the detailed report.

Control issues were flagged and resolved if possible. VOC and NO_x control devices were evaluated to determine if the control efficiency fell within a range expected for the identified control device.

2.9.6 Process Unit Emissions

Pollutants for each process were listed. The pollutant code (Chemical Abstracts Service number or the National Emission Inventory Input Format (NIF) version 3.0 code), pollutant name, the emission estimation method code, emission factor, the overall capture and control efficiencies, and annual emissions in tons per year are displayed in the detailed report.

The capture and control efficiencies were compared to the process unit control section. Issues associated with pollutant code or capture and control efficiencies were flagged, investigated, and resolved.

This section was flagged for further review if there was a throughput in the process unit section but emissions were not provided. If emissions were expected, but not provided, the process unit emissions for a previous year (usually 1999) were checked. Usually, in cases such as this, the facility provided an explanation in the process unit or process emissions Notes field. An example of this would be when CEMs are used for NO_x emissions from combustion sources that utilize more than one type of fuel. All NO_x emissions would be reported under the major fuel burned. The secondary fuel would have a throughput, but no process unit NO_x emissions.

2.9.7 Facility Pollutant Emissions Summary

Facility-wide emissions for each pollutant were provided in tons per year in this section of the detailed report. This is used primarily for reference, for comparison to other inventory years, or to compare to TRI reported air releases.

2.9.8 Database Queries, Reports and Spreadsheets

Besides the detailed report, numerous database queries, reports and spreadsheets were created to identify information that appeared to be missing, in error or inconsistent with other related information. This included analysis of related operating schedule information. Another analysis

compared the total non-combustion VOC emission estimate for a process to the sum of the individual VOC compounds reported. Air emissions of specific VOCs reported to TRI were compared to the inventory data.

2.9.9 Ozone Season QA/QC Report

The ozone season QA/QC report allowed AQMS staff to identify missing, suspicious or conflicting data needed for the ozone SIP inventory. The report was also used to compare ozone season throughput and operating schedule data to process-level annual emissions for all pollutants listed and process-level ozone season daily emissions for VOC, NO_x and CO. The ozone season QA/QC report expanded on the information provided in the detailed report and presented the ozone SIP information in a more organized and concise form.

The ozone season QA/QC report was also used to identify issues missed in the detailed report review, database queries and spreadsheets, in addition to flagging problems introduced during subsequent modifications and updates to the database. ***i***-STEPS® calculates and stores summer season weekday (SSWD) daily emission values in pounds per day. As a check, the QA/QC report calculates SSWD daily emission values for each process using data in the database independent of the ***i***-STEPS® calculation routine. Both values are printed on the report for comparison. An example of the report is provided in the supporting documentation.

2.9.10 Review of NO_x Emissions from EGUs and Other Large Sources

AQMS staff conducted a review of NO_x emissions from all electric generation units (EGUs) that report emissions data based on CEMs to EPA's Emissions Tracking System (ETS). ETS contains emissions data to EPA's Acid Rain Program and to the Ozone Transport Commission's (OTC) NO_x Budget Program. AQMS staff compared 2002 ETS emissions to emissions reported to AQMS. A spreadsheet was developed for this review and contained the facility name, EGU description, ORIS ID, annual emissions reported to AQMS and to ETS, and the five-month ozone season emissions reported to ETS for the NO_x Budget Program.

There were 17 EGUs that reported under the Acid Rain Program. Emissions from these units could be directly compared to annual emissions reported to AQMS. These units also reported five-month ozone season emissions under the NO_x Budget Program. There were 17 additional units that reported to ETS only under the NO_x Budget Program. For these EGUs, annual emissions are not provided to ETS. For those units that only reported five-month ozone season emissions, an annual estimate was needed to directly compare to the facility reported value. A NO_x emission factor was calculated in pounds of NO_x emissions/MMBtu using the five-month emission amount divided by the heat content of the fuel listed in ETS for the five months. Annual emissions were then calculated by applying this factor to the annual fuel heat content reported in ***i***-STEPS®.

NO_x emission estimates were compared and the results were added to the spreadsheet. Any significant discrepancies were resolved and an explanation added to the spreadsheet. AQMS staff determined annual NO_x emissions in ETS for one unit at Conectiv Edge Moor and one at the Premcor Refinery were significantly inflated due to default maximum load values as required by EPA when the CEM is not functioning properly. AQMS staff worked with these facilities to

determine the best estimate of actual NO_x emissions for the inventory. In another instance a facility included NO_x emissions associated with a testing period of the EGU, which was not reported to EPA.

There were six additional non-EGUs reported under the NO_x Budget Program. These units were located at the Premcor Refinery and were evaluated using the same methodology as above. Three facilities do not report emissions from their EGUs to ETS. These include Invista, City of Seaford, and City of Lewes. Invista used stack test data to develop site-specific emission factors. The City of Seaford used FIRE emission factors within ***i***-STEPS®. The City of Lewes provided fuel throughputs on the activity data report forms and FIRE emission factors were applied by AQMS.

2.10 Methods for Correcting Erroneous Data

Questionable data, missing information, and the correction of errors were addressed in several ways. In all cases AQMS maintained a paper or electronic trail of changes made by staff or the facility. When a problem was identified, such as missing data, typographic error, or other simple errors in the data, a phone call or e-mail usually was sufficient to resolve and document the issue. Usually no other correspondence was needed.

If an issue had a significant impact on the facility's reported total emissions, AQMS may request documentation that the facility acknowledged the change in the emissions. The documentation may be in the form of a letter, e-mail, or facsimile from the facility. Title V facilities were required to resubmit a new emissions summary report signed by the Responsible Official.

For submissions where there were extensive problems, a facility may have been asked to meet with AQMS staff to outline the issues and to develop ways to address the problems. Once issues had been discussed and resolved, the facility may have been asked to resubmit information through the on-line reporting system. AQMS staff would reopen the facility's record within the Terminal Server Satellite ***i***-STEPS® on-line system to allow access for corrections and updates.

If issues were unable to be resolved with the facility, AQMS staff updated or modified the information submitted by the facility to the extent needed to develop emission estimates. This usually was acknowledged in correspondence with the facility.

2.11 Facility Site and Stack Coordinates

Accurate geographical coordinates were essential to the air toxics modeling project. Therefore, coordinates were verified for all facilities that reported for the 2002 inventory. Coordinates were verified through the use of high-resolution aerial photography that DNREC had previously placed in GIS. Existing site coordinates contained in ***i***-STEPS® were plotted and superimposed on the aerial photography. Staff from the Engineering and Compliance (E&C) Branch met with inventory staff and reviewed the resulting facility locations on the aerial photographs. E&C staff were knowledgeable enough with the layout of the facilities they permit to identify them on the photographs. Based on the permitting engineer's advice, the facility point was moved, if

necessary, to place it over the geographic center of emissions activity at the facility. For several facilities, ground reconnaissance was performed to verify a facility's location.

In addition to verifying the site coordinates, many stacks were individually identified on the aerial photographs and points were plotted for these stacks. For stacks and vents that were not able to be identified, the site coordinates were assigned to those stacks by default.

