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NORTHEAST CORRIDOR REGIONAL MODELING PROJECT ANNUAL EMISSION INVENTORY COMPILATION AND FORMATTING

Volume III: Delaware Emission Inventory

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Volume III: Delaware Emission Inventory

by
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This report has been reviewed by the Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, and approved for publication as received from GCA Corporation, Bedford, MA. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use. Copies of this report are available from the Air Management Technology Branch, Monitoring and Data Analysis Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

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INTRODUCTION

BACKGROUND

On a nationwide basis, nonattainment of the National Ambient Air Quality Standard (NAAQS) for ozone is one of the most serious and widespread air pollution problems facing the air quality management community. The Northeast Corridor, a megalopolis of urban and suburban areas extending from Washington to Boston, bears a large extent of the ozone problem. The United States Environmental Protection Agency (USEPA), in cooperation with the northeastern states, local agencies and Metropolitan Planning Organizations (MPOs), has undertaken the Northeast Corridor Regional Modeling Project (NECRMP) to develop regional and urban ozone control strategies through the use of photochemical air quality simulation models.

To employ a regional model, an inventory of point and area source emissions covering the entire NECRMP study area had to be assembled and placed into a common format. Unfortunately, existing data bases were inadequate to either properly test or validate a regional model. To this end, USEPA's Office of Air Quality Planning and Standards retained GCA/Technology Division to complete an annual inventory for use in NECRMP. The study area shown in Figure 1, includes the entire northeast quadrant of the United States from longitude 69 degrees to 84 degrees West, and latitude 45 degrees to 38 degrees North.

OBJECTIVES

The objective of the effort reported in this volume was to assemble the most current, comprehensive and accurate emission inventory possible for the State of Delaware. This was achieved through the cooperation of the Delaware Division of Environmental Control (DDEC) and U.S. EPA/Region III. The intent of the program was to avoid direct contact between GCA and individual facilities in Delaware. Rather, GCA worked directly with the DDEC who in turn contacted sources when necessary. GCA reviewed the State supplied data and submitted a list of potential errors back to the DDEC, who was responsible for confirming the data or supplying corrections, as necessary.

The major pollutants of interest were VOC and NO_x although TSP, SO_x, and CO emissions were also compiled for point sources. Because of this emphasis, quality assurance checks focused primarily on sources of VOC and NO_x.

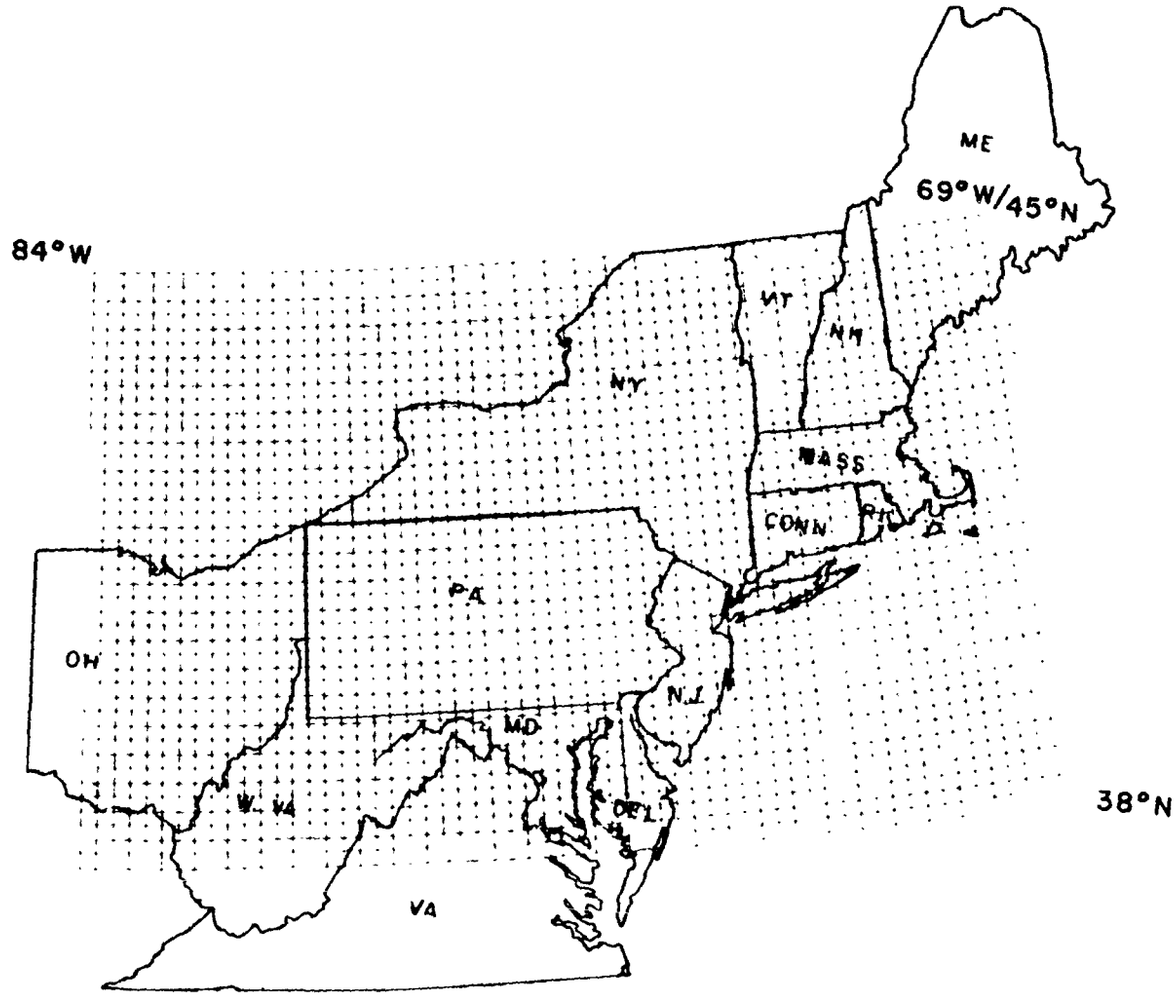

Figure 1. Boundaries of regional model grid system.

The completed inventories were computerized for further use in the NECRMP study. Point source data were computerized in the format specified in the Emission Inventory System/Point Source (EIS/PS) User's Guide[1] and area source data were coded into EIS/AS[2] format.

REPORT ORGANIZATION

The results of the NECRMP annual emission inventory are reported in an 18 volume set of documents. Volume I in this series describes the background of the program and discusses the methods used to compile and verify the annual emission inventory. Volumes II through XVI present a more detailed discussion of each state's inventory effort. Volume XVII describes the spatial, temporal, and species allocation factors developed to allow for the creation of modeler's tapes from the completed inventory. Volume XVIII presents a summary of the point and area source inventories for the entire study area. Also included in Volume XVIII is a detailed analysis of the overall quality of the data base and an assessment of the data's suitability for photochemical modeling. A directory of the NECRMP annual emission inventory reports is presented in Table 1.

This volume, which presents a discussion of the annual emission inventory for Delaware, consists of five sections. Section 2 describes the project history and includes a summary of the major events that relate to the Delaware inventory development. Section 3 discusses in greater detail the point source inventory task while the area source inventory development is covered in Section 4. All references cited in the volume are identifed in Section 5. Appendices A and B present county emissions for point and area sources, respectively.

TABLE 1. DIRECTORY OF THE NECRMP ANNUAL REGIONAL EMISSION INVENTORY REPORTS

Volume	Contents
I	Project Approach
II	Connecticut Emission Inventory
III	Delaware Emission Inventory
IV	Maine Emission Inventory
V	Maryland Emission Inventory
VI	Massachusetts Emission Inventory
VII	New Hampshire Emission Inventory
VIII	New Jersey Emission Inventory
IX	New York Emission Inventory
X	Ohio Emission Inventory
XI	Pennsylvania Emission Inventory
XII	Rhode Island Emission Inventory
XIII	Vermont Emission Inventory
XIV	Virginia Emission Inventory
XV	Washington, DC Emission Inventory
XVI	West Virginia Emission Inventory
XVII	Development of Allocation Factors
XVIII	Inventory Review and Evaluation

SECTION 2

PROJECT HISTORY

AGENCY CONTACTS

The EPA Project Officer provided agency contacts in the Delaware Division of Environmental Control (DDEC) and the Environmental Protection Agency's Region III Office (EPA/Region III). The DDEC contact was responsible for confirming data, supplying required corrections or additional data, interfacing with individual sources as necessary, and concurring on the comprehensiveness and accuracy of the final data base. The agency also provided information, as needed, to assist in a detailed review of the point source data for errors, inconsistencies and missing data elements.

Since Delaware is not in attainment of the National Ambient Air Quality Standard (NAAQS) for ozone (O_3), the DDEC was required to develop point and area source emission inventories for use in their 1982 State Implementation Plan (SIP) Revision. While the Agency intended to submit a 1980 base year point source inventory, they planned to utilize projections of a 1976 base year area source inventory.[3] Since one of the program objectives was to avoid projections of emission data older than 1978,[4] GCA developed a 1980 base year area source inventory for NECRMP. The DDEC contact played a key role in this process by directly supplying some input data necessary for the area source calculations, and identifying other state agencies which could provide the remaining information. The DDEC contact was Mr. Samuel Eaton, (302) 736-4791.

SUMMARY OF EVENTS

Summaries of the major milestones pertaining to the Delaware portion of the NECRMP inventory are provided separately for the point source and area source data, as follows:

Point Sources

Most work on the Delaware point source inventory occurred between June and August 1981. In November, data for two major facilities were significantly modified by the DDEC. GCA received a computer tape containing these modifications in January 1982. The modifications were then reflected in a revised EIS/PS Master File which was forwarded to EPA on 2 March 1982. Major milestones are identified below.

- Computer tape sent to Delaware for 1980 EIS/P&R Inventory 4/10/81
- EIS/P&R Inventory sent to GCA 5/26/81
- List of possibly omitted sources sent to Delaware 6/30/81
- Lists of potential errors sent to Delaware 7/13/81
- Responses on potential omissions sent to GCA 7/16/81
- Error resolution meeting held in Dover, Delaware 7/21/81
- EIS/PS Master File (1980) completed 8/3/81
- Completed EIS/PS Master File sent to EPA 9/21/81
- GCA notified concerning revisions to point source inventory 11/24/81
- Revised EIS/P&R inventory sent to GCA 1/8/82
- EIS/PS Master File revised to reflect modifications 2/2/82
- Revised EIS/PS Master File sent to EPA 3/2/82

Area Sources

The Delaware area source inventory was developed by GCA during the period between January and September 1981. While most of the effort was concentrated between January and April, the area source inventory had to be "balanced" with the point source data, which were not available until May. Major events are identified below:

- Begin procurement of input data 1/5/81
- Emissions calculated by category (except those dependent on point source data) 2/27/81
- Completed categories sent to Delaware for concurrence 5/6/81
- Balance with point source data (i.e., adjust area source totals to avoid double accounting of overlapping point source totals) 7/10/81
- Error resolution meeting held in Dover, Delaware 7/21/81
- Delaware responses on area source inventory received 8/5/81
- Revised mobile source data supplied 11/6/81
- EIS/AS Master File completed 11/13/81
- Completed EIS/AS inventory forwarded to Project Officer 2/8/82

SECTION 3

POINT SOURCE INVENTORY

DATA PROCUREMENT

A computer tape containing the Delaware 1980 point source inventory was procured from the Delaware Division of Environmental Control (DDEC) on May 26, 1981. The inventory was sent in EIS/P&R format and contained data on 1,277 individual emission points at 472 facilities. Since Delaware is not in attainment of the National Ambient Air Quality Standard (NAAQS) for ozone (O_3), the inventory was developed by the DDEC to be used for both the 1982 Ozone State Implementation Plan (SIP) Revision and the NECRMP study.

