Appendix B1a

Technical support document for the development of quasi-point, nonpoint, and marine, airport and railroad source emissions inventories for 2022

Ozone Season Tons Per Day to Annual Ratios

Introduction

Federal guidance in the September 4, 1992, memorandum entitled, "Procedures for Processing requests to Redesignate Areas to Attainment" (1992 memo)[1] recommends that emissions for ozone maintenance plans be analyzed in units of ozone season tons per day (OStd). Additionally, the more recent EPA guidance document entitled, "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations (EPA-454/B-17-002, May 2017)," recommends that ozone planning inventories be provided in units of OStd.[2] EPA Region 3 staff have also noted that such data must be provided by jurisdiction or Federal Information Processing Standards (FIPS) code and source classification code (SCC).

EPA published the 2022 version 1 (2022v1) emissions inventory as part of the 2022 Emissions Inventory Platform (EMP).[3] The year 2022 is appropriate for use as the attainment year for the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area's redesignation request and maintenance plan. However, the 2022 version 1 EMP dataset did not include emissions in units of typical OStd by FIPS code jurisdiction and SCC.

Onroad and nonroad data estimates in units of OStd may be obtained directly from MOVES outputs. Point source OStd estimates may be obtained from ERTAC outputs for those units reporting to the Clean Air Markets Division under 40 CFR Part 75. For point sources other than those reporting under 40 CFR Part 75, OStd estimates may be created using seasonal and annual throughput characteristics supplied as part of the annual Air Emissions Reporting Rule requirements and other emissions inventory reporting requirements. However, for the following emission categories, which are disparate in nature, developing OStd estimates is more resource intensive:

- Biogenic estimates (not required for SIP planning purposes but helpful to have for consistency and completeness);
- Commercial marine vessel (CMV) estimates;
- Airport emission estimates;
- Rail emission estimates; and
- Nonpoint category estimates.

[1] https://www.epa.gov/ground-level-ozone-pollution/procedures-processing-requests-redesignate-areas-attainment
[2] https://www.epa.gov/sites/default/files/2016-12/documents/2016_ei_guidance_for_naaqs.pdf
[3] https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

Data Sources

EPA's 2022 EMP Wiki page provides information on the development and contents of the 2022 EMP.[4] This page provides links to EPA's FTP site, which contain the annual emissions inventory data and modeling files used for this effort. [5] This site includes a zipped folder[6] containing the annual emissions estimates for the nonpoint inventory and also a text file[7] describing the contents of the zipped folder.

Application of the Emissions Modeling Framework

To assist with the development of an emissions inventory in units of OStd, staff from the Mid Atlantic Regional Air Management Association (MARAMA) used the Emissions Modeling Framework (EMF) in conjunction with temporal profile information in the 2022v1 EMP to develop OStd values of nitrogen oxides (NO_X), volatile organic compounds (VOCs), and carbon monoxide (CO) for 2022 emissions by FIPS code and SCC. EMF is a software system designed to facilitate the development of emissions inventories. EMF provides quality assurance functions, organizes emissions modeling data, aids in the application of growth factors and control information, and allows conversion of emissions into hourly, gridded, chemically-speciated emissions estimates suitable for input into air quality models. MARAMA also used EMF queries to summarize annual 2022 emissions of NO_X, VOC, and CO at the FIPS and SCC level. The OSTD and annual data sets generated by EMF were used to develop a ratio of OSTD to annual emissions. This 2022 ratio for each pollutant/SCC/FIPS combination is then applied to the 2032 and 2038 annual projections to develop 2032 and 2038 OSTD projections for the emission categories listed above.

The following paragraphs explain the process and provide the data sources for each sector needing OStd to annual ratios.