2.12 Database Management

The 2002 point source inventory database was managed using ***i***-STEPS® for Microsoft® SQL Server 5.0 data management system, associated utilities and applications including the Terminal Server Satellite ***i***-STEPS® on-line system and Microsoft® Access. Microsoft® Access was used to create queries and reports from the SQL tables. After the administrative review and a check of reasonableness of the facility-wide emissions were completed for most facilities, a copy of the Terminal Server database was produced as an archive of data reported by the facilities. A second database was created as the 2002 production database for purposes of developing the ozone SIP inventory. This database was accessed and managed using the Agency ***i***-STEPS®.

DNREC's Office of Information Technology (OIT) provides computer network support and routine database management functions. Joseph Handley, Application Support Specialist, of the OIT office served as liaison between AQMS inventory staff and OIT. Mr. Handley also helped with user network, Internet connectivity, and firewall issues.

i-STEPS® utilizes relational databases and contains functions and utilities to maintain database integrity. There are field-sensitive look up tables, and data element and record validation routines that ensure valid data and enforce database integrity. The application also incorporates warning messages for non-critical, but important, ozone SIP inventory data elements and records. The system has a record level audit trail that records changes made to the records, identifies the user and the date the change was made. In addition, there are comment/note windows for each record where text can be added by the user and AQMS staff to clarify information provided or supply additional documentation.

The ***i***-STEPS® data management system allows AQMS staff to identify the type of inventory being developed, in this case an ozone precursor inventory. This designation enforced required fields and record validation routines, and pop-up error and warning messages specific to the ozone inventory. The designation also activated routines that calculated summer season daily emission estimates for VOC, CO and NO_x.

2.13 Final Data Manipulation

Upon completion of the technical review and verification of the data within the production database, AQMS staff removed any non-reactive VOC emissions from the VOC totals and applied rule effectiveness to controlled sources. These two tasks are described below in detail.

2.13.1 Removal of Non-Reactive VOCs

Facilities were required to report speciated non-combustion VOC emissions. The definition of volatile organic compounds within AQMS Regulation 1 (DNREC, 1999) identifies the organic compounds that are considered to be negligibly reactive in the photochemical process of forming ozone. AQMS inventory staff verified whether or not these compounds were included in the process VOC emissions. The non-reactive VOCs were identified and subtracted from the emissions estimates at the process emissions level. This was done prior to rule effectiveness adjustments. Table 2-3 lists the processes with the four highest emissions of reported non-reactive VOC emissions.

Table 2-3. Significant Emissions of Non-Reactive VOCs for 2002

Facility Name	Process	Pollutant	TPY
Maritrans	Crude Oil Lightering	Methane and Ethane	324
General Motors	Misc. Solvent Usage	Acetone	18
DuPont Experimental Station	R&D	Acetone	4.22
Sunoco Refinery	CO_2 Recovery Unit	Methane	4.0

2.13.2 Rule Effectiveness

EPA has had a longstanding requirement that ozone SIP inventories consider and account for rule effectiveness (RE). AQMS staff initially made RE determinations in accordance with the *Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories* (EPA, 1992). Revised RE guidance was published in August 2005 and incorporated into *Emissions Inventory Guidance* (EPA, 2005).

Given the large number of stationary point sources contained within an emission inventory, EPA did not expect that state and local agencies would immediately implement the revised guidance for all sources and source categories. Therefore, for the 2002 inventory, it was acceptable to EPA to use either RE guidance. However, EPA encouraged all state and local agencies to use the revised guidance as soon as possible, because EPA believes it will lead to higher quality emission estimates for controlled sources. AQMS decided to reevaluate processes subject to RE using the revised guidance.

Rule effectiveness, as it pertains to point sources, is meant to adjust emissions upward to account for the inability of process control equipment to always operate to the level required by regulation or as stated by the facility. For point sources, RE is applied to the overall control efficiency of each controlled pollutant at the process level. Therefore, the appropriate RE is based on considerations unique to the controlled source.

Identifying Processes for RE Determination

Delaware's 2002 point source inventory had nearly 1,300 processes with emissions of at least one ozone precursor. Only processes with a control device or an applied control technique were considered for RE. Since there are no controls for VOC emissions from combustion sources, only

non-combustion VOC emission sources were evaluated. Processes evaluated for RE in past inventories were also considered because AQMS has found that facilities sometimes report controlled emissions but do not indicate the controls or control efficiency. Without control information, AQMS may be led to believe the emissions are uncontrolled and thus would not be identified for an RE determination. Finally, due to the significant level of effort to make an RE determination, processes with controlled emissions less than 0.1 tons were not evaluated for RE.

Point Source Rule Effectiveness Criteria

The new RE guidance recommends that State and local agencies assess a facility against a set of factors in each of five RE value ranges. An RE value should be selected from within the range that best characterizes the facility. Within each range there are three tiers of factors in order of importance:

- The most important factors that influence rule effectiveness,
- Other important factors, and
- Other factors.

Each factor is presented below with a description of the general methods employed by AQMS relative to each factor.

<u>Most Important Factors</u>

- Monitoring - AQMS generally relies on parametric data for most facilities unless CEMs (and associated accuracy testing) are required by a regulation. For larger facilities without CEMs, AQMS generally require a stack test every five years.
- Compliance history - Eight quarters of compliance history for calendar years 2001 and 2002 were obtained.

<u>Other Important Factors</u>

- Type of inspection - AQMS often uses stack test data for compliance determinations. AQMS also conducts boiler efficiency tests and collects parametric data (i.e., temperature of a thermal oxidizer, pressure drop across a baghouse, etc.)
- Operation and maintenance (O&M) – O&M records are reviewed during inspections.
- Unannounced inspections – Generally inspections are announced.
- Actions against violators – AQMS has the authority to impose punitive measures against a facility found to be in violation of Delaware's air quality regulations, including Title V and other permitted facilities. Many fines are levied against facilities each year.

<u>Other Factors</u>

- Compliance certification - Most point sources are subject to Title V or other types of compliance certification.

- Inspection frequency - AQMS generally inspects sources more often than is required under the Compliance Monitoring Strategy agreement with EPA Region 3. AQMS is required to perform a TV inspection every 2 years and a SM inspection every 3 years.
- High Profile Violator (HPV) policy - In 2001 and 2002, AQMS was in the early stages of implementing EPA's HPV program.
- Operator training - Formal training for control equipment operators is not implemented consistently and is generally not a permit requirement.
- Media publicity - All enforcement actions are posted to the DNREC website and some of these actions are published in the media.
- Regulatory guidance - Workshops or information package mailings were not done routinely.
- Inspector training – AQMS staff are trained on an as-needed basis.
- Testing methods and schedule - AQMS has specific testing guidelines and schedule, and testing is based on established protocols.
- Follow-up inspections –Follow-up inspections were conducted, when necessary.

Relevant Compliance Information

The new EPA rule effectiveness guidance (EPA, 2005) states, *"The best way to obtain information on the compliance history of a source is to speak with the compliance and enforcement staff at your agency that is most familiar with the facility."* Although the point source inventory staff conducted the RE evaluations, they consulted with staff and managers from the Engineering and Compliance (E&C) Branch of AQMS. Inventory staff requested from the E&C Branch the compliance history as was entered into EPA's Air Facility System (AFS) database for the years 2001 and 2002. The compliance information provided included descriptions and outcomes of on-site inspections, off-site records reviews, cylinder gas audits (CGAs), recent stack tests, and relative accuracy test audits (RATAs). CGAs and RATAs are associated with units equipped with CEMs. Also provided were copies of Delaware's Federal fiscal year 2001, 2002, and 2003 compliance monitoring plans and reports. A spreadsheets was created to compile the compliance evaluations, stack test results, and RATA and CGA information to organize and expedite the RE evaluation. The RE spreadsheet is included with the supporting documentation contained on a CD accompanying this report.