DATA REVIEW AND UPDATE

The 1980 EIS/P&R file was first converted into NEDS format to allow utilization of the GCA-modified version of the NEDS to EIS/PS Conversion-Editor[1] described previously in Volume I.[5] The data were then subjected to the quality assurance (QA) measures presented in Volume I.[5]

One QA measure involved cross-checking the VOC sources listed in the RACT Directory[6] against those facilities included in the Delaware inventory to identify possible omissions. Table 2 lists sources identified as being listed in the RACT Directory, but not in the Delaware inventory, and the DDEC's resolution of these potential omissions.[7]

TABLE 2. DELAWARE SOURCES LISTED IN THE RACT DIRECTORY[6] BUT NOT IN THE DELAWARE INVENTORY

Source type	Name	Location	Resolution
Packaging Rotogravure and Flexographic Printing	American Can Co.	New Castle	Source no longer operational
	Free Flow Packaging	Newark	Insignificant source

A manual review was undertaken of all sources emitting more than 100 tons/yr of VOC or NO_x or 500 tons/yr of any other criteria pollutant. In addition, all "error," "conditional," or "warning" messages resulting from the conversion of data from NEDS format to EIS/PS format were examined.

In general, the Delaware inventory was found to be complete and exceptionally well prepared. A few minor problems were detected, however, regarding UTM errors and duplicate SCCs at single points.

A list of questions and/or problems related to the Delaware inventory was forwarded to the DDEC and a visit to that Agency was made to resolve these questions on July 21, 1981. All corrections, additions, and deletions resulting from that visit were coded on NEDS coding forms in compliance with the instructions given in AEROS, Volume II.[8] The NEDS update transactions were edited and translated into EIS/PS update transactions using the NEDS to EIS Conversion-Editor. The EIS/PS Masterfile was updated using the EIS/PS update transactions and the EIS/PS Masterfile Maintenance Program. A detailed list of the changes, additions, and deletions performed is provided in Table 3.

On January 8, 1982, the Delaware DEC provided more current data on two major point sources, General Motors and Chrysler.[9] The new data were screened for errors and used to replace the earlier EIS/PS Master File records for those two plants.

RESULTS

For reporting purposes, point source emissions for 1980 were aggregated into 70 categories based on specific SCC-SIC combinations. A complete description of the codes used to aggregate emissions is presented in Volume I.[5] For points with multiple SCCs, no attempt was made to split emissions into more than one category. In these instances, the primary SCC was used to account for all emissions at that point.

Statewide point source emissions for 1980 are presented, by category, in Table 4. County-specific point source emissions are presented, by category, in Appendix A.

A list of "major" facilities was developed by totaling emissions at each facility using a criteria of 100 tons/yr of VOC or NO_x to define a major source. These facilities, and their reported 1980 emissions for all five criteria pollutants, are presented in Table 5.

Final Data Tape

The first completed Delaware point source inventory was written onto computer tape for delivery to EPA. Included on the tape, which was forwarded on September 21, 1981, were the following files:

- Original NEDS file, as converted from EIS/P&R (1980)
- Updated 1980 NEDS file (after manual updates)

TABLE 3. CORRECTIONS MADE TO THE DELAWARE POINT SOURCE INVENTORY

Facility	EIS facility ID	Update action taken	Comment
Kent County (0060)			
Dover AFB	0001	Add compliance, ECAP codes	Incomplete master file record
Warren Brothers	0014	Change SCC	
Milford Middle School	0054	Change UTM X and Y	
Milford Senior High	0055	Change UTM X and Y	
Smyrna Elementary	0061	Change UTM X and Y	
New Castle County (0180)			
DuPont-Edgemore	0010	Change SCCs Add stack height Add flow rate Change % annual thruput	
DuPont-Newport	0013	Add plume data Delete SCC	 Duplicate
Electric Hose and Rubber	0014	Delete Source	No data
General Motors	0015	Change % annual thruput Add plume data	
Getty Oil	0016	Change UTM-X Add plume data	
Phoenix Steel	0019	Delete SCC Delete pt 12	Duplicate Two duplicates of same pt
University of Delaware	0022	Change estimation method	
Stauffer Chemical	0027	Change flow rate Change stack diameter	

(continued)

TABLE 3 (continued)

Facility	EIS facility ID	Update action taken	Comment
Diamond Shamrock	0030	Change SCC	
Amoco Chemical	0038	Add stack parameters Add annual thruputs Add flow rate	
Artic Roofing	0039	Delete source	No data
Del Val	0047	Delete source	No data
Halby Div.	0056	Delete source	No data
Blue Ridge Winkler Textiles	0086	Delete source	No data
C&M Mfg.	0088	Delete source	No data
Delaware Dept. of Corrections	0090	Change UTM X and Y	
W.L. Gore & Assoc.	0103	Delete redundant SCC	Four duplicates
Chrysler Corp.	0128	Add stack data	
Georgia Pacific	0129	Add process rate	
Samuel G. Elbert School	0231	Delete source	No data
G.B. Industries	0293	Add compliance, ECAP codes	Incomplete master file
Sussex County (0240)			
DuPont-Nylon Plant	0002	Add % annual thruput	
Jenkins Food	0009	Add UTM Zone Change UTM-Y	
Seaford Feed	0018	Delete redundant SCC	Duplicate

(continued)

TABLE 3 (continued)

Facility	EIS facility ID	Update action taken	Comment
L.D. Caulk	0023	Change UTM X and Y	
Nanticoke Cleaners	0033	Change UTM-Y	
Milford Memorial High School	0036	Change UTM X and Y	

TABLE 4. DELAWARE POINT SOURCE EMISSIONS (1980) BY CATEGORY-STATEWIDE

GCA / TECHNOLOGY DIVISION
DELAWARE EMISSIONS BY CATEGORY 1980

STATE OR REGION TOTALS

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
1 OIL AND GAS PRODUCTION & PROCESSING	0	0	0	0	0	0
2 SYN. ORGANIC CHEM. STORAGE & TRANSFER	1	0	0	0	20	0
3 GASOLINE AND CRUDE OIL STORAGE	4	0	0	0	29	0
4 SHIP AND BARGE TRANSFER OF VOC	0	0	0	0	0	0
5 BARGE AND TANKER CLEANING	0	0	0	0	0	0
6 BULK GASOLINE TERMINALS	3	0	0	0	66	0
7 GASOLINE BULK PLANTS	1	0	0	0	67	0
8 TANK TRUCK LOADING	1	0	0	0	2	0
9 SERVICE STATION LOADING (STAGE I)	2	0	0	0	0	0
10 SERVICE STATION UNLOADING (STAGE II)	0	0	0	0	0	0
11 OTHERS-(STORAGE, TRANSP., MKT OF VOC)	28	0	0	7	866	0
12 LUBE OIL MANUFACTURE	2	1420	16162	1007	516	2076
13 PETROLEUM REFINERIES	21	2091	9626	1656	5495	136
14 PHARMACEUTICAL MANUFACTURE	7	72	0	0	1	0
15 TEXTILE POLYMERS & RESIN MANUFACTURE	48	306	0	0	1023	0
16 SYNTHETIC FIBER MANUFACTURE	22	54	0	0	548	0
17 ORGANIC CHEMICAL MANUFACTURE	57	53	3354	28	687	0
18 INORGANIC CHEMICAL MANUFACTURE	42	234	2478	0	194	148
19 FERMENTATION PROCESSES	0	0	0	0	0	0
20 VEGETABLE OIL PROCESSING	0	0	0	0	0	0
21 PLASTIC PRODUCTS MANUFACTURE	1	0	0	0	8	0
22 RUBBER TIRE MANUFACTURE	0	0	0	0	0	0
23 SBR RUBBER MANUFACTURE	0	0	0	0	0	0
24 OTHER CHEMICAL MANUFACTURE	107	293	42	50	2099	33
25 IRON AND STEEL MANUFACTURE	29	863	0	0	0	0
26 TOBACCO PRODUCTS	0	0	0	0	0	0
27 FOOD PRODUCTS	38	340	0	0	0	0
28 TEXTILE MILL PRODUCTS	1	0	0	0	28	0
29 LUMBER AND WOOD PRODUCTS	0	0	0	0	0	0
30 PAPER AND ALLIED PRODUCTS	0	0	0	0	0	0
31 STONE,CLAY,GLASS,CONCRETE	35	103	0	9	1	0
32 PRIMARY & SECONDARY METALS & ELECTRICAL	14	20	0	0	0	0
33 FABRICATED METAL PRODUCTS	1	0	0	0	86	0
34 IN-PROCESS FUEL USE	3	13	0	0	0	15
35 OTHERS - (INDUSTRIAL PROCESSES)	18	105	0	0	102	0
36 ADHESIVES	1	0	0	0	0	0
37 IND. SRC. COATING-LARGE APPLIANCES	0	0	0	0	0	0
38 IND. SRC. COATING-MAGNET WIRE	1	0	0	0	17	0
39 IND. SRC. COATING-AUTOMOBILE	25	0	0	0	8217	0
40 IND. SRC. COATING-CANS	0	0	0	0	0	0
41 IND. SRC. COATING-METAL COILS	0	0	0	0	0	0
42 IND. SRC. COATING-PAPER	0	0	0	0	0	0
43 IND. SRC. COATING-FABRIC	0	0	0	0	0	0
44 IND. SRC. COATING-MISC. FURNITURE	0	0	0	0	0	0
45 IND. SRC. COATING-METAL/WOOD PRODUCTS	0	0	0	0	0	0
46 PLASTIC PARTS PAINTING	0	0	0	0	0	0
47 LARGE SHIPS	0	0	0	0	0	0
48 LARGE AIRCRAFT	0	0	0	0	0	0
49 IND. SRC. COATING-MISC.METAL PRODUCTS	1	0	0	0	0	0
50 OTHERS - (INDUSTRIAL SURFACE COATING)	1	0	0	0	19	0

TABLE 4 (continued)

SCA / TECHNOLOGY DIVISION
DELAWARE EMISSIONS BY CATEGORY 1980

STATE OR REGION TOTALS

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
51 DEGREASING	0	0	0	0	0	0
52 DRY CLEANING	1	0	0	0	11	0
53 GRAPHIC ARTS	2	0	0	0	5	0
54 OTHER - (SOLVENT USE)	2	0	0	0	8	0
55 ARCHITECTURAL COATINGS	0	0	0	0	0	0
56 AUTO REFINISHING	0	0	0	0	0	0
57 OTHERS-(NON-INDUSTRIAL SURFACE COATING)	3	0	0	0	5	0
58 EXT. COMB. BOILERS-ELEC. GENERATION	20	34693	87332	34812	312	1454
59 EXT. COMB. BOILERS-INDUSTRIAL	373	1205	11221	4386	109	5212
60 EXT. COMB. BOILERS-COMM/INST	343	187	2235	771	12	37
61 EXT. COMB. SPACE HEATERS-INDUST.	0	0	0	0	0	0
62 EXT. COMB. SPACE HEATERS-COMM.	0	0	0	0	0	0
63 OTHERS-(FUEL COMBUSTION)	11	0	0	0	66	1
64 SOLID WASTE DISPOSAL-GOVT.	3	2	0	1	0	0
65 SOLID WASTE DISPOSAL-COMM/INST	18	3	0	0	0	2
66 SOLID WASTE DISPOSAL-INDUSTRIAL	4	5	3	3	3	10
67 OTHER SOLID WASTE DISPOSAL	0	0	0	0	0	0
68 WASTE SOLVENT RECOVERY PROCESSES	2	4	0	0	0	0
69 STATIONARY INTERNAL COMBUSTION ENGINES	0	0	0	0	0	0
70 NOT CLASSIFIED	0	0	0	0	0	0
STATE OR REGION TOTALS		42066	132463	42730	21222	9126