EMF Approach for 2022 OStd and Ratio Development

MARAMA staff used EMF to apply temporal allocation files (year-to-month, month-to-day) from the Sparse Matrix Operator Kernel Emissions (SMOKE) model input files to inventory datasets. Working from the annual CO, NO_X, and VOC values, MARAMA staff estimated 2022 ozone season daily CO, NOx, and VOC emissions in the Metropolitan Washington D.C. 2015 ozone NAAQS nonattainment area using the EMF temporal allocation module.[8] The temporal allocation module in EMF allows the

[4] URL: https://views.cira.colostate.edu/wiki/SiteSettings/Wiki/Index/11209
[5] URL: https://gaft.epa.gov/Air/emismod/2022/v1/2022emissions/
[6] URL: https://gaftp.epa.gov/Air/emismod/2022/v1/2022emissions/2022hc_nonpoint_inventory_20dec2024.zip
[7] URL: https://gaftp.epa.gov/Air/emismod/2022/v1/2022emissions/2022hc_nonpoint_inventory_20dec2024_contents.txt
[8] https://www.cmascenter.org/cost/documentation/3.5/EMF%20User's%20Guide/#temporal-allocation

estimation of inventory emissions for different time periods and resolutions. Using temporal allocation factors, the module can estimate monthly totals, monthly average-day values, daily totals, episodic totals, or episodic average-day values.

EMF applied a series of queries that filtered the data for the appropriate FIPs codes within the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area and for the SCCs in question to provide pollutant-specific emissions for days in June, July, and August. EMF also supplied annual totals for each pollutant/SCC/FIPS combination being examined.

Nonpoint Emissions

SCCs from Most Nonpoint/Area Sources

The EMF tool used the following inventory files for most of the nonpoint sector data:

- 2022hc_from_rwc_2020NEI_NONPOINT_20230222_25jun2024_nf_v2.csv,
- 2022hc_proj_2020NEI_NONPOINT_20230222_15jun2024_nf_v1.csv,
- 2022hc_proj_nonFEM_livestock_2020NEI_NONPOINT_20230222_monthly_14jun2024_v0.csv,
- livestock_2022hc_FEM_monthly_14jun2024_v0.csv,
- np_solvents_2022v1_20240221_12mar2024_v0.csv,
- openburn_2022hc_proj_2020NEI_NONPOINT_20230222_15jun2024_v0.csv,
- ptday_agburn_2022v1_conus_filtered_02jul2024_v0.csv, and
- ptday_sf2_2022v1_20240626_caps_rx_08jul2024_v0.csv.

These files included emissions estimates for the SCCs and descriptions included in Table 1.

Table 1: Nonpoint Sector SCCs

SCC	Description	SCC	Description
2102001000	Stationary Source Fuel Combustion-Industrial-Anthracite Coal-Total: All Boiler Types	2401090000	Solvent Utilization-Surface Coating-Miscellaneous Manufacturing-Total: All Solvent Types
2102002000	Stationary Source Fuel Combustion-Industrial-Bituminous/Subbituminous Coal-Total: All Boiler Types	2401100000	Solvent Utilization-Surface Coating-Industrial Maintenance Coatings-Total: All Solvent Types
2102004001	Stationary Source Fuel Combustion-Industrial-Distillate Oil-All Boiler Types	2401200000	Solvent Utilization-Surface Coating-Other Special Purpose Coatings-Total: All Solvent Types
2102004002	Stationary Source Fuel Combustion-Industrial-Distillate Oil-All IC Engine Types	2415000000	Solvent Utilization-Degreasing-All Processes/All Industries-Total: All Solvent Types
2102006000	Stationary Source Fuel Combustion-Industrial-Natural Gas-Total: Boilers and IC Engines	2420000000	Solvent Utilization-Dry Cleaning-All Processes-Total: All Solvent Types
2102007000	Stationary Source Fuel Combustion-Industrial-Liquified Petroleum Gas (LPG)-Total: All Boiler Types	2425000000	Solvent Utilization-Graphic Arts-All Processes-Total: All Solvent Types
2102008000	Stationary Source Fuel Combustion-Industrial-Wood-Total: All Boiler Types	2460030999	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-Lighter Fluid, Fire Starter, Other Fuels-Total: All Volatile Chemical Product Types