The new EPA rule effectiveness guidance (EPA, 2005) also states, *"First and foremost, an agency responsible for emissions inventory preparation should attempt to obtain facility-specific data from as many sources as possible, and use the collected information to make a refined source or source category RE determination."* Delaware facilities are requested to provide documentation along with the emissions estimates. Facilities were also asked to explain in the cover letter the reasons for significant facility-wide increases or decreases in emissions from previous years. In cases where this information was not provided and this information was needed for the RE evaluation, the facilities were contacted and in most cases the information was provided.

The compliance plans were reviewed as well as the compliance monitoring reports (semi-annual and end-of-year.) Inventory staff met with a manager in the E&C Branch to gain an understanding of AQMS policies and procedures used in compliance evaluations and inspections. The results of the calendar year 2001 and 2002 compliance summary indicate all TV facilities were inspected at least once during the two year period, meeting EPA requirements. In addition, 64 % of TV facilities were

inspected two or more times in the same time period, which is significantly more than EPA requirements. All SM facilities were inspected at least once during the same period and 55% of them were inspected two or more times. The inspection frequency of SM facilities significantly exceeds the EPA requirement of one inspection every three years.

Rule effectiveness determinations made in the 1999 ozone precursor inventory were evaluated to understand the reasons for applying a particular value. If the reasons were still valid, they were considered in light of the new RE guidance document.

When an RE of 100% May Apply

There were several situations where a 100% RE was appropriate and thus no adjustment of the emissions was made. The use of a continuous emission monitor accounts for actual emissions regardless of whether the emissions meet permit limits or stated control device efficiencies. In some instances, the control device or technique had sufficient safeguards to account for any control device equipment failure, such as an automatic shutdown device. For control techniques, such as the use of VOC-compliant paints, the use of mass balance accounted for all possible emissions, as long as the use of compliant paints was verified and there were no add-on controls. Some facilities chose to report an in-use control device efficiency lower than the stated manufacturer's efficiency in order to account for periods of less than optimum control. Other facilities based emission on their permitted control efficiency, which is usually lower than demonstrated efficiencies. Therefore, these facilities were in effect already applying an adjustment to their emissions and AQMS decided to not apply any additional adjustment to the emissions.

Application of RE to CO Sources

The RE evaluation process was organized by pollutant. In the 2002 database, there were 4,600 emission records for VOC, NO_x, and CO, including records with zero reported emissions. Zero emissions existed either because a process did not operate in 2002 or the emissions were assigned to another process. As an example, for a boiler that burns several types of fuel, each boiler/fuel type combination is considered a process. However, emissions may not be known by the facility per each fuel type, as in the case when CEMs are used to determine actual emissions.

There were 1,055 CO emission records in the inventory database; however, only two emission records could be considered controlled. The only source that employed CO controls in 2002 was the Premcor Refinery. The refinery had two CO boilers operating in 2002. In accordance with the *1987-1991 Interim Regional Emission Inventories* (EPA, 1993) these boilers were treated as processes and not as control devices, because they burned CO as a fuel. Therefore, an RE of 100% was used for these boilers.

Application of RE to NO_x Sources

Of the 940 combustion NO_x emissions records, RE was applied to all emission sources having post-combustion NO_x controls, including selective non-catalytic reduction (SNCR) and selective catalytic reduction (SCR). However, emissions from all units in Delaware with post-combustion controls were reported based on CEM data, thus a 100% RE was applied for these units.

Many external combustion boilers had combustion NO_x controls, such as low-NO_x burners, low excess air, flue gas recirculation and over-fire air. Most facilities used the uncontrolled AP-42 emission factors to estimate emissions. The use of uncontrolled emission factors is a conservative estimate of emissions if a low-NO_x burner is used. Either a facility is not taking credit for NO_x combustion controls or the emissions were uncontrolled. Therefore, AQMS staff did not further adjust emissions.

Several facilities used stack tests as the basis for estimating emissions. In these cases, the emission estimates were nearly identical to what the emissions would have been if the uncontrolled emission factors were used. Therefore, emissions were not adjusted. One facility operated two ultra-low-NO_x boilers. Since emissions from these units were monitored through the use of a NO_x CEM, 100% RE applied. One facility identified low-NO_x burners for two boilers and estimated emissions using the controlled low-NO_x burner emission factor. The boilers were relatively new and the facility was found to be in compliance. Given the integral nature of a low-NO_x burner to the combustion process (as opposed to post-combustion control), an RE of 100% was considered appropriate.

Three non-combustion NO_x emissions records were identified in the database, two of which were controlled. Rule effectiveness was applied to both of the controlled sources. Based on the RE evaluation, NO_x emissions were adjusted as follows:

General Chemical - Nitrate production area emissions are reported as having a 15% NO_x control efficiency. The emission estimate was not sufficiently documented. The facility was found out of compliance for 47 off-site compliance evaluations, one on-site evaluation and one full compliance evaluation. Therefore an RE adjustment of 80% was applied to estimate emissions.

SPI Polyols – This facility operates a NO_x scrubber associated with nitric acid usage. Emissions were estimated using undocumented facility information, which appeared to be based on 15 years old stack tests. The control efficiency was stated as 27.7%. Therefore an RE adjustment of 80% was applied to estimate emissions.

The application of rule effectiveness increased statewide NO_x emissions by 0.22 TPY statewide.

Application of RE to VOC Sources

There were 2,602 VOC emission records in the inventory database. Emission records for sources known to be uncontrolled were eliminated from further consideration. As a rule, tanks have some type of control and therefore were retained in the list of emission sources for RE consideration. For reasons mentioned earlier, records with controlled emissions less than or equal to 0.1 TPY were not evaluated for RE adjustment. Including tanks, there were 243 controlled VOC emission records with emissions above 0.1 TPY.

Storage tanks comprised over half of the 243 emissions records. AQMS inventory staff instructed facilities to estimate tank emissions using EPA's TANKS software (EPA, 2003). The software uses chemical, meteorological, roof fitting, and rim seal data to generate emission estimates for several types of storage tanks, including vertical and horizontal fixed roof tanks, internal and external floating roof tanks, domed external floating roof tanks and underground tanks. Emissions for eight VOC emission records were not estimated using the TANKS software. However, in all cases

uncontrolled emission factors were used. The TANKS software does not provide an overall control efficiency to determine uncontrolled emissions needed for RE adjustments. Therefore, AQMS did not apply RE to reported VOC tank emissions.

VOC air emissions data for six facilities reporting to the Toxic Release Inventory were included in the inventory. The chemical-specific TRI information indicated controls at two facilities. However, since process-level data is not available through TRI, there was insufficient information to make an RE determination on these two facilities. Therefore, RE was not applied to TRI-reported emissions.

Once tanks and TRI facilities were removed from further consideration, 87 controlled emission records remained. Of the 87 emission records, an RE of 100% was applied to 70 records (at 29 facilities) while the remaining 17 emission records (at five facilities) were given an RE of less than 100%. In addition to the reasons stated previously for when AQMS selected an RE of 100%, all 29 facilities that received an RE of 100% were in compliance for calendar years 2001 and 2002. Detailed determinations for each of the 29 facilities can be found in the RE/compliance spreadsheet included on the CD accompanying this report.