TABLE 5. DELAWARE SOURCES EMITTING MORE THAN 100 TONS/YEAR OF VOC OR NO_x

NEDRMF 1980 NEDS STATE INVENTORY
LARGE FACILITIES SELECTED
FOR DELAWARE

STATE	COUNTY	AQCR	PLANT	FACILITY	TSP (****)	SO2 (****)	NOX (100)	HC (100)	CO (****)
8	60	46	0001	DOVER AFB	26	553	101	1	6
8	60	46	0002	DOVER POWER PLT WALKER RD DOVER 19901	153	4091	1555	14	81
8	60	46	0007	GENERAL FOOD CORP BOX 600 DOVER DEL	128	1043	133	2	11
8	60	46	0016	DEIGHTON POLYMERS INC PO DRAWER K DOVE	7	277	37	254	3
8	100	45	0007	DELMARVA POWER & LIGHT EDGEMOOR POWER PL	341	15836	12346	104	557
8	100	45	0006	DEL CITY POWER PLANT DP&L 800 KING ST WI	210	29855	5407	25	239
8	180	45	0010	DUPONT DE NEMOURS & CO EDGEMOOR PLANT	331	1001	396	8	5020
8	180	45	0011	E I DUPONT EXPERIMENTAL STATION 19898	31	314	146	94	44
8	180	45	0013	E I DUPONT & COMPANY NEWPORT PIGMENTS PL	27	167	59	854	5
8	180	45	0015	GEN MOTORS BOX 1512 WILMINGTON 19899	40	246	104	5201	7
8	180	45	0016	GETTY OIL CO DELAWARE CITY 19706	3511	25798	2663	6785	2214
8	180	45	0018	NATL VULCAN, FIBER CO YORKLYN 19736	6	265	106	2	9
8	180	45	0019	PHOENIX STEEL CORP,CLAYMONT 19703	774	190	134	7	16
8	180	45	0021	SUNOLIN CHEM CO,PCA F, CLAYMONT 19703	151	1706	1088	316	74
8	180	45	0027	STAUFFER CHEM PVC PLANT BOX 320 DEL CITY	242	64	42	869	10
8	180	45	0030	DIAMOND SHAMROCK CHEM RIVER RD DEL CITY	407	68	130	351	19
8	180	45	0038	AMOCO CHEM BOX 312 NEW CASTLE DE	180	509	192	1242	16
8	180	45	0058	TCI AMERICA IN,ATLAS PT,NEW CASTLE 19720	87	212	167	58	12
8	180	45	0074	STANDARD CHLORINE OF DEL DEL CITY 19706	18	125	79	367	17
8	180	45	0093	CROWN ZELLERBACH RIVER RD BOX 312 N CAST	2	14	8	134	0
8	180	45	0126	CHRYSLER CORP PO BOX 179 NEWARK DEL	45	291	120	3005	6
8	180	45	0291	DELAWARE TERMINAL COMPANY WILMINGTON	2	18	7	117	0
8	240	46	0001	DELMARVA POWR INDIAN RIVER MILLSBORO	16960	30394	13766	140	471
8	240	46	0002	E I DUPONT NYLON PLT SEAFORD 19973	17117	8258	1845	579	110
8	240	46	0004	TOWNSEND'S INC MILLSBORO 19966	36	526	102	2	9
				TOTALS	40832	121873	40797	29531	8958

- EIS/PS Master file (1980)
- 1980 NEDS file (translated from final EIS Master File)
- NEDS update transactions (1980)

After revising the EIS/PS Master File to reflect updates made to the two major facilities discussed earlier, the final EIS/PS Master File was forwarded to EPA on March 2, 1982.

Further evaluation of this inventory and improvements made can be found in Volume XVIII.

SECTION 4

AREA SOURCE INVENTORY DEVELOPMENT

OBJECTIVES

The area source emission inventory task entailed reviewing area source inventories prepared by the states for technical accuracy and consistency with EPA-prescribed procedures and developing these area source inventories where state-developed inventories were unavailable. The major objective of this effort was to ensure that all emissions of VOC and NO_x were accounted for and that the procedures used to develop the inventories were consistent from state to state. It was also important that the inventories be disaggregated into sufficient categories to allow for application of temporal and pollutant allocation factors and the evaluation of control scenarios in subsequent modeling efforts.

When contacted in December 1980, the Delaware DEC indicated that they intended to utilize projections of a 1976 base year inventory for their 1982 State Implementation Plan Revision.[3] Since one of the program objectives was to avoid data older than 1978,[4] GCA developed the Delaware area source inventory for the NECRMP study.

METHODOLOGIES

GCA developed a 1980 area source inventory of VOC and NO_x emissions using state-supplied and published activity data, AP-42[10] and other EPA-approved emission factors, and methodologies generally consistent with the Procedures for the Preparation of Emission Inventories for Volatile Organic Compounds--Volume I, Second Edition.[11]

Procedures[11] lists multiple methodologies for a number of the area source categories inventoried. To maintain consistency from state-to-state, GCA selected methods, from Procedures,[11] to be used to compile and verify all NECRMP area source emission inventories. These recommended methods are documented in Volume I.[5]

Area source emissions of VOC and NO_x were calculated for each county for 54 individual categories. While the intention was to estimate total VOC, for maximum compatibility with the regional model to be used in the NECRMP, this was not always possible. For several area source categories,

only reactive (nonmethane) VOC emission factors were available. Table 6 presents the 54 area source categories inventoried and designates whether the VOC emissions inventoried in each category represent total or reactive VOC.

Area source activity data and emission factors used to develop the Delaware emission inventory originated from a number of sources. Table 7 presents a matrix of:

- The 54 area source categories inventoried
- The source activity or surrogate indicator on which emissions estimates were based
- The source of these activity rate estimates
- The emission factors used
- The source of these emission factors

DEVIATIONS FROM THE VOLUME I METHODOLOGIES

For some area source categories, the methodologies reported in Volume I[5] had to be modified to accommodate the source activity data available for Delaware. Additionally, the quality of existing activity data sometimes necessitated making certain assumptions or adjusting older data to 1980. The assumptions, adjustments, and deviations from the Volume I methodologies are discussed below. The information supplied here is supplemental to the general methodology descriptions presented in Volume I.[5]

Gasoline Marketing Operations

Statewide 1979 gasoline sales for Delaware were obtained from Highway Statistics.[12] Statewide estimates of 1980 sales were developed based on actual 1979 sales and the FHwA predicted change for 1980.[13] County-specific estimates were derived by apportioning statewide sales to counties on the basis of the number of gasoline service stations in each county.[14]

Composite emission factors were calculated for two gasoline marketing categories, service station loading (Stage I evaporation) and tank truck loading and transit. These factors were developed based on AP-42 factors and the assumption that both service stations and tanker trucks are comprised of 25 percent splash loading tanks and 75 percent submerged fill tanks.[11] Derivations of these composite emission factors are further explained in Volume I.[5]

Cutback Asphalt Paving

The Delaware Department of Transportation--Division of Highways provided county-specific cutback and emulsified asphalt usage statistics for 1980.[15] Also included in these data were the solvent type and content for each asphalt type. Emissions were calculated independently for each asphalt type using the following equation:

TABLE 6. AREA SOURCE CATEGORIES INVENTORIED FOR DELAWARE

EIS/AS Category No.	Category description	Pollutants inventoried
001	Stage I Gasoline Evaporation	TVOC
002	Stage II Gasoline Evaporation	TVOC
003	Storage Tank Breathing	TVOC
004	Gasoline Loading/Transit	TVOC
005	Small Industrial/Commercial Degreasing	RVOC
006	Dry Cleaning	RVOC
007	Architectual Surface Coating	RVOC
008	Auto Body Refinishing	RVOC
009	Small Industrial Surface Coating	TVOC
010	Graphic Arts	RVOC
011	Commercial/Consumer Solvent Use	RVOC
012	Cutback Asphalt	RVOC
013	Pesticides	RVOC
014	On-Highway Light Duty Vehicles	RVOC NO_x
015	On-Highway Light Duty Trucks--Class I	RVOC NO_x
016	On-Highway Light Duty Trucks--Class II	RVOC NO_x
017	On-Highway Heavy Duty Gas Trucks	RVOC NO_x
018	On-Highway Heavy Duty Diesel Trucks	RVOC NO_x
019	On-Highway Motorcycles	RVOC NO_x
020	Residential Anthracite Coal	TVOC NO_x
021	Residential Bituminous Coal	TVOC NO_x
022	Residential Residual Oil	TVOC NO_x
023	Residential Distillate	TVOC NO_x
024	Residential Natural Gas	TVOC NO_x
025	Residential LPG	TVOC NO_x
026	Residential Wood	RVOC NO_x
027	Commercial/Institutional Anthracite	TVOC NO_x
028	Commercial/Institutional Bituminous	TVOC NO_x

(continued)

TABLE 6 (continued)

EIS/AS category No.	Category description	Pollutants inventoried
029	Commercial/Institutional Residual Oil	TVOC NO_x
030	Commercial/Institutional Distillate Oil	TVOC NO_x
031	Commercial/Institutional Natural Gas	TVOC NO_x
032	Commercial/Institutional LPG	TVOC NO_x
033	Commercial/Institutional Wood/other	TVOC NO_x
034	Industrial Anthracite	TVOC NO_x
035	Industrial Bituminous	TVOC NO_x
036	Industrial Residual Oil	TVOC NO_x
037	Industrial Distillate Oil	TVOC NO_x
038	Industrial Natural Gas	TVOC NO_x
039	Industrial LPG	TVOC NO_x
040	Industrial Wood/other	TVOC NO_x
041	Military Aircraft	TVOC NO_x
042	Civil Aircraft	TVOC NO_x
043	Commercial Aircraft	TVOC NO_x
044	Railroad Locomotives	TVOC NO_x
045	Gasoline Powered Vessels	TVOC NO_x
046	Distillate Oil Powered Vessels	TVOC NO_x
047	Residual Oil Powered Vessels	TVOC NO_x
048	Off Highway Vehicles--Gas	TVOC NO_x
049	Off Highway Vehicles--Diesel	TVOC NO_x
050	Onsite Incineration	TVOC NO_x
051	Open Burning	TVOC NO_x
052	Structural Fires	TVOC NO_x
053	Field/Slash Burning	TVOC NO_x
054	Forest Fires	TVOC NO_x