SCC	Description	SCC	Description
2102011000	Stationary Source Fuel Combustion-Industrial-Kerosene-Total: All Boiler Types	2460100000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All Personal Care Products-Total: All Solvent Types
2103001000	Stationary Source Fuel Combustion-Commercial/Institutional-Anthracite Coal-Total: All Boiler Types	2460200000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All Household Products-Total: All Solvent Types
2103002000	Stationary Source Fuel Combustion-Commercial/Institutional-Bituminous/Subbituminous Coal-Total: All Boiler Types	2460400000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All Automotive Aftermarket Products-Total: All Solvent Types
2103004001	Stationary Source Fuel Combustion-Commercial/Institutional-Distillate Oil-Boilers	2460500000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All Coatings and Related Products-Total: All Solvent Types
2103004002	Stationary Source Fuel Combustion-Commercial/Institutional-Distillate Oil-IC Engines	2460600000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All Adhesives and Sealants-Total: All Solvent Types
2103006000	Stationary Source Fuel Combustion-Commercial/Institutional-Natural Gas-Total: Boilers and IC Engines	2460800000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-All FIFRA Related Products-Total: All Solvent Types
2103007000	Stationary Source Fuel Combustion-Commercial/Institutional-Liquified Petroleum Gas (LPG)-Total: All Combustor Types	2460900000	Solvent Utilization-Miscellaneous Non-industrial: Consumer and Commercial-Miscellaneous Products (Not Otherwise Covered)-Total: All Solvent Types
2103008000	Stationary Source Fuel Combustion-Commercial/Institutional-Wood-Total: All Boiler Types	2461021000	Solvent Utilization-Miscellaneous Non-industrial: Commercial-Cutback Asphalt-Total: All Solvent Types
2103011000	Stationary Source Fuel Combustion-Commercial/Institutional-Kerosene-Total: All Combustor Types	2461022000	Solvent Utilization-Miscellaneous Non-industrial: Commercial-Emulsified Asphalt-Total: All Solvent Types
2104004000	Stationary Source Fuel Combustion-Residential-Distillate Oil-Total: All Combustor Types	2461025100	Solvent Utilization-Miscellaneous Non-industrial: Commercial-Asphalt Paving: Hot and Warm Mix-Hot Mix Total: All Solvent Types
2104006000	Stationary Source Fuel Combustion-Residential-Natural Gas-Total: All Combustor Types	2461025200	Solvent Utilization-Miscellaneous Non-industrial: Commercial-Asphalt Paving: Hot and Warm Mix-Warm Mix Total: All Solvent Types
2104007000	Stationary Source Fuel Combustion-Residential-Liquified Petroleum Gas (LPG)-Total: All Combustor Types	2461850000	Solvent Utilization-Miscellaneous Non-industrial: Commercial-Pesticide Application: Agricultural-All Processes
2104008100	Stationary Source Fuel Combustion-Residential-Wood-Fireplace: general	2501011011	Storage and Transport-Petroleum and Petroleum Product Storage-Residential Portable Gas Cans-Permeation
2104008210	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: fireplace inserts; non-EPA certified	2501011012	Storage and Transport-Petroleum and Petroleum Product Storage-Residential Portable Gas Cans-Evaporation (includes Diurnal losses)
2104008220	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: fireplace inserts; EPA certified; non-catalytic	2501011014	Storage and Transport-Petroleum and Petroleum Product Storage-Residential Portable Gas Cans-Refilling at the Pump - Vapor Displacement
2104008230	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: fireplace inserts; EPA certified; catalytic	2501012011	Storage and Transport-Petroleum and Petroleum Product Storage-Commercial Portable Gas Cans-Permeation
2104008310	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: freestanding, non-EPA certified	2501012012	Storage and Transport-Petroleum and Petroleum Product Storage-Commercial Portable Gas Cans-Evaporation (includes Diurnal losses)
2104008320	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: freestanding, EPA certified, non-catalytic	2501012014	Storage and Transport-Petroleum and Petroleum Product Storage-Commercial Portable Gas Cans-Refilling at the Pump - Vapor Displacement
2104008330	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: freestanding, EPA certified, catalytic	2501050120	Storage and Transport-Petroleum and Petroleum Product Storage-Bulk Terminals: All Evaporative Losses-Gasoline
2104008400	Stationary Source Fuel Combustion-Residential-Wood-Woodstove: pellet-fired, general (freestanding or FP insert)	2501055120	Storage and Transport-Petroleum and Petroleum Product Storage-Bulk Plants: All Evaporative Losses-Gasoline
2104008510	Stationary Source Fuel Combustion-Residential-Wood-Furnace: Indoor, cordwood-fired, non-EPA certified	2501060051	Storage and Transport-Petroleum and Petroleum Product Storage-Gasoline Service Stations-Stage 1: Submerged Filling