For the 17 remaining emission records, VOC emissions were adjusted for RE at the following facilities:

Formosa Plastics – The facility based its vinyl chloride monomer emissions on stack tests that were later determined to be invalid. The facility did not perform a second set of stack tests in the required time period. The facility was also found to be out of compliance during four off-site compliance evaluations. The facility could not demonstrate compliance, therefore an RE of 84% was applied to the vinyl chloride incinerators.

FP International - Compliance evaluations of this facility identified numerous deficiencies. One of the deficiencies included operating a regenerative thermal oxidizer (RTO) below the required temperature for 97 three-hour periods. There were also minor RTO outages and the facility did not keep a continuous record of RTO temperatures. While the facility did report accidental releases, which may have account for the RTO outages, the facility could not demonstrate compliance, therefore an RE of 84% was applied to the thermal oxidizer.

GE Energy - The facility was found to be out of compliance during an inspection and the facility was unable to document their stated control efficiency. An RE of 90 % was applied to the print line thermal oxidizer.

Metachem Products - For many years there had been concerns about the emissions reported for numerous processes at Metachem. The facility closed in May 2002 and did not submit a 2002 inventory. AQMS staff calculated 2002 emissions for this facility using production data for 2002 and previous inventory information. In previous inventories, controlled process emissions were adjusted based on an 80% RE. As of the beginning of 2002, the facility was a high profile violator (HPV) and was out of compliance for three on-site compliance evaluations during 2001. Based on these considerations, an RE of 80% was applied to the controlled sources.

Premcor Refinery– Premcor provided one emission estimate for a collection of controlled processes associated with wastewater treatment. For years, the facility has based this overall control

efficiency on a 1993 memorandum which references benzene NESHAP controls. The facility has not provided any documentation on the controls or how the emissions were calculated. An RE of 80% has historically been applied to these processes and was used again for 2002.

The application of rule effectiveness increased statewide VOC emissions by 189 TPY.

Rule Effectiveness Calculations

Where a control device was used and emissions were estimated using an emission factor within ***i***-STEPS®, annual and peak ozone season daily emissions adjusted for RE were calculated using the ***i***-STEPS® emissions calculation utility. Once the RE value was entered into the appropriate field, ***i***-STEPS®automatically calculated the emissions using the *Procedures, Volume I* (EPA, 1991b) relationship.

$$E_{re} = [(Q_a) * (EF_x) / 2000] * [1 - (CE_x * RE)]$$

where:

E_{re}	=	Annual emissions adjusted for RE, tons per year
Q_a	=	Annual process throughput
EF_x	=	Uncontrolled emission factor for pollutant x
CE_x	=	Overall capture and control efficiency
RE	=	Rule effectiveness factor

Where a control device was used and emissions were estimated outside of ***i***-STEPS®, the annual and peak ozone season daily emissions adjusted for RE were calculated using the following equation from *Emissions Inventory Guidance* (EPA, 2005):

$$E_{re} = E_{unc} * [1 - (CE_x * RE)]$$

where:

E_{re}	=	Annual emissions adjusted for RE, tons per year
E_{unc}	=	Uncontrolled emissions
CE_x	=	Overall capture and control efficiency
RE	=	Rule effectiveness factor

In some instances, uncontrolled emissions had to first be calculated from controlled emissions provided using the supplied overall control efficiency as follows:

$$E_{unc} = E_c / (1 - CE_x)$$

where:

E_{unc}	=	Uncontrolled emissions
E_c	=	Controlled emissions
CE_x	=	Overall capture and control efficiency

2.14 NIF File Creation and Review

Once non-reactive VOCs were accounted for and rule effectiveness applied, NIF 3.0 files in Microsoft® Access format were generated from the ***i***-STEPS® database. EPA's Basic Format and Content Checker (versions 3.0 and 3.1) were run numerous times on the eight NIF 3.0 point source inventory Access tables. All issues identified by the checker for mandatory and necessary fields were reviewed and resolved. The resolutions of the issues were as follows:

- A value was in error and the information was corrected; or
- A value was outside ranges determined by EPA, however the value was determined to be reasonable and correct based on information available. Upon completion of the review process less than a dozen records contained data that continued to fall outside the established ranges; or
- The operating hours per year did not match the calculated product of operating hours per day, days per week, and weeks per year. AQMS allows facilities to indicate their actual annual hours of operation independent of the typical operating schedule. Since the difference represents more accurate information, no further action was taken; or
- An SCC was flagged as being invalid. A check of EPA's master list of SCCs indicated the flagged values (five SCCs) are valid, so no further action was taken.

There are some non-mandatory/non-necessary fields of data in the NIF files that were flagged by the checker. Since AQMS does not populate these fields, no further action was taken.

2.15 Source Sector Discussions

All facilities associated with hot-mix asphalt production and electric generation are included in the 2002 ozone precursor point source inventory. Details of these two industry sectors are presented below.

2.15.1 Hot-mix Asphalt Plants

Hot-mix asphalt (also known as asphaltic concrete or blacktop) production facilities have been historically tracked and permitted by the Department as point sources. There were 11 facilities in Delaware in 2002 and these are all included in the point source inventory. Delaware facilities employ both drum mixer and rotary dryer processes in the production of hot-mix asphalt. The appropriate SCCs were used to identify these processes. In 2002, the 11 facilities collectively emitted 27 tons of VOC, 55 tons of NO_x, and 157 tons of CO.

The activity data forms were used to obtain throughput data from hot-mix asphalt plants. Data from the completed forms were entered into ***i***-STEPS® and standard emission factors were used based on the SCC provided by the facility to calculated emissions within ***i***-STEPS®. For one facility, Pure Green Industries, AQMS developed a site-specific emission factor based on recent stack test data, then applied this factor to the asphalt production reported by the facility.

Many of these facilities also had crushing operations powered by diesel engines. The emissions of VOC, NO_x and CO for these diesel engines were estimated based on reported fuel usage and

FIRE 6.24 emission factors. Five Tilcon facilities shared a mobile crusher that moved from facility to facility. Emissions for the mobile crusher were allocated to the Tilcon facility that utilized the crusher the most.

Hot-mix asphalt plants were requested to report their use of cutback asphalt in the manufacturing of "cold patch", which is a product able to remain workable at ambient temperatures. Data on cold patch production were used to estimate VOC emissions from cutback asphalt within the non-point source sector.

2.15.2 Electric Generating Units (EGUs)

Delaware EGUs are represented by two large generating stations (NRG Indian River Power Plant and the Conectiv Edge Moor/Hay Road complex), a number of smaller private and municipal units, two industrial generators (Premcor Refinery and Invista), and several Conectiv peaking units. In total, there are 45 EGUs located at 15 facilities included in the point source inventory. EGUs in Delaware include external combustion boilers, combustion turbines and reciprocating diesel engines. Small diesel generators used by businesses and institutions for emergency backup power and load management are not included in this discussion, and are generally not reported to the point source inventory. 2002 NO_x emissions from EGUs are presented in Table 2-4.

NO_x emissions from all EGUs represent 73% of the statewide annual NOx emissions. While the amount of annual emissions from peaking units is small relative to the large power plants, their contribution to summer season daily emissions can be significant. Most peaking units operate exclusively during the summer, and operation is typically limited to a few hours per week, which significantly increases their daily contribution. In addition, since peaking units are operated to meet periods of high demand, their operation often coincides with very hot and muggy summer days when air quality is most likely to experience an exceedance of the ozone standard.