TABLE 7. DELAWARE 1980 AREA SOURCE INVENTORY DATA SOURCES

EIS/AS category No.	Category description	Activity rate basis	Activity rate source	Emissions factors		Emission factor source[a]
				VOC	NO_x	
001	Stage I Gasoline Evaporation	Gasoline Delivered	Highway Statistics	8.35#/10^3gal	-	AP-42; Table 4.4-4
002	Stage II Gasoline Evaporation	Gasoline Taxed	Highway Statistics	9.7#/10^3gal	-	AP-42; Table 4.4-4
003	Gasoline Tank Breathing	Gasoline Delivered	Highway Statistics	1.0#/10^3gal	-	AP-42; Table 4.4-4
004	Gasoline Loading/Transit	Gasoline Delivered	Highway Statistics	6.87#/10^3gal	-	AP-42; Table 4.4-3
005	Small Industrial/Commercial Degreasing	Population	1980 Census	7.59#/capita	-	GCA, based on EPA-450/2-78-045a
006	Dry Cleaning	Population	1980 Census	1.5#/capita	-	EPA-450/2-77-028 (2nd Ed.)
007	Architectural Surface Coating	Population	1980 Census	4.6#/capita	-	EPA-450/2-77-028 (2nd Ed.)
008	Auto Body Refinishing	Population	1980 Census	1.9#/capita	-	EPA-450/2-77-028 (2nd Ed.)
009	Small Industrial Surface Coating	Coating applied	Nat. Paint & Coating Assoc.	1175#/ton	-	AP-42; Table 4.2-1
010	Graphic Arts	Population	1980 Census	0.8#/capita	-	EPA-450/2-77-028 (2nd Ed.)
011	Commercial/consumer solvent use	Population	1980 Census	6.3#/capita	-	EPA-450/2-77-028 (2nd Ed.)
012	Cutback Asphalt	Tons applied	Delaware DOT	County-Specific	-	GCA Calc. based on AP-42; Table 4.5-1
013	Pesticides	Acreage Harvested	Delaware Dept. of Agriculture	3.5 #/acre	-	EPA-450/2-77-028 (2nd Ed.)
014	On Highway-Light Duty Vehicles	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
015	On Highway-Light Duty Trucks--I	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
016	On Highway-Light Duty Trucks--II	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
017	On Highway-Heavy Duty Gas Trucks	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
018	On Highway-Heavy Duty Diesel Trucks	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
019	On Highway-Motorcycles	Vehicle Miles Traveled	Delaware DOT	County-Specific	County-Specific	MOBILE2, GCA calculations
020	Residential Anthracite Combustion	Tons burned	GCA (based on EPA-450/2-77-028)	2.5#/ton	3.0#/ton	AP-42; Table 1.2-1
021	Residential Bituminous Combustion	Tons burned	GCA (based on EPA-450/2-77-028)	3.0#/ton	6.0#/ton	AP-42; Table 1.1-2
022	Residential Residual Oil Combustion	N/A	N/A	N/A	N/A	N/A
023	Residential Distillate Oil Combustion	Gallons burned	GCA (based on EPA-450/2-77-028)	1.0#/10^3gal	18#/10^3gal	AP-42; Table 1.3-1
024	Residential Natural Gas Combustion	Cubic feet burned	GCA (based on EPA-450/2-77-028)	8.0#/10^6ft^3	80#/10^6ft^3	AP-42; Table 1.4-1
025	Residential LPG Combustion	Gallons burned	GCA (based on EPA-450/2-77-028)	0.75#/10^3gal	7.5#10^3gal	AP-42; Table 1.5-1
026	Residential Wood Combustion	Tons burned	GCA (based on EPA-450/2-77-028)	5.0#/ton	1.0#/ton	AP-42; Table 1.9-1
027	Comm/Inst Anthracite Combustion	Tons burned	EPA-450/4-80-028	Negligible	10#/ton	AP-42; Table 1.2-1
028	Comm/Inst Bituminous Combustion	Tons burned	U.S. Dept. of Energy	3#/ton	6#/ton	AP-42; Table 1.1-2
029	Comm/Inst Residual Oil Combustion	Gallons burned	U.S. Dept. of Energy	1#/10^3gal	60#/10^3gal	AP-42; Table 1.3-1
030	Comm/Inst Distillate Oil Combustion	Gallons burned	U.S. Dept. of Energy	1#/10^3gal	22#/10^3gal	AP-42; Table 1.3-1
031	Comm/Inst Natural Gas Combustion	Cubic feet burned	AGA-Gas Facts	8#/10^6ft^3	120#/10^6ft^3	AP-42; Table 1.4-1
032	Comm/Inst LPG Combustion	Gallons burned	U.S. Dept. of Energy	0.75#/10^3gal	11#/10^3gal	AP-42; Table 1.5-1
033	Comm/Inst Wood Combustion	Tons burned	EPA-450/4-80-028	36#/ton	10#/ton	AP-42; Table 1.6-1

(continued)

TABLE 7 (continued)

EIS/AS category No.	Category description	Activity rate basis	Activity rate source	Emissions factors		Emission factor source[a]
				VOC	NO_x	
034	Industrial Anthracite Combustion	Tons burned	EPA-450/4-80-028	Negligible	18#/ton	AP-42; Table 1.2-1
035	Industrial Bituminous Combustion	Tons burned	U.S. Dept. of Energy	1#/ton	15#/ton	AP-42; Table 1.1-2
036	Industrial Residual Oil Combustion	Gallons burned	U.S. Dept. of Energy	1#/10^3gal	60#/10^3gal	AP-42; Table 1.3-1
037	Industrial Distillate Oil Combustion	Gallons burned	U.S. Dept. of Energy	1#/10^3gal	22#/10^3gal	AP-42; Table 1.3-1
038	Industrial Natural Gas Combustion	Cubic feet burned	AGA-Gas Facts	3#/10^6ft^3	175#/10^6ft^3	AP-42; Table 1.4-I
039	Industrial LPG Combustion	Gallons burned	U.S. Dept. of Energy	0.3 #/10^3gal	11.65#/10^3gal	AP-42; Table 1.5-1
040	Industrial Wood Combustion	Tons burned	EPA-450/4-80-028	36#/ton	10#/ton	AP-42; 1.6-1
041	Military Aircraft	LTO Cycles	FAA	27.1#/LTO	9.16#/LTO	EPA/NADB
042	Civil Aircraft	LTO Cycles	FAA	0.41#/LTO	0.028#/LTO	EPA/NADB
043	Commercial Aircraft	LTO Cycles	FAA	30.66#/LTO	26.93#/LTO	EPA/NADB
044	Railroad Locomotives	Oil used	U.S. Dept. of Energy	94#/10^3gal	370#/10^3gal	AP-42; Table 3.2.2-1
045	Vessels--Gasoline	Gallons used	Delaware Fish and Wildlife Division (based on EPA-450/2-77-028)	623.42#/10^3 gal	65.06#/10^3gal	GCA (based on AP-42; Tables 3.2.3-5, 6)
046	Vessels--Distillate oil	Gallons	GCA (based on on USDOE)	50#/10^3gal	270#/10^3gal	AP-42; Table 3.2.3-1
047	Vessels--Residual Oil	Gallons used	GCA (based on on USDOE)	1.72#/10^3gal	63.6 #/10^3gal	AP-42; Table 3.2.3-2
048	Off Highway--Gasoline Vehicles	Gallons used	EPA-450/4-80-028	267.24#/10^3gal	105.98#/10^3gal	GCA (based on AP-42)
049	Off Highway--Diesel Vehicles	Gallons used	EPA-450/4-80-028	39#/10^3gal	421#/10^3gal	GCA (based on AP-42)
050	Onsite Incineration	Tons incinerated	Delaware DEC	38#/ton	2.5#/ton	GCA (based on data from EPA/NADB)
051	Open Burning	Tons burned	EPA-450/2-77-028	29.1#/ton	5.55#/ton	GCA (based on data from EPA/NADB)
052	Structural Fires	Number of fires	Delaware Fire Marshall	107#/fire	17#/fire	EPA/NADB
053	Field/Slash Burning	Acres burned	Delaware Forestry Service	23.5#/fire	4#/acre	GCA (based on AP-42)
054	Forest Fires	Acres burned	Delaware Forestry Service	261.02#/acre	43.21#/acre	GCA (based on AP-42)

[a]When AP-42 is designated, the latest factors through supplement 12 were used.

$$\text{Emissions}_i \text{ (ton/yr)} = [(\text{gallons of asphalt}_i)\ (\text{solvent content } \%_i)\ (\text{solvent density } \#/\text{gal}_i)\ (\%\ \text{of solvent evaporated}_i)]$$

where Gallons of asphalt = state supplied usage of asphalt$_i$

Solvent content % = state supplied diluent content for asphalt$_i$

Solvent density = 6.1 #/gal for naptha; 6.8 #/gal for kerosene

% solvent evaporated = 70% for medium cure (kerosene); 95% for rapid cure (naptha)

County emissions were calculated as the sum of the emissions from each individual asphalt type used in that county.

Pesticide Application

Data on harvested acreage, by county, for 1978 was available from the Delaware Department of Agriculture.[16] At the Department contact's suggestion, no change in acreage was assumed to occur between 1978 and 1980. Emissions were calculated assuming 3.5 # VOC/harvested acre.[11]

On Highway Motor Vehicles

County-specific vehicle miles traveled (VMT) data for 1979 were available from the Delaware Department of Transportation.[17] At the suggestion of the Delaware DOT, no change in VMT through 1980 was assumed.[18]

Emissions were calculated using emission factors derived from the MOBILE2 emission model employing the VMT distribution, speed, temperature, and cold/hot start assumptions presented in Volume I.[5]

Residential Fuel Combustion

Fuel used in the residential sector was estimated using the equations presented in Reference 11. The number of housing units using each individual fuel type were determined using the following equation:

$$H_{i\ 80} = H_{i\ 70} \left(\frac{H_{T\ 80}}{H_{T\ 70}} \right)$$

where $H_{i\ 80}$ = Number of housing units using fuel type i in 1980

$H_{i\ 70}$ = Number of housing units using fuel type i in 1970 (from the 1970 Census of Housing)

$H_{T\ 80}$ = Number of total housing units in 1980 (from the 1980 Census)

$H_{T\ 70}$ = Number of total housing units in 1970 (from the 1970 Census)

This method, used in lieu of fuel-specific data for 1980, assumes an insignificant change in fuel mix from 1970 to 1980. The emission factor for LPG was derived assuming a 1:1 ratio of propane to butane. Emission factors for the remaining fuels were obtained directly from AP-42.

Commercial/Institutional and Industrial Fuel Combustion

To determine area source fuel use in the commercial/institutional and industrial sectors, the following approach was used. Total statewide fuel use was available for 1978 or 1979 from the sources listed in Table 7. Historical data back to 1970 were obtained from earlier versions of the same references. Total 1980 fuel use was estimated through linear regression of the 1970 to 1978/79 data. For each fuel, area source use in the commercial/institutional and industrial sectors was calculated using the following equation:

$$C/I \ \& \ I_{80-x} = (T_{80-x}) - (R_{80-x}) - (P_{80-x})$$

where $C/I \ \& \ I_{80-x}$ = Commercial/Institutional and Industrial area source use of fuel x in 1980

T_{80-x} = Total use of fuel-x in 1980 (estimated previously through linear regression)

R_{80-x} = Residential use of fuel-x in 1980 (calculated previously)

P_{80-x} = Point source use of fuel-x in 1980 (determined from point source inventory)

Fuel use calculated using the above equation was split between the commercial and industrial sectors using the distribution of area source fuel use for these two sectors reported in the NEDS Fuel Use Report.[19]

Aircraft Operations

Aircraft landing and takeoff (LTO) data were available for 1979 from the Federal Aviation Administration (FAA). Based on historical FAA data, it was determined that changes in the quantity of LTO operations between 1979 and 1980 in Delaware were probably insignificant. Therefore, 1979 data were assumed to approximate 1980 statistics. Composite emissions factors for civil, commercial, and military aircraft LTOs were obtained from EPA/NADB.[19]

Railroad Locomotives

Historical data on sales of fuel oil to railroads from 1970 to 1978 were available from the sources listed in Table 11. The 1980 statewide use was determined through linear regression. County-specific use was determined by apportioning statewide use to counties on the basis of railroad right-of-way, measured from state rail line maps.