SCC	Description	SCC	Description
2104008610	Stationary Source Fuel Combustion-Residential-Wood-Hydronic heater: outdoor	2501060053	Storage and Transport-Petroleum and Petroleum Product Storage-Gasoline Service Stations-Stage 1: Balanced Submerged Filling
2104008700	Stationary Source Fuel Combustion-Residential-Wood-Outdoor wood burning device, NEC (fire-pits, chimineas, etc)	2501060201	Storage and Transport-Petroleum and Petroleum Product Storage-Gasoline Service Stations-Underground Tank: Breathing and Emptying
2104009000	Stationary Source Fuel Combustion-Residential-Firelog-Total: All Combustor Types	2501080050	Storage and Transport-Petroleum and Petroleum Product Storage-Airports : Aviation Gasoline-Stage 1: Total
2104011000	Stationary Source Fuel Combustion-Residential-Kerosene-Total: All Heater Types	2501080100	Storage and Transport-Petroleum and Petroleum Product Storage-Airports : Aviation Gasoline-Stage 2: Total
2302002100	Industrial Processes-Food and Kindred Products: SIC 20-Commercial Cooking - Charbroiling-Conveyorized Charbroiling	2505030120	Storage and Transport-Petroleum and Petroleum Product Transport-Truck-Gasoline
2302002200	Industrial Processes-Food and Kindred Products: SIC 20-Commercial Cooking - Charbroiling-Under-fired Charbroiling	2505040120	Storage and Transport-Petroleum and Petroleum Product Transport-Pipeline-Gasoline
2302003000	Industrial Processes-Food and Kindred Products: SIC 20-Commercial Cooking - Frying-Deep Fat Frying	2601020000	Waste Disposal, Treatment, and Recovery-On-site Incineration-Commercial/Institutional-Total
2302003100	Industrial Processes-Food and Kindred Products: SIC 20-Commercial Cooking - Frying-Flat Griddle Frying	2610000100	Waste Disposal, Treatment, and Recovery-Open Burning-All Categories-Yard Waste - Leaf Species Unspecified
2302003200	Industrial Processes-Food and Kindred Products: SIC 20-Commercial Cooking - Frying-Clamshell Griddle Frying	2610000400	Waste Disposal, Treatment, and Recovery-Open Burning-All Categories-Yard Waste - Brush Species Unspecified
2302050000	Industrial Processes-Food and Kindred Products: SIC 20-Bakery Products-Total	2610000500	Waste Disposal, Treatment, and Recovery-Open Burning-All Categories-Land Clearing Debris (use 28-10-005-000 for Logging Debris Burning)
2302070005	Industrial Processes-Food and Kindred Products: SIC 20-Fermentation/Beverages-Wineries	2610030000	Waste Disposal, Treatment, and Recovery-Open Burning-Residential-Household Waste (use 26-10-000-xxx for Yard Wastes)
2302070010	Industrial Processes-Food and Kindred Products: SIC 20-Fermentation/Beverages-Distilleries	2630020000	Waste Disposal, Treatment, and Recovery-Wastewater Treatment-Public Owned-Total Processed
2401001000	Solvent Utilization-Surface Coating-Architectural Coatings-Total: All Solvent Types	2680003000	Waste Disposal, Treatment, and Recovery-Composting-100% Green Waste (e.g., residential or municipal yard wastes)-All Processes
2401005000	Solvent Utilization-Surface Coating-Auto Refinishing: SIC 7532-Total: All Solvent Types	2802004001	Miscellaneous Area Sources-Agricultural Crop Usage-Agriculture Silage-Storage
2401008000	Solvent Utilization-Surface Coating-Traffic Markings-Total: All Solvent Types	2802004002	Miscellaneous