2.15.3 Emissions by Source Sector

Table 2-5 provides statewide VOC, NO_x, and CO annual and summer season daily emissions grouped by source sector as defined by the first three digits of the SCC codes assigned to each process. The source sectors include various combustion and manufacturing processing, material storage and transfer operations, solvent evaporation, and solid waste disposal.

Petroleum product transfers account for 39% of the statewide point source VOC emissions. Surface coating operations and petroleum industry processes and storage account for 21% and 12% of the statewide VOC emissions, respectively. NO_x emissions are almost exclusively a result of fuel combustion with 96% of the statewide NO_x emissions coming from utilities (see discussion above) and industrial sources. Fuel combustion is responsible for 43% of the statewide CO emissions. One chemical manufacturer emits 30% of the state total CO emissions and refineries account for an additional 11%.

Table 2-4. 2002 NO_x Emissions for Electric Generating Units

Facility Name	Unit Description	NOx	
		TPY	TPD
City of Dover McKee Run	Boiler #1	23	0.39
	Boiler #2	22	0.34
	Boiler #3	345	1.94
City of Dover Van Sant	Turbine	13	0.17
NRG Energy Center Dover	Boiler	484	1.38
	Turbine #1	5	0.15
	Turbine #2	3	0.09
Warren F. Beasley Power Station	Turbine	5	0.04
Kent County Total		**899**	**4.50**
Conectiv Christiana	Turbine #11	13	0.51
	Turbine #14	13	0.52
Conectiv Delaware City	Turbine #10	9	0.31
Conectiv Edge Moor	Boiler #3	748	2.38
	Boiler #4	1,096	3.25
	Boiler #5	1,289	13.94
	Turbine	5	0.31
Conectiv Hay Road	Turbine #1	93	0.50
	Turbine #2	145	0.73
	Turbine #3	205	1.09
	Turbine #5	30	0.21
	Turbine #6	55	0.43
	Turbine #7	38	0.30
Conectiv Madison Street	Turbine	1	0.23
Conectiv West Substation	Turbine	8	0.22
Premcor Refinery (formerly Motiva Enterprises)	Boiler #1	370	1.00
	Boiler #2	205	0.60
	Boiler #3	342	0.97
	Boiler #4	419	1.14
	Turbine #1	63	0.56
	Turbine #2	34	0.20
New Castle County Total		**5,181**	**29.41**
City of Lewes Power Plant	Reciprocating Unit #1	1	0.11
	Reciprocating Unit #2	1	0.11
City of Seaford Power Plant	Reciprocating Unit #1	18	0.17
	Reciprocating Unit #2	17	0.16
	Reciprocating Unit #3	14	0.14
	Reciprocating Unit #4	14	0.14
	Reciprocating Unit #5	0	0
	Reciprocating Unit #6	21	0.23
Invista (formerly DuPont Seaford)	Boiler #1	311	1.50
	Boiler #2	634	2.03
	Boiler #3	547	1.92
NRG Indian River Power Plant	Boiler #1	666	2.43
	Boiler #2	621	2.58
	Boiler #3	663	3.41
	Boiler #4	2,365	8.83
	Turbine #10	4	0.32
Sussex County Total		**5,897**	**24.09**
STATE TOTAL		**11,977**	**58.00**

Table 2-5. 2002 Annual VOC, NO_X, and CO Emissions by Industry Sector

SCC	SCC Description	TPY		
		VOC	NO_X	CO
101	External Comb. Boilers - Electric Generation	82	9,172	581
102	External Combustion Boilers - Industrial	264	5,610	3,311
103	Ex. Comb. Boilers – Comm./Institutional	7	152	92
105	External Comb. Boilers - Space Heaters	2	36	10
201	Internal Comb. Engines - Electric Generation	20	818	114
202	Internal Combustion Engines - Industrial	3	44	12
203	Internal Combustion Engines – Comm./Inst.	1	14	3
204	Internal Comb. Engines - Engine Testing	2	23	6
301	Chemical Manufacturing	377	88	2,888
302	Food and Agriculture	14	30	3
303	Primary Metal Production	67	125	624
305	Mineral Products	49	44	155
306	Petroleum Industry	467	133	1,013
308	Rubber and Misc. Plastics Products	100	6	< 1
312	Machinery, Misc.	0	0	< 1
315	Photo. Equipment/Health Care/Labs	4	0	0
330	Textile Products	38	0	0
385	Cooling Tower	< 1	0	0
390	In-process Fuel Use	< 1	1	< 1
399	Misc. Manufacturing	19	< 1	< 1
401	Organic Solvent Evaporation	11	0	0
402	Surface Coating Operations	997	8	8
403	Petroleum Product Storage at Refineries	128	0	0
404	Petroleum Liquids Storage (non-Refinery)	10	0	0
405	Printing/Publishing	126	0	0
406	Transport/Marketing of Petroleum Products	1,879	5	13
407	Organic Chemical Storage	9	0	0
408	Organic Chemical Transportation	5	0	0
490	Organic Solvent Evaporation	37	< 1	< 1
501	Solid Waste Disposal - Government	13	1	14
502	Solid Waste Disposal – Comm./Institutional	25	29	84
503	Solid Waste Disposal - Industrial	18	32	664
651	Inorganic Chemicals Manufacturing	< 1	0	0
684	Miscellaneous Processes (Chemicals)	0	0	16
	Statewide Total	**4,773**	**16,372**	**9,612**

2.16 Emissions by Facility

Facility-level annual and summer season daily emissions for the 121 facilities included in the 2002 ozone SIP inventory are provided by county in Tables 2-6 through 2-8. Emissions in these tables have been adjusted for rule effectiveness, where appropriate. For recent facility name changes, the former name is included in parentheses.

Table 2-6. 2002 Facility-Level Annual and SSWD VOC, NO_X, and CO Emissions for Kent County Facilities

Facility Name	VOC		NO_X		CO	
	TPY	TPD	TPY	TPD	TPY	TPD
Camdel Metals	7	0.03	0	0	0	0
City of Dover - McKee Run	4	0.03	392	2.70	35	0.29
City of Dover - Van Sant	< 1	< 0.01	13	0.17	4	0.05
Color-Box (Inland Paperboard and Packaging)	13	0.06	1	< 0.01	< 1	< 0.01
Delaware State University	< 1	< 0.01	4	< 0.01	3	< 0.01
Dover Air Force Base	38	0.10	57	0.15	26	0.05
Dow Reichhold	18	0.05	11	0.02	8	0.02
DSWA Central Landfill	7	0.02	14	0.04	265	0.73
Hanover Foods	< 1	< 0.01	9	< 0.01	1	< 0.01
Harris Manufacturing (General Clothing)	6	0.04	0	0	0	0
Hirsh Industries	19	0.08	1	< 0.01	1	< 0.01
ILC Dover	5	0.01	0	0	0	0
Kent General Hospital	< 1	< 0.01	2	0.01	1	< 0.01
Kraft Foods	< 1	0	7	0	3	0
NRG Energy Center Dover	2	< 0.01	492	1.63	25	0.21
Perdue Farms - Milford	< 1	< 0.01	15	0.06	2	0.01
Proctor & Gamble Dover Wipes	8	0.03	19	0.12	4	0.02
Tilcon - Bay Road	5	0.03	14	0.07	17	0.10
Tilcon - Horsepond Road	1	< 0.01	8	0.04	33	0.16
Warren F. Beasley Power Station	< 1	< 0.01	5	0.04	10	0.09
Kent County Total	**133**	**0.49**	**1,064**	**5.06**	**436**	**1.73**