On-Site Incineration

According to the Delaware DEC,[21] all on-site incinerators are covered by Delaware operating permits and are, thus, all accounted for in the point source inventory. It was therefore assumed that area source emissions were insignificant.

Structural Fires

The Delaware State Fire Marshall's Office was unable to provide an estimate of the number of structural fires in Delaware during 1980. The EPA default factor of 6 fires/1000 population[11] was used with composite emission factors supplied by EPA/NADB[22] and the 1980 Census[23] to estimate emissions from structural fires.

DEVELOPMENT OF EIS/AS MASTER FILE

After emissions were calculated for all area source categories on a countywide basis, the completed inventory was coded and keypunched in EIS/AS format and subjected to the series of computerized QA checks included in the EIS/AS System.[2] The completed Master file was then manually verified for accuracy before the finalized data were written onto computer tape for delivery to EPA.

RESULTS

Statewide totals of 1980 VOC and NO_x emissions from area sources in Delaware are provided in Table 8. County summaries of area source emissions are presented in Appendix B.

TABLE 8. ANNUAL EMISSIONS (1980) OF VOC AND NO_X FROM AREA SOURCES IN DELAWARE

GCA / TECHNOLOGY DIVISION
AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

STATE SUMMARY

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
001	STAGE I GASOLINE EVAP	293034	THOUS GAL			
				NOX		0
				VOC		1223
002	STAGE II GASOLINE EVAP	285945	THOUS GAL			
				NOX		0
				VOC		1386
003	STORAGE TANK BREATHING	293034	THOUS GAL			
				NOX		0
				VOC		147
004	GASOLINE LOADING/TRANSIT	293034	THOUS GAL			
				NOX		0
				VOC		1006
005	SM IND/COMM DEGREASING	594779	POPULATION			
				NOX		0
				VOC		2257
006	DRY CLEANING	0	**********			
				NOX		0
				VOC		269
007	ARCH SURFACE COATING	594779	POPULATION			
				NOX		0
				VOC		1368
008	AUTO BODY REFINISHING	594779	POPULATION			
				NOX		0
				VOC		566
010	GRAPHIC ARTS	594779	POPULATION			
				NOX		0
				VOC		237
011	COMM/CONS SOLVENT USE	594779	POPULATION			
				NOX		0
				VOC		1874
012	CUTBACK ASPHALT	370	THOUS GAL			
				NOX		0
				VOC		107
013	PESTICIDES	496756	ACRE			
				NOX		0
				VOC		869
014	ON-HIGHWAY LDV	3196633	THOUS VMT			
				NOX		11974
				VOC		12764

TABLE 8 (continued)

GCA / TECHNOLOGY DIVISION
AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

STATE SUMMARY

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
015	ON-HIGHWAY LDT1	339719	THOUS VMT			
				NOX		1373
				VOC		1409
016	ON-HIGHWAY LDT2	192371	THOUS VMT			
				NOX		885
				VOC		873
017	ON-HIGHWAY HDG	171906	THOUS VMT			
				NOX		2255
				VOC		1899
018	ON-HIGHWAY HDD	135069	THOUS VMT			
				NOX		3668
				VOC		402
019	ON-HIGHWAY MC	36837	THOUS VMT			
				NOX		26
				VOC		268
020	RESIDENTIAL ANTHRACITE	14820	TON			
				NOX		22
				VOC		18
023	RESIDENTIAL DISTILLATE	169484	THOUS GAL			
				NOX		1526
				VOC		84
024	RESIDENTIAL NATURAL GAS	8550	MIL CU FT			
				NOX		341
				VOC		34
025	RESIDENTIAL LPG	16135	THOUS GAL			
				NOX		60
				VOC		6
026	RESIDENTIAL WOOD	42326	TON			
				NOX		22
				VOC		106
029	COMM/INST RESIDUAL OIL	26377	THOUS GAL			
				NOX		791
				VOC		14
032	COMM/INST LPG	21150	THOUS GAL			
				NOX		116
				VOC		8
035	INDUSTRIAL BITUMINOUS	170571	TON			
				NOX		1279
				VOC		85

TABLE 8 (continued)

GCA / TECHNOLOGY DIVISION
AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

STATE SUMMARY

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
036	INDUSTRIAL RESIDUAL OIL	105515	THOUS GAL			
				NOX		3165
				VOC		53
041	MILITARY AIRCRAFT	44615	LND/TAKE OFF			
				NOX		205
				VOC		604
042	CIVIL AIRCRAFT	836215	LND/TAKE OFF			
				NOX		12
				VOC		171
043	COMMERCIAL AIRCRAFT	1360	LND/TAKE OFF			
				NOX		28
				VOC		13
044	RAILROAD LOCOMOTIVES	840	THOUS GAL			
				NOX		155
				VOC		40
045	VESSELS - GASOLINE	4494	THOUS GAL			
				NOX		146
				VOC		1400
046	VESSELS - DISTILLATE OIL	4934	THOUS GAL			
				NOX		666
				VOC		123
047	VESSELS - RESIDUAL OIL	1621	THOUS GAL			
				NOX		52
				VOC		1
048	OFF-HIGHWAY VEHICLES-GAS	7604	THOUS GAL			
				NOX		402
				VOC		1015
049	OFF-HIGHWAY VEH - DIESEL	52866	THOUS GAL			
				NOX		11133
				VOC		1033
052	STRUCTURAL FIRES	3569	FIRES			
				NOX		30
				VOC		191
053	FIELD/SLASH BURNING	156512	TON			
				NOX		312
				VOC		1800
054	FOREST FIRES	222	ACRE			
				NOX		5
				VOC		29

TABLE 8 (continued)

GCA / TECHNOLOGY DIVISION
AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

STATE SUMMARY

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
STATE OR REGION TOTALS						
				NOX		40649
				VOC		35743

Asterisks in units column indicates that the same units were not used in all three Delaware Counties. Emission in Sussex and Kent Counties from Dry Cleaning were calculated based on population while in New Castle County emissions were available from the Delaware DEC, which were based on the number of Dry Cleaning establishments.

SECTION 5

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APPENDIX A

POINT SOURCE EMISSIONS BY CATEGORY FOR THE DELAWARE COUNTIES

Table A-1 presents point source emissions, by category, for each of the Delaware counties, which are identified below.

County	EIS/NEDS County Code
Kent	0060
New Castle	0180
Sussex	0240

TABLE A-1. COUNTY SUMMARIES OF POINT SOURCE EMISSIONS (1980) FOR DELAWARE

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:*OEO

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
1 OIL AND GAS PRODUCTION & PROCESSING	0	0	0	0	0	0
2 SYN. ORGANIC CHEM. STORAGE & TRANSFER	0	0	0	0	0	0
3 GASOLINE AND CRUDE OIL STORAGE	1	0	0	0	23	0
4 SHIP AND BARGE TRANSFER OF VOC	0	0	0	0	0	0
5 BARGE AND TANKER CLEANING	0	0	0	0	0	0
6 BULK GASOLINE TERMINALS	2	0	0	0	0	0
7 GASOLINE BULK PLANTS	0	0	0	0	0	0
8 TANK TRUCK LOADING	0	0	0	0	0	0
9 SERVICE STATION LOADING (STAGE I)	0	0	0	0	0	0
10 SERVICE STATION UNLOADING (STAGE II)	0	0	0	0	0	0
11 OTHERS-(STORAGE, TRANSP., MKT OF VOC)	10	0	0	7	13	0
12 LUBE OIL MANUFACTURE	0	0	0	0	0	0
13 PETROLEUM REFINERIES	0	0	0	0	0	0
14 PHARMACEUTICAL MANUFACTURE	0	0	0	0	0	0
15 TEXTILE POLYMERS & RESIN MANUFACTURE	2	0	0	0	0	0
16 SYNTHETIC FIBER MANUFACTURE	0	0	0	0	0	0
17 ORGANIC CHEMICAL MANUFACTURE	0	0	0	0	0	0
18 INORGANIC CHEMICAL MANUFACTURE	0	0	0	0	0	0
19 FERMENTATION PROCESSES	0	0	0	0	0	0
20 VEGETABLE OIL PROCESSING	0	0	0	0	0	0
21 PLASTIC PRODUCTS MANUFACTURE	0	0	0	0	0	0
22 RUBBER TIRE MANUFACTURE	0	0	0	0	0	0
23 SYN RUBBER MANUFACTURE	0	0	0	0	0	0
24 OTHER CHEMICAL MANUFACTURE	10	0	0	0	253	0
25 IRON AND STEEL MANUFACTURE	0	0	0	0	0	0
26 TOBACCO PRODUCTS	0	0	0	0	0	0
27 FOOD PRODUCTS	16	104	0	0	0	0
28 TEXTILE MILL PRODUCTS	0	0	0	0	0	0
29 LUMBER AND WOOD PRODUCTS	0	0	0	0	0	0
30 PAPER AND ALLIED PRODUCTS	0	0	0	0	0	0
31 STONE,CLAY,GLASS,CONCRETE	1	3	0	0	0	0
32 PRIMARY & SECONDARY METALS & ELECTRICAL	0	0	0	0	0	0
33 FABRICATED METAL PRODUCTS	1	0	0	0	86	0
34 IN-PROCESS FUEL USE	0	0	0	0	0	0
35 OTHERS - (INDUSTRIAL PROCESSES)	2	101	0	0	0	0
36 ADHESIVES	0	0	0	0	0	0
37 IND. SFC. COATING-LARGE APPLIANCES	0	0	0	0	0	0
38 IND. SFC. COATING-MAGNET WIRE	0	0	0	0	0	0
39 IND. SFC. COATING-AUTOMOBILE	0	0	0	0	0	0
40 IND. SFC. COATING-CANS	0	0	0	0	0	0
41 IND. SFC. COATING-METAL COILS	0	0	0	0	0	0
42 IND. SFC. COATING-PAPER	0	0	0	0	0	0
43 IND. SFC. COATING-FABRIC	0	0	0	0	0	0
44 IND. SFC. COATING-MISC. FURNITURE	0	0	0	0	0	0
45 IND. SFC. COATING-METAL/WOOD PRODUCTS	0	0	0	0	0	0
46 PLASTIC PARTS PAINTING	0	0	0	0	0	0
47 LARGE SHIPS	0	0	0	0	0	0
48 LARGE AIRCRAFT	0	0	0	0	0	0
49 IND. SFC. COATING-MISC.METAL PRODUCTS	0	0	0	0	0	0
50 OTHERS - (INDUSTRIAL SURFACE COATING)	0	0	0	0	0	0

TABLE A-1 (continued)