Table 2-7. 2002 Facility-Level Annual and SSWD VOC, NO_X, and CO Emissions for New Castle County Facilities

Facility Name	VOC		NO_X		CO	
	TPY	TPD	TPY	TPD	TPY	TPD
Agilent - Little Falls (Hewlett-Packard)	1	< 0.01	0	0	0	0
A.I. DuPont Hospital	1	< 0.01	28	0.06	3	0.01
Air Liquide - Delaware City	3	0.01	0	0	5	0.01
American Minerals	16	0.06	1	< 0.01	< 1	< 0.01
Ametek	1	< 0.01	2	< 0.01	2	< 0.01
Amtrak Maintenance Facility	1	< 0.01	3	0.01	2	< 0.01
Arlon	1	< 0.01	0	0	0	0
AstraZeneca Pharmaceuticals	2	< 0.01	14	0.03	9	0.02
Christiana Hospital	1	0.08	36	1.62	4	0.34
Christiana Materials	1	0.01	3	0.03	10	0.06
Ciba Specialty Chemicals	26	0.07	9	0.02	28	0.06
Claymont Steel (Citisteel USA)	67	0.32	125	0.59	624	3.00
Clean Earth of New Castle	11	0.03	18	0.07	2	0.01
Conectiv - Christiana	< 1	< 0.01	26	1.04	< 1	0.01
Conectiv - Delaware City	< 1	< 0.01	9	0.31	< 1	< 0.01
Conectiv - Edge Moor	36	0.23	3,138	19.88	453	2.17
Conectiv - Hay Road	10	0.05	566	3.26	73	0.39
Conectiv - Madison Street	< 1	< 0.01	1	0.23	< 1	< 0.01
Conectiv - West Substation	< 1	< 0.01	8	0.22	< 1	< 0.01
Contractors Materials (New Castle Hot Mix)	2	0.02	2	0.01	9	0.07
Crowell	2	< 0.01	2	0.01	3	0.01
DaimlerChrysler	595	2.17	39	0.07	27	0.04
Dassault Falcon Jet	9	0.03	1	0	1	0
Del. Correctional Center - Smyrna	1	0.01	10	0.14	7	0.04
Delaware Recyclable Products	2	0.01	1	< 0.01	5	0.01
Diamond Materials	4	0.02	4	0.02	16	0.08
DSWA Cherry Island Landfill	12	0.03	< 1	< 0.01	3	0.01
DSWA Pigeon Point Landfill	3	0.01	1	< 0.01	14	0.04
DuPont - Chestnut Run	3	0.01	52	0.18	6	0.02
DuPont - Edge Moor	83	0.27	35	0.29	2,843	9.70
DuPont Experimental Station	8	0.05	208	0.91	22	0.12
DuPont Stine - Haskell Lab	2	0.02	46	0.43	8	0.07
DuPont Building - Wilmington	< 1	< 0.01	24	0.07	3	0.01
E-A-R Specialty Composites	5	0.02	1	< 0.01	< 1	< 0.01
Edgemoor Materials	2	0.01	2	0.01	4	0.02
FMC	< 1	< 0.01	< 1	< 0.01	2	0.01
Formosa Plastics	124	0.32	31	0.08	8	0.01
FP International	33	0.12	1	< 0.01	1	< 0.01
GE Energy – Pencader (Astropower)	14	0.05	0	0	0	0
General Chemical	2	< 0.01	91	0.38	22	0.05
General Motors	334	1.51	56	0.11	19	0.06
Hardcore Composites	< 1	< 0.01	0	0	0	0
Hercules Research Center	1	0.01	31	0.13	3	0.01

Continued next page

Table 2-7. continued

Facility Name	VOC		NO_X		CO	
	TPY	TPD	TPY	TPD	TPY	TPD
Honeywell International (Allied-Signal)	46	0.16	0	0	0	0
International Petroleum	6	0.02	5	0.04	1	0.01
Kaneka	19	0.05	5	0.01	67	0.18
Lafarge	10	0.05	69	0.32	27	0.13
Laidlaw	14	0.14	0	0	0	0
MacDermid	9	0.04	1	< 0.01	< 1	0
Magellan Terminals (Delaware Terminal)	1	< 0.01	4	0.01	1	< 0.01
Medal Air Liquide	1	< 0.01	0	0	0	0
Metachem Products (Standard Chlorine of Delaware)	20	0	0	0	0	0
Noramco	2	< 0.01	2	0.01	4	0.01
NVF Yorklyn	1	< 0.01	16	0.06	13	0.05
Occidental Chemical	1	0.01	48	0.25	28	0.16
Premcor Refinery (Motiva Enterprises)	829	2.35	3,555	10.59	3,858	14.66
Premcor Bulk Terminal (Motiva)	29	0.08	0	0	0	0
Printpack	107	0.28	4	0.01	4	0.01
PTFE Compounds	14	0.07	0	0	0	0
Pure Green Industries	< 1	< 0.01	1	0.04	2	0.02
Rohm & Haas Electronic Materials (Rodel)	23	0.10	5	0.08	3	0.02
Spatz Fiberglass	2	0.01	0	0	0	0
SPI Polyols	2	< 0.01	150	0.37	49	0.13
St. Francis Hospital	< 1	< 0.01	3	0.01	3	< 0.01
Sunoco	50	0.14	610	1.76	182	0.53
Tilcon - Terminal Avenue	3	0.02	4	0.02	13	0.07
Uniqema	11	0.04	3	0.01	5	0.02
Unisource Worldwide	13	0.05	1	< 0.01	< 1	< 0.01
University of Delaware - Newark	5	0.02	23	0.08	17	0.06
Veterans Administration Hospital	< 1	< 0.01	4	0.01	3	0.01
VPI Film (American Mirrex)	20	0.06	5	0.01	0	0
Westvaco	10	0.03	< 1	0	< 1	0
Wilmington Hospital	1	0.01	9	0.14	5	0.04
Wilmington Piece Dye	21	0.10	2	0.01	2	0.01
Wilmington WWTP	< 1	< 0.01	3	0.01	2	0.01
New Castle County Total	**2,687**	**9.42**	**9,157**	**44.09**	**8,530**	**32.60**

Table 2-8. 2002 Facility-Level Annual and SSWD VOC, NO_X, and CO Emissions for Sussex County Facilities