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:0060

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
51 DEGREASING	0	0	0	0	0	0
52 DRY CLEANING	0	0	0	0	0	0
53 GRAPHIC ARTS	0	0	0	0	0	0
54 OTHER - (SOLVENT USE)	0	0	0	0	0	0
55 ARCHITECTURAL COATINGS	0	0	0	0	0	0
56 AUTO REFINISHING	0	0	0	0	0	0
57 OTHERS-(NON-INDUSTRIAL SURFACE COATING)	0	0	0	0	0	0
58 EXT. COMB. BOILERS-ELEC. GENERATION	4	153	4051	1555	14	81
59 EXT. COMB. BOILERS-INDUSTRIAL	52	96	1772	287	5	23
60 EXT. COMB. BOILERS-COMM/INST	62	52	841	201	2	11
61 EXT. COMB. SPACE HEATERS-INDUST.	0	0	0	0	0	0
62 EXT. COMB. SPACE HEATERS-COMM.	0	0	0	0	0	0
63 OTHERS-(FUEL COMBUSTION)	0	0	0	0	0	0
64 SOLID WASTE DISPOSAL-GOVT.	0	0	0	0	0	0
65 SOLID WASTE DISPOSAL-COMM/INST	3	0	0	0	0	0
66 SOLID WASTE DISPOSAL-INDUSTRIAL	0	0	0	0	0	0
67 OTHER SOLID WASTE DISPOSAL	0	0	0	0	0	0
68 WASTE SOLVENT RECOVERY PROCESSES	0	0	0	0	0	0
69 STATIONARY INTERNAL COMBUSTION ENGINES	0	0	0	0	0	0
70 NOT CLASSIFIED	0	0	0	0	0	0
COUNTY TOTALS		509	6704	2050	396	115

TABLE A-1 (continued)

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:0180

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
1 OIL AND GAS PRODUCTION & PROCESSING	0	0	0	0	0	0
2 SYN. ORGANIC CHEM. STORAGE & TRANSFER	1	0	0	0	20	0
3 GASOLINE AND CRUDE OIL STORAGE	3	0	0	0	6	0
4 SHIP AND BARGE TRANSFER OF VOC	0	0	0	0	0	0
5 BARGE AND TANKER CLEANING	0	0	0	0	0	0
6 BULK GASOLINE TERMINALS	1	0	0	0	66	0
7 GASOLINE BULK PLANTS	1	0	0	0	67	0
8 TANK TRUCK LOADING	1	0	0	0	2	0
9 SERVICE STATION LOADING (STAGE I)	2	0	0	0	0	0
10 SERVICE STATION UNLOADING (STAGE II)	0	0	0	0	0	0
11 OTHERS-(STORAGE, TRANSP., MKT OF VOC)	6	0	0	0	828	0
12 LUBE OIL MANUFACTURE	2	1420	16162	1007	516	2076
13 PETROLEUM REFINERIES	21	2091	9636	1656	5495	138
14 PHARMACEUTICAL MANUFACTURE	7	72	0	0	1	0
15 TEXTILE POLYMERS & RESIN MANUFACTURE	46	306	0	0	1023	0
16 SYNTHETIC FIBER MANUFACTURE	1	0	0	0	0	0
17 ORGANIC CHEMICAL MANUFACTURE	37	53	3354	28	687	0
18 INORGANIC CHEMICAL MANUFACTURE	42	234	2478	0	194	148
19 FERMENTATION PROCESSES	0	0	0	0	0	0
20 VEGETABLE OIL PROCESSING	0	0	0	0	0	0
21 PLASTIC PRODUCTS MANUFACTURE	0	0	0	0	0	0
22 RUBBER TIRE MANUFACTURE	0	0	0	0	0	0
23 SBR RUBBER MANUFACTURE	0	0	0	0	0	0
24 OTHER CHEMICAL MANUFACTURE	97	293	42	50	2446	33
25 IRON AND STEEL MANUFACTURE	29	863	0	0	0	0
26 TCE/CCE PRODUCTS	0	0	0	0	0	0
27 FOOD PRODUCTS	1	0	0	0	0	0
28 TEXTILE MILL PRODUCTS	1	0	0	0	26	0
29 LUMBER AND WOOD PRODUCTS	0	0	0	0	0	0
30 PAPER AND ALLIED PRODUCTS	0	0	0	0	0	0
31 STONE,CLAY,GLASS,CONCRETE	33	96	0	9	1	0
32 PRIMARY & SECONDARY METALS & ELECTRICAL	14	20	0	0	0	0
33 FABRICATED METAL PRODUCTS	0	0	0	0	0	0
34 IN-PROCESS FUEL USE	2	9	0	0	0	15
35 OTHERS - (INDUSTRIAL PROCESSES)	14	4	0	0	76	0
36 ADHESIVES	1	0	0	0	0	0
37 IND. SRC. COATING-LARGE APPLIANCES	0	0	0	0	0	0
38 IND. SRC. COATING-MAGNET WIRE	1	0	0	0	17	0
39 IND. SRC. COATING-AUTOMOBILE	25	0	0	0	8217	0
40 IND. SRC. COATING-CANS	0	0	0	0	0	0
41 IND. SRC. COATING-METAL COILS	0	0	0	0	0	0
42 IND. SRC. COATING-PAPER	0	0	0	0	0	0
43 IND. SRC. COATING-FABRIC	0	0	0	0	0	0
44 IND. SRC. COATING-MISC. FURNITURE	0	0	0	0	0	0
45 IND. SRC. COATING-METAL/WOOD PRODUCTS	0	0	0	0	0	0
46 PLASTIC PARTS PAINTING	0	0	0	0	0	0
47 LARGE SHIPS	0	0	0	0	0	0
48 LARGE AIRCRAFT	0	0	0	0	0	0
49 IND. SRC. COATING-MISC.METAL PRODUCTS	1	0	0	0	0	0
50 OTHERS - (INDUSTRIAL SURFACE COATING)	1	0	0	0	19	0

TABLE A-1 (continued)

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:010C

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
51 DEGREASING	0	0	0	0	0	0
52 DRY CLEANING	1	0	0	0	11	0
53 GRAPHIC ARTS	2	0	0	0	5	0
54 OTHER - (SOLVENT USE)	2	0	0	0	8	0
55 ARCHITECTURAL COATINGS	0	0	0	0	0	0
56 AUTO REFINISHING	0	0	0	0	0	0
57 OTHERS-(NON-INDUSTRIAL SURFACE COATING)	3	0	0	0	5	0
58 EXT. COMB. BOILERS-ELEC. GENERATION	11	556	45188	17822	131	808
59 EXT. COMB. BOILERS-INDUSTRIAL	279	994	7062	3660	94	5156
60 EXT. COMB. BOILERS-COMM/INST	188	117	1180	473	9	23
61 EXT. COMB. SPACE HEATERS-INDUST.	0	0	0	0	0	0
62 EXT. COMB. SPACE HEATERS-COMM.	0	0	0	0	0	0
63 OTHERS-(FUEL COMBUSTION)	11	0	0	0	66	1
64 SOLID WASTE DISPOSAL-GOVT.	3	2	0	1	0	0
65 SOLID WASTE DISPOSAL-COMM/INST	11	1	0	0	0	1
66 SOLID WASTE DISPOSAL-INDUSTRIAL	4	5	3	3	3	10
67 OTHER SOLID WASTE DISPOSAL	0	0	0	0	0	0
68 WASTE SOLVENT RECOVERY PROCESSES	2	4	0	0	0	0
69 STATIONARY INTERNAL COMBUSTION ENGINES	0	0	0	0	0	0
70 NOT CLASSIFIED	0	0	0	0	0	0
COUNTY TOTALS		7140	85705	24709	20041	8409

TABLE A-1 (continued)

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:0240

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
1 OIL AND GAS PRODUCTION & PROCESSING	0	0	0	0	0	0
2 SYN. ORGANIC CHEM. STORAGE & TRANSFER	0	0	0	0	0	0
3 GASOLINE AND CRUDE OIL STORAGE	0	0	0	0	0	0
4 SHIP AND BARGE TRANSFER OF VOC	0	0	0	0	0	0
5 BARGE AND TANKER CLEANING	0	0	0	0	0	0
6 BULK GASOLINE TERMINALS	0	0	0	0	0	0
7 GASOLINE BULK PLANTS	0	0	0	0	0	0
8 TANK TRUCK LOADING	0	0	0	0	0	0
9 SERVICE STATION LOADING (STAGE I)	0	0	0	0	0	0
10 SERVICE STATION UNLOADING (STAGE II)	0	0	0	0	0	0
11 OTHERS-(STORAGE, TRANSF., MKT OF VOC)	15	0	0	0	25	0
12 LUBE OIL MANUFACTURE	0	0	0	0	0	0
13 PETROLEUM REFINERIES	0	0	0	0	0	0
14 PHARMACEUTICAL MANUFACTURE	0	0	0	0	0	0
15 TEXTILE POLYMERS & RESIN MANUFACTURE	0	0	0	0	0	0
16 SYNTHETIC FIBER MANUFACTURE	21	54	0	0	540	0
17 ORGANIC CHEMICAL MANUFACTURE	0	0	0	0	0	0
18 INORGANIC CHEMICAL MANUFACTURE	0	0	0	0	0	0
19 FERMENTATION PROCESSES	0	0	0	0	0	0
20 VEGETABLE OIL PROCESSING	0	0	0	0	0	0
21 PLASTIC PRODUCTS MANUFACTURE	1	0	0	0	8	0
22 RUBBER TIRE MANUFACTUR	0	0	0	0	0	0
23 SYN RUBBER MANUFACTURE	0	0	0	0	0	0
24 OTHER CHEMICAL MANUFACTURE	0	0	0	0	0	0
25 IRON AND STEEL MANUFACTURE	0	0	0	0	0	0
26 TOBACCO PRODUCTS	0	0	0	0	0	0
27 FOOD PRODUCTS	21	236	0	0	0	0
28 TEXTILE MILL PRODUCTS	0	0	0	0	0	0
29 LUMBER AND WOOD PRODUCTS	0	0	0	0	0	0
30 PAPER AND ALLIED PRODUCTS	0	0	0	0	0	0
31 STONE,CLAY,GLASS,CONCRETE	1	4	0	0	0	0
32 PRIMARY & SECONDARY METALS & ELECTRICAL	0	0	0	0	0	0
33 FABRICATED METAL PRODUCTS	0	0	0	0	0	0
34 IN-PROCESS FUEL USE	1	4	0	0	0	0
35 OTHERS - (INDUSTRIAL PROCESSES)	2	0	0	0	26	0
36 ADHESIVES	0	0	0	0	0	0
37 IND. SRC. COATING-LARGE APPLIANCES	0	0	0	0	0	0
38 IND. SRC. COATING-MAGNET WIRE	0	0	0	0	0	0
39 IND. SRC. COATING-AUTOMOBILE	0	0	0	0	0	0
40 IND. SRC. COATING-CANS	0	0	0	0	0	0
41 IND. SRC. COATING-METAL COILS	0	0	0	0	0	0
42 IND. SRC. COATING-PAPER	0	0	0	0	0	0
43 IND. SRC. COATING-FABRIC	0	0	0	0	0	0
44 IND. SRC. COATING-MISC. FURNITURE	0	0	0	0	0	0
45 IND. SRC. COATING-METAL/WOOD PRODUCTS	0	0	0	0	0	0
46 PLASTIC PARTS PAINTING	0	0	0	0	0	0
47 LARGE SHIPS	0	0	0	0	0	0
48 LARGE AIRCRAFT	0	0	0	0	0	0
49 IND. SRC. COATING-MISC.METAL PRODUCTS	0	0	0	0	0	0
50 OTHERS - (INDUSTRIAL SURFACE COATING)	0	0	0	0	0	0

TABLE A-1 (continued)

DELAWARE EMISSIONS BY CATEGORY 1980

COUNTY:0240

CATEGORY	POINT COUNT	PRIMARY SCC EMISSIONS (TONS/YEAR) TSP	SO2	NOX	HC	CO
51 DEGREASING	0	0	0	0	0	0
52 DRY CLEANING	0	0	0	0	0	0
53 GRAPHIC ARTS	0	0	0	0	0	0
54 OTHER - (SOLVENT USE)	0	0	0	0	0	0
55 ARCHITECTURAL COATINGS	0	0	0	0	0	0
56 AUTO REFINISHING	0	0	0	0	0	0
57 OTHERS-(NON-INDUSTRIAL SURFACE COATING)	0	0	0	0	0	0
58 EXT. COMB. BOILERS-ELEC. GENERATION	5	33984	37453	15435	167	565
59 EXT. COMB. BOILERS-INDUSTRIAL	42	115	2387	439	10	33
60 EXT. COMB. BOILERS-COMM/INST	73	18	214	97	1	3
61 EXT. COMB. SPACE HEATERS-INDUST.	0	0	0	0	0	0
62 EXT. COMB. SPACE HEATERS-COMM.	0	0	0	0	0	0
63 OTHERS-(FUEL COMBUSTION)	0	0	0	0	0	0
64 SOLID WASTE DISPOSAL-GOVT.	0	0	0	0	0	0
65 SOLID WASTE DISPOSAL-COMM/INST	4	2	0	0	0	1
66 SOLID WASTE DISPOSAL-INDUSTRIAL	0	0	0	0	0	0
67 OTHER SOLID WASTE DISPOSAL	0	0	0	0	0	0
68 WASTE SOLVENT RECOVERY PROCESSES	0	0	0	0	0	0
69 STATIONARY INTERNAL COMBUSTION ENGINES	0	0	0	0	0	0
70 NOT CLASSIFIED	0	0	0	0	0	0
COUNTY TOTALS		34417	40054	15971	785	602

APPENDIX B

AREA SOURCE EMISSIONS BY CATEGORY FOR THE DELAWARE COUNTIES

Table B-1 presents area source emissions, by category, for each of the Delaware counties, which are identified below.

County	EIS/NEDS County Code
Kent	0060
New Castle	0180
Sussex	0240

TABLE B-1. COUNTY SUMMARIES OF AREA SOURCE EMISSIONS (1980) FOR DELAWARE

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0060

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
001	STAGE I GASOLINE EVAP	000063588	THOUS GAL	THC	8.35	0000265
002	STAGE II GASOLINE EVAP	000062050	THOUS GAL	THC	9.70	0000301
003	STORAGE TANK BREATHING	000063588	THOUS GAL	THC	1.00	0000032
004	GASOLINE LOADING/TRANSIT	000063588	THOUS GAL	THC	6.87	0000218
005	SM IND/COMM DEGREASING	000098592	POPULATION	NHC	7.59	0000374
006	DRY CLEANING	000098592	POPULATION	NHC	1.50	0000074
007	ARCH SURFACE COATING	000098592	POPULATION	NHC	4.60	0000227
008	AUTO BODY REFINISHING	000098592	POPULATION	NHC	1.90	0000094
009	SM IND SURFACE COATING	000000000	THOUS GAL	THC	4,112.50	0000000
010	GRAPHIC ARTS	000098592	POPULATION	NHC	0.80	0000039
011	COMM/CONS SOLVENT USE	000098592	POPULATION	NHC	6.30	0000311
012	CUTBACK ASPHALT	000000047	THOUS GAL	NHC	1,406.00	0000033
013	PESTICIDES	000160942	ACRE	NHC	3.50	0000282
014	ON-HIGHWAY LDV	000551386	THOUS VMT	NOX	7.66	0002113
				NHC	7.61	0002154
015	ON-HIGHWAY LDT1	000058598	THOUS VMT	NOX	8.29	0000243
				NHC	8.15	0000239
016	ON-HIGHWAY LDT2	000033182	THOUS VMT	NOX	9.40	0000156
				NHC	8.86	0000147

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0060

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
017	ON-HIGHWAY HDG	000029652	THOUS VMT			
				NOX	26.77	0000397
				NHC	20.77	0000308
018	ON-HIGHWAY HDD	000023298	THOUS VMT			
				NOX	56.22	0000655
				NHC	5.66	0000066
019	ON-HIGHWAY MC	000006354	THOUS VMT			
				NOX	1.57	0000005
				NHC	14.16	0000045
020	RESIDENTIAL ANTHRACITE	000000975	TON			
				NOX	3.00	0000001
				THC	2.50	0000001
021	RESIDENTIAL BITUMINOUS	000000000	TON			
				NOX	3.00	0000000
				THC	20.00	0000000
022	RESIDENTIAL RESIDUAL OIL	000000000	THOUS GAL			
				NOX	18.00	0000000
				THC	1.00	0000000
023	RESIDENTIAL DISTILLATE	000032657	THOUS GAL			
				NOX	18.00	0000294
				THC	1.00	0000016
024	RESIDENTIAL NATURAL GAS	000000532	MIL CU FT			
				NOX	80.00	0000021
				THC	8.00	0000002
025	RESIDENTIAL LPG	000003570	THOUS GAL			
				NOX	7.50	0000013
				THC	0.75	0000001
026	RESIDENTIAL WOOD	000009238	TON			
				NOX	1.00	0000005
				NHC	5.00	0000023
027	COMM/INST ANTHRACITE	000000000	TON			
				NOX	10.00	0000000
				THC	0.00	0000000
028	COMM/INST BITUMINOUS	000000000	TON			
				NOX	6.00	0000000
				THC	3.00	0000000
029	COMM/INST RESIDUAL OIL	000003165	THOUS GAL			
				NOX	60.00	0000095
				THC	1.00	0000002

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0060

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
030	COMM/INST DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
031	COMM/INST NATURAL GAS	000000000	MIL CU FT			
				NOX	120.00	0000000
				THC	8.00	0000000
032	COMM/INST LPG	000002536	THOUS GAL			
				NOX	11.00	0000014
				THC	0.75	0000001
033	COMM/INST WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
034	INDUSTRIAL ANTHRACITE	000000000	TON			
				NOX	18.00	0000000
				THC	0.00	0000000
035	INDUSTRIAL BITUMINOUS	000018763	TON			
				NOX	15.00	0000141
				THC	1.00	0000009
036	INDUSTRIAL RESIDUAL OIL	000011607	THOUS GAL			
				NOX	60.00	0000348
				THC	1.00	0000006
037	INDUSTRIAL DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
038	INDUSTRIAL NATURAL GAS	000000000	MIL CU FT			
				NOX	175.00	0000000
				THC	3.00	0000000
039	INDUSTRIAL LPG	000000000	THOUS GAL			
				NOX	11.65	0000000
				THC	0.30	0000000
040	INDUSTRIAL WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
041	MILITARY AIRCRAFT	000036618	LND/TAKE OFF			
				NOX	9.16	0000168
				THC	27.10	0000496
042	CIVIL AIRCRAFT	000206590	LND/TAKE OFF			
				NOX	0.02	0000003
				THC	0.41	0000042

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0060

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
043	COMMERCIAL AIRCRAFT	000009000	LND/TAKE OFF			
				NOX	41.18	0000000
				THC	19.12	0000000
044	RAILROAD LOCOMOTIVES	000000185	THOUS GAL			
				NOX	370.00	0000034
				THC	94.00	0000009
045	VESSELS - GASOLINE	000001168	THOUS GAL			
				NOX	65.06	0000038
				THC	623.42	0000364
046	VESSELS - DISTILLATE OIL	000001480	THOUS GAL			
				NOX	270.00	0000200
				THC	50.00	0000037
047	VESSELS - RESIDUAL OIL	000000000	THOUS GAL			
				NOX	63.60	0000000
				THC	1.72	0000000
048	OFF-HIGHWAY VEHICLES-GAS	000001176	THOUS GAL			
				NOX	106.00	0000062
				THC	267.23	0000157
049	OFF-HIGHWAY VEH - DIESEL	000003902	THOUS GAL			
				NOX	421.16	0000822
				THC	39.12	0000076
050	ON-SITE INCINERATION	000000000	TON			
				NOX	2.37	0000000
				THC	35.23	0000000
051	OPEN BURNING	000000000	TON			
				NOX	0.56	0000000
				THC	29.13	0000000
052	STRUCTURAL FIRES	000000592	FIRES			
				NOX	17.00	0000005
				THC	107.00	0000032
053	FIELD/SLASH BURNING	000000638	TON			
				NOX	4.00	0000121
				THC	23.00	0000697
054	FOREST FIRES	000000013	ACRE			
				NOX	43.21	0000000
				THC	261.02	0000002
999	COUNTY TOTALS					
				THC		0002766
				NHC		0004416
				NOX		0005954

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0180

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
001	STAGE I GASOLINE EVAP	000145052	THOUS GAL	THC	8.35	0000606
002	STAGE II GASOLINE EVAP	000141543	THOUS GAL	THC	9.70	0000686
003	STORAGE TANK BREATHING	000145052	THOUS GAL	THC	1.00	0000073
004	GASOLINE LOADING/TRANSIT	000145052	THOUS GAL	THC	6.87	0000498
005	SM IND/COMM DEGREASING	000398694	POPULATION	NHC	7.59	0001513
006	DRY CLEANING	000000041	OTHER	NHC	5,970.73	0000122
007	ARCH SURFACE COATING	000398694	POPULATION	NHC	4.60	0000917
008	AUTO BODY REFINISHING	000398694	POPULATION	NHC	1.90	0000379
009	SM IND SURFACE COATING	000000000	THOUS GAL	THC	4,112.50	0000000
010	GRAPHIC ARTS	000398694	POPULATION	NHC	0.80	0000159
011	COMM/CONS SOLVENT USE	000398694	POPULATION	NHC	6.30	0001256
012	CUTBACK ASPHALT	000000004	THOUS GAL	NHC	1,206.00	0000002
013	PESTICIDES	000080277	ACRE	NHC	3.50	0000140
014	ON-HIGHWAY LDV	001960310	THOUS VMT	NOX	7.39	0007247
				NHC	7.90	0007749
015	ON-HIGHWAY LDT1	000208330	THOUS VMT	NOX	7.96	0000830
				NHC	8.18	0000853
016	ON-HIGHWAY LDT2	000117970	THOUS VMT	NOX	9.07	0000535
				NHC	8.98	0000530

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0180

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
017	ON-HIGHWAY HDG	000105420	THOUS VMT			
				NOX	26.08	0001375
				NHC	22.23	0001172
018	ON-HIGHWAY HDD	000082830	THOUS VMT			
				NOX	53.29	0002207
				NHC	6.01	0000249
019	ON-HIGHWAY MC	000022590	THOUS VMT			
				NOX	1.41	0000016
				NHC	14.52	0000164
020	RESIDENTIAL ANTHRACITE	000009713	TON			
				NOX	3.00	0000015
				THC	2.50	0000012
021	RESIDENTIAL BITUMINOUS	000000000	TON			
				NOX	3.00	0000000
				THC	20.00	0000000
022	RESIDENTIAL RESIDUAL OIL	000000000	THOUS GAL			
				NOX	16.00	0000000
				THC	1.00	0000000
023	RESIDENTIAL DISTILLATE	000096620	THOUS GAL			
				NOX	18.00	0000870
				THC	1.00	0000048
024	RESIDENTIAL NATURAL GAS	000007807	MIL CU FT			
				NOX	80.00	0000312
				THC	8.00	0000031
025	RESIDENTIAL LPG	000004344	THOUS GAL			
				NOX	7.50	0000016
				THC	0.75	0000002
026	RESIDENTIAL WOOD	000009658	TON			
				NOX	1.00	0000005
				NHC	5.00	0000024
027	COMM/INST ANTHRACITE	000000000	TON			
				NOX	10.00	0000000
				THC	0.00	0000000
028	COMM/INST BITUMINOUS	000000000	TON			
				NOX	6.00	0000000
				THC	3.00	0000000
029	COMM/INST RESIDUAL OIL	000020047	THOUS GAL			
				NOX	60.00	0000601
				THC	1.00	0000010