Facility Name	VOC		NO_X		CO	
	TPY	TPD	TPY	TPD	TPY	TPD
Allen Family Foods	< 1	< 0.01	7	0.02	1	< 0.01
Allen's Milling	< 1	< 0.01	10	0.03	3	0.01
City of Lewes Power Plant	< 1	0.01	3	0.21	1	0.06
City of Seaford Power Plant	4	0.04	83	0.85	18	0.18
DSWA Southern Landfill	9	0.02	20	0.05	263	0.72
Invista (DuPont Seaford)	14	0.04	1,563	5.67	43	0.13
Johnson Polymers	< 1	< 0.01	< 1	< 0.01	< 1	< 0.01
Justin Tanks	16	0.04	< 1	0	< 1	0
Kaye Construction	< 1	< 0.01	7	0.06	23	0.13
Marble Works	1	< 0.01	0	0	0	0
Maritrans	1,836	12.90	0	0	0	0
Mil-Del	2	0.01	0	0	0	0
Milford Memorial Hospital	< 1	< 0.01	3	0.04	1	0.01
Mountaire Farms - Frankford	< 1	< 0.01	10	0.02	1	< 0.01
Mountaire Farms - Millsboro	< 1	< 0.01	27	0.06	3	0.01
Mountaire Farms - Selbyville	< 1	< 0.01	13	0.04	1	< 0.01
Multi-Tech (D&B Industrial Group)	12	0.05	0	0	0	0
NRG Indian River Power Plant	34	0.19	4,320	17.57	249	1.01
Orient	1	0.01	0	0	0	0
Perdue Farms AgriRecycle	< 1	< 0.01	23	0.08	< 1	< 0.01
Perdue Farms - Bridgeville	< 1	< 0.01	8	0.02	1	< 0.01
Perdue Farms - Georgetown	< 1	< 0.01	20	0.08	2	0.01
Pinnacle Foods (Vlasic Foods)	12	0.04	9	0.04	1	< 0.01
Sea Watch International	< 1	< 0.01	15	0.07	3	0.02
Tilcon - Georgetown	3	0.02	6	0.03	14	0.06
Tilcon – Gumboro (I.A. Construction)	4	0.02	3	0.02	16	0.08
Sussex County Total	**1,952**	**13.40**	**6,151**	**24.95**	**645**	**2.44**

2.16.1 Sources of VOC Emissions

VOCs are emitted from a wide variety of combustion and non-combustion sources in Delaware. The largest point source of VOC emissions for 2002 is the crude oil lightering operation reported by Maritrans that occurs at an anchorage in the middle of the Delaware Bay within the boundaries of Sussex County. The emissions occur when crude oil is pumped from a supertanker to barges to reduce the draft of the supertanker so it is able to reach ports further up the river. The emissions are a result of the displacement of organic vapors within the barge when crude oil is transferred to the barge. Maritrans accounts for 38.5% of the statewide VOC emissions.

The second largest source of VOC emissions is the Premcor Refinery and its accompanying bulk terminal. The refinery and bulk terminal report emissions for several hundred processes, although only a few processes account for a large majority of emissions (85%), including the catalytic cracking unit, the fluidized coking unit, the wastewater treatment plant, and storage tanks. The third and fourth largest sources of VOC emissions in 2002 are the two automotive

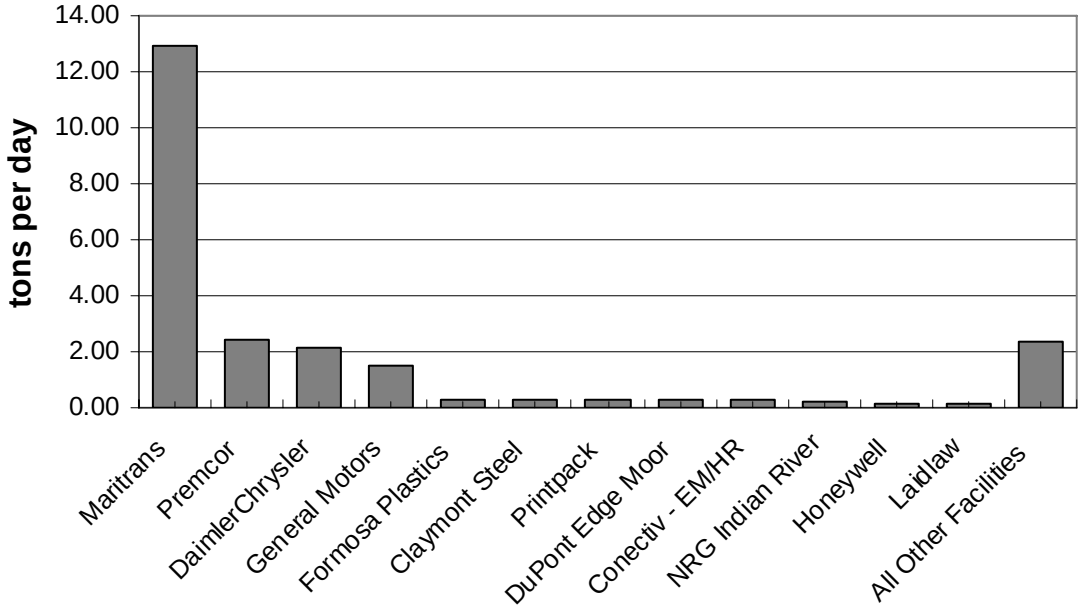
assembly plants in Delaware, DaimlerChrysler and General Motors, respectively. Coating operations represent the bulk of emissions from these two facilities.

The top twelve VOC sources, representing 90% of statewide VOC SSWD daily emissions for 2002 from point sources, are presented in Table 2-9 and in Figure 2-1.

Table 2-9. 2002 Facility Ranking of VOC SSWD Emissions

Facility Name	Major Activity	VOC	
		TPD	TPY
Maritrans	Crude Oil Lightering	12.90	1,836
Premcor Refinery & Terminal	Petroleum Refinery	2.43	858
DaimlerChrysler	Automotive Assembly Plant	2.17	595
General Motors	Automotive Assembly Plant	1.51	334
Formosa Plastics	PVC Manufacturing	0.32	124
Claymont Steel	Steel Manufacturing	0.32	67
Conectiv Edge Moor/ Hay Road	Electricity Generation	0.28	46
Printpack	Plastic Film Printing	0.28	107
DuPont Edge Moor	Titanium Dioxide Manufacturing	0.27	83
NRG Indian River Power Plant	Electricity Generation	0.19	34
Honeywell International	Specialty Chemicals	0.16	46
Laidlaw	Metal Wire Coating	0.14	14
All Other Facilities		2.33	630
Statewide Total		**23.31**	**4,773**

Figure 2-1. 2002 VOC SSWD Emissions by Facility



2.16.2 Sources of NO_x Emissions

As presented in Section 2.15.2, NO_x emissions from Delaware point sources are primarily from electricity generation. The two large electricity generation stations in Delaware, NRG Indian River Power Plant and the Conectiv Edge Moor/Hay Road complex, are the largest and second largest NO_x point sources for 2002. The third largest source of NO_x emissions is the Premcor refinery. A large majority of emissions (75%) from the refinery come from just a few processes, including the catalytic cracking unit, the fluidized coking unit, and four boilers used for electricity generation. The fourth largest source of NO_x emissions is the Invista nylon manufacturing facility (formerly DuPont Seaford). The facility operates three coal-fired boilers to create heat and electricity for use at the plant. These boilers emit more than 95% of the NO_x emissions reported by the facility for 2002.

The top ten NO_x sources, representing 90% of statewide NO_x SSWD daily emissions for 2002 from point sources, are presented in Table 2-10 and in Figure 2-2.