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0180

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
030	COMM/INST DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
031	COMM/INST NATURAL GAS	000000000	MIL CU FT			
				NOX	120.00	0000000
				THC	8.00	0000000
032	COMM/INST LPG	000016074	THOUS GAL			
				NOX	11.00	0000088
				THC	0.75	0000006
033	COMM/INST WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
034	INDUSTRIAL ANTHRACITE	000000000	TON			
				NOX	18.00	0000000
				THC	0.00	0000000
035	INDUSTRIAL BITUMINOUS	000127928	TON			
				NOX	15.00	0000959
				THC	1.00	0000064
036	INDUSTRIAL RESIDUAL OIL	000079136	THOUS GAL			
				NOX	60.00	0002374
				THC	1.00	0000040
037	INDUSTRIAL DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
038	INDUSTRIAL NATURAL GAS	000000000	MIL CU FT			
				NOX	175.00	0000000
				THC	3.00	0000000
039	INDUSTRIAL LPG	000000000	THOUS GAL			
				NOX	11.65	0000000
				THC	0.30	0000000
040	INDUSTRIAL WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
041	MILITARY AIRCRAFT	000007997	LND/TAKE OFF			
				NOX	9.16	0000037
				THC	27.10	0000108
042	CIVIL AIRCRAFT	000506985	LND/TAKE OFF			
				NOX	0.02	0000007
				THC	0.41	0000104

TABLE B-1 (continued)

GCA / TECHNOLOGY DIVISION
AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0180

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
043	COMMERCIAL AIRCRAFT	000001360	LND/TAKE OFF			
				NOX	41.18	0000028
				THC	19.12	0000013
044	RAILROAD LOCOMOTIVES	000000528	THOUS GAL			
				NOX	370.00	0000098
				THC	94.00	0000025
045	VESSELS - GASOLINE	000001528	THOUS GAL			
				NOX	65.06	0000050
				THC	623.42	0000476
046	VESSELS - DISTILLATE OIL	000001579	THOUS GAL			
				NOX	270.00	0000213
				THC	50.00	0000039
047	VESSELS - RESIDUAL OIL	000001621	THOUS GAL			
				NOX	63.60	0000052
				THC	1.72	0000001
048	OFF-HIGHWAY VEHICLES-GAS	000003386	THOUS GAL			
				NOX	106.00	0000179
				THC	267.23	0000452
049	OFF-HIGHWAY VEH - DIESEL	000041067	THOUS GAL			
				NOX	421.18	0008648
				THC	39.12	0000803
050	ON-SITE INCINERATION	000000000	TON			
				NOX	2.37	0000000
				THC	35.23	0000000
051	OPEN BURNING	000000000	TON			
				NOX	5.67	0000000
				THC	29.13	0000000
052	STRUCTURAL FIRES	000002392	FIRES			
				NOX	17.00	0000020
				THC	107.00	0000128
053	FIELD/SLASH BURNING	000011710	TON			
				NOX	4.00	0000023
				THC	23.00	0000135
054	FOREST FIRES	000000176	ACRE			
				NOX	43.21	0000004
				THC	261.02	0000023
599	COUNTY TOTALS					
				THC		0004383
				NHC		0015229
				NOX		0026809

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0240

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
001	STAGE I GASOLINE EVAP	000084394	THOUS GAL	THC	8.35	0000352
002	STAGE II GASOLINE EVAP	000082352	THOUS GAL	THC	9.70	0000399
003	STORAGE TANK BREATHING	000084394	THOUS GAL	THC	1.00	0000042
004	GASOLINE LOADING/TRANSIT	000084394	THOUS GAL	THC	6.87	0000290
005	SM IND/COMM DEGREASING	000097493	POPULATION	NHC	7.59	0000370
006	DRY CLEANING	000097493	POPULATION	NHC	1.50	0000073
007	ARCH SURFACE COATING	000097493	POPULATION	NHC	4.60	0000224
008	AUTO BODY REFINISHING	000097493	POPULATION	NHC	1.90	0000093
009	SM IND SURFACE COATING	000000000	THOUS GAL	THC	4,112.50	0000000
010	GRAPHIC ARTS	000097493	POPULATION	NHC	0.80	0000039
011	COMM/CONS SOLVENT USE	000097493	POPULATION	NHC	6.30	0000307
012	CUTBACK ASPHALT	000000319	THOUS GAL	NHC	450.00	0000072
013	PESTICIDES	000255537	ACRE	NHC	3.50	0000447
014	ON-HIGHWAY LDV	000684937	THOUS VMT	NOX	7.63	0002614
				NHC	6.35	0002661
015	ON-HIGHWAY LDT1	000072791	THOUS VMT	NOX	8.24	0000300
				NHC	8.71	0000317
016	ON-HIGHWAY LDT2	000041219	THOUS VMT	NOX	9.41	0000194
				NHC	9.51	0000196

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0240

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
017	ON-HIGHWAY HDG	000036834	THOUS VMT			
				NOX	26.22	0000483
				NHC	22.26	0000410
018	ON-HIGHWAY HDD	000028941	THOUS VMT			
				NOX	55.70	0000806
				NHC	6.01	0000087
019	ON-HIGHWAY MC	000007893	THOUS VMT			
				NOX	1.26	0000005
				NHC	14.95	0000059
020	RESIDENTIAL ANTHRACITE	000004132	TON			
				NOX	3.00	0000006
				THC	2.50	0000005
021	RESIDENTIAL BITUMINOUS	000000000	TON			
				NOX	3.00	0000000
				THC	20.00	0000000
022	RESIDENTIAL RESIDUAL OIL	000000000	THOUS GAL			
				NOX	18.00	0000000
				THC	1.00	0000000
023	RESIDENTIAL DISTILLATE	000040207	THOUS GAL			
				NOX	18.00	0000362
				THC	1.00	0000020
024	RESILENTIAL NATURAL GAS	000000211	MIL CU FT			
				NOX	80.00	0000008
				THC	8.00	0000001
025	RESIDENTIAL LPG	000008221	THOUS GAL			
				NOX	7.50	0000031
				THC	0.75	0000003
026	RESIDENTIAL WOOD	000023430	TON			
				NOX	1.00	0000012
				NHC	5.00	0000059
027	COMM/INST ANTHRACITE	000000000	TON			
				NOX	10.00	0000000
				THC	0.00	0000000
028	COMM/INST BITUMINOUS	000000000	TON			
				NOX	6.00	0000000
				THC	3.00	0000000
029	COMM/INST RESIDUAL OIL	000003165	THOUS GAL			
				NOX	60.00	0000095
				THC	1.00	0000002

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0240

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
030	COMM/INST DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
031	COMM/INST NATURAL GAS	000000000	MIL CU FT			
				NOX	120.00	0000000
				THC	8.00	0000000
032	COMM/INST LPG	000002538	THOUS GAL			
				NOX	11.00	0000014
				THC	0.75	0000001
033	COMM/INST WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
034	INDUSTRIAL ANTHRACITE	000000000	TON			
				NOX	18.00	0000000
				THC	0.00	0000000
035	INDUSTRIAL BITUMINOUS	000023880	TON			
				NOX	15.00	0000179
				THC	1.00	0000012
036	INDUSTRIAL RESIDUAL OIL	000014772	THOUS GAL			
				NOX	60.00	0000443
				THC	1.00	0000007
037	INDUSTRIAL DISTILLATE OIL	000000000	THOUS GAL			
				NOX	22.00	0000000
				THC	1.00	0000000
038	INDUSTRIAL NATURAL GAS	000000000	MIL CU FT			
				NOX	175.00	0000000
				THC	3.00	0000000
039	INDUSTRIAL LPG	000000000	THOUS GAL			
				NOX	11.65	0000000
				THC	0.30	0000000
040	INDUSTRIAL WOOD/OTHER	000000000	TON			
				NOX	10.00	0000000
				THC	36.00	0000000
041	MILITARY AIRCRAFT	000000000	LND/TAKE OFF			
				NOX	9.16	0000000
				THC	27.10	0000000
042	CIVIL AIRCRAFT	000122640	LND/TAKE OFF			
				NOX	0.02	0000002
				THC	0.41	0000025

TABLE B-1 (continued)

AREA SOURCE MASTER FILE SUMMARY
FOR DELAWARE

COUNTY:0240

CATEGORY NUMBER	CATEGORY DESCRIPTION	PROCESS RATE	UNITS	POLLUTANT I.D.	EMISSION FACTOR	EMISSIONS ESTIMATE
043	COMMERCIAL AIRCRAFT	000000000	LND/TAKE OFF			
				NOX	41.18	0000000
				THC	19.12	0000000
044	RAILROAD LOCOMOTIVES	000000127	THOUS GAL			
				NOX	370.00	0000023
				THC	94.00	0000006
045	VESSELS - GASOLINE	000001798	THOUS GAL			
				NOX	65.06	0000058
				THC	623.42	0000560
046	VESSELS - DISTILLATE OIL	000001875	THOUS GAL			
				NOX	270.00	0000253
				THC	50.00	0000047
047	VESSELS - RESIDUAL OIL	000000000	THOUS GAL			
				NOX	63.60	0000000
				THC	1.72	0000000
048	OFF-HIGHWAY VEHICLES-GAS	000003042	THOUS GAL			
				NOX	106.00	0000161
				THC	267.23	0000406
049	OFF-HIGHWAY VEH - DIESEL	000007897	THOUS GAL			
				NOX	421.18	0001663
				THC	39.12	0000154
050	ON-SITE INCINERATION	000000000	TON			
				NOX	2.37	0000000
				THC	35.23	0000000
051	OPEN BURNING	000000000	TON			
				NOX	5.67	0000000
				THC	29.13	0000000
052	STRUCTURAL FIRES	000000585	FIRES			
				NOX	17.00	0000005
				THC	107.00	0000031
053	FIELD/SLASH BURNING	000084164	TON			
				NOX	4.00	0000168
				THC	23.00	0000968
054	FOREST FIRES	000000033	ACRE			
				NOX	43.21	0000001
				THC	261.02	0000004
999	COUNTY TOTALS					
				THC		0003335
				NHC		0005614
				NOX		0007886

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15. SUPPLEMENTARY NOTES

EPA Project Officers: James H. Southerland and Thomas F. Lahre

16. ABSTRACT

This report discusses the development of the Northeast Corridor Regional Modeling Project (NECRMP) annual regional emission inventory. The inventory reflects 1979/1980 data and focuses on point, area and mobile source emissions of Volatile Organic Compounds (VOC) and Nitrogen Oxides (NO_x), although particulate, sulfur oxides and carbon monoxide emissions were also compiled for point sources. The study area includes the entire northeast quadrant of the United States from longitude 69° to 82° West, and latitude 38° to 45° North. This Volume discusses the emission inventory for Delaware.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Emission Inventory Inventory Source Inventory Point Sources Area Sources Ozone Nitrogen Oxides Volatile Organic Compounds		

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