Table 2-10. 2002 Facility Ranking of NO_x SSWD Emissions

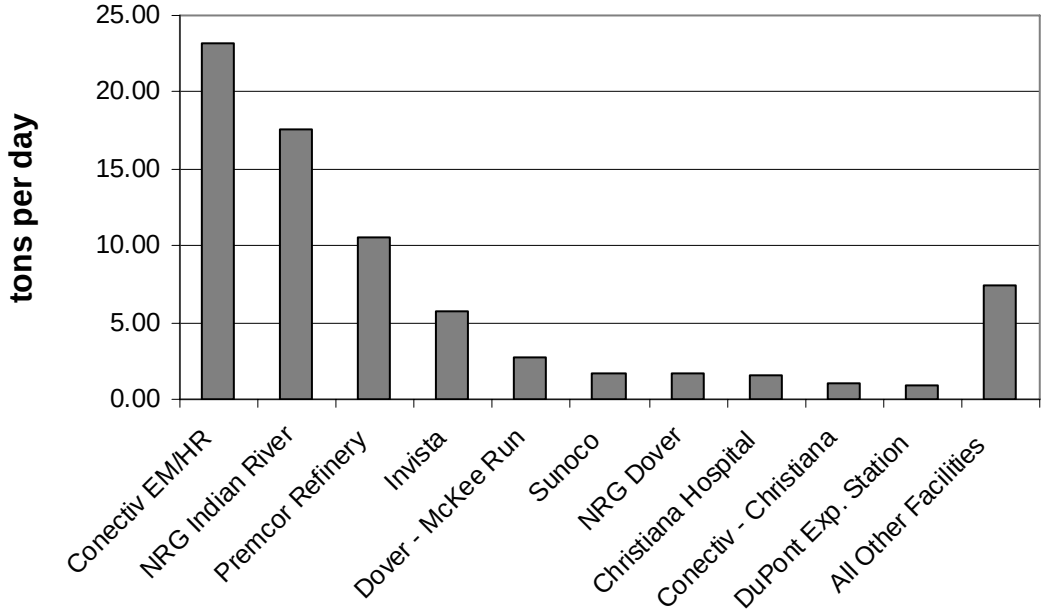
Facility Name	Major Activity	NO_x	
		TPD	TPY
Conectiv Edge Moor/Hay Road	Electricity Generation	23.13	3,704
NRG Indian River Power Plant	Electricity Generation	17.57	4,320
Premcor Refinery & Terminal	Petroleum Refinery	10.59	3,555
Invista	Nylon Production/Cogeneration	5.67	1,563
City of Dover McKee Run	Electricity Generation	2.70	392
Sunoco	Petroleum Refinery	1.76	610
NRG Energy Center Dover	Electricity Generation	1.63	492
Christiana Hospital	Health Care	1.62	36
Conectiv Christiana	Electricity Generation	1.04	26
DuPont Experimental Station	R&D Hazardous Waste Incinerator	0.91	208
All Other Facilities		7.47	1,467
Statewide Total		**74.09**	**16,372**

2.16.3 Sources of CO Emissions

CO is typically formed during combustion processes. Most combustion units produce mostly carbon dioxide (CO_2) since CO emissions represent incomplete combustion and loss of efficiency. Large quantities of CO emissions may result from combustion processes operating at lower than normal temperature, short residence time, and/or under starved-air conditions.

The largest point source of CO emissions for 2002 is the Premcor Refinery. Over 90% of CO emissions from the refinery come from the catalytic cracking unit, the fluidized coking unit, and several gas flares. The refinery limits the emissions from the cracking and coking units by routing exhaust gases from these processes through CO boilers, which convert the CO into CO_2. The second largest CO source is the DuPont Edge Moor titanium dioxide plant. The manufacturing of titanium dioxide through the roasting of titanium rich ore forms large quantities of CO.

Figure 2-2. 2002 NO_x SSWD Emissions by Facility

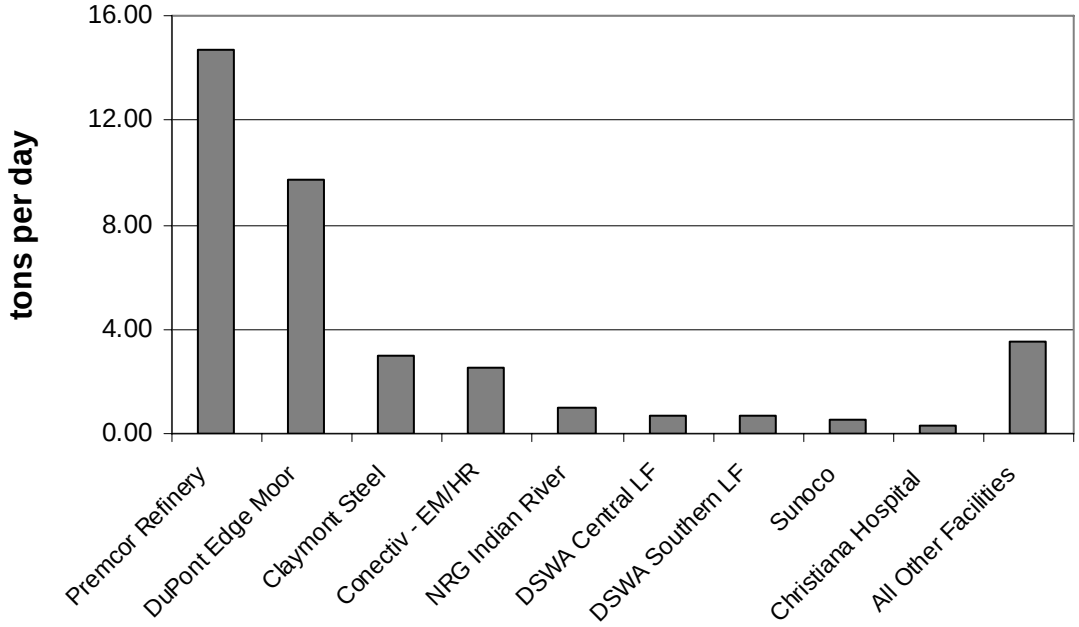


The top nine CO sources, representing 90% of statewide CO SSWD daily emissions for 2002 from point sources, are presented in Table 2-11 and in Figure 2-3.

Table 2-11. 2002 Facility Ranking of CO SSWD Emissions

Facility Name	Major Activity	CO	
		TPD	TPY
Premcor Refinery & Terminal	Petroleum Refinery	14.66	3,858
DuPont Edge Moor	Titanium Dioxide Manufacturing	9.70	2,843
Claymont Steel	Steel Manufacturing	3.00	624
Conectiv Edge Moor/Hay Road	Electricity Generation	2.56	525
NRG Indian River Power Plant	Electricity Generation	1.01	249
DSWA Central Landfill	Municipal Solid Waste Landfill	0.73	265
DSWA Southern Landfill	Municipal Solid Waste Landfill	0.72	263
Sunoco	Petroleum Refinery	0.53	182
Christiana Hospital	Health Care	0.34	4
All Other Facilities		3.53	798
Statewide Total		**36.77**	**9,612**

Figure 2-3. 2002 CO SSWD Emissions by Facility



2.17 Facilities Since Closed

Several facilities included in the 2002 ozone SIP inventory have permanently closed. Table 2-12 presents a list of closed facilities and the month and year operations ceased.

Table 2-12. Facilities That Have Ceased Operations

Facility Name	Date Closed
Metachem Products	May 2002
Lafarge	November 2002
Westvaco	May 2003
Kaneka	July 2003
VPI Film	July 2003
Wilmington Piece Dye	September 2003
General Chemical	June 2004
Conectiv - Madison Street	December 2004
Ametek	October 2005
Tilcon - Horsepond Road	December 2005

2.18 References

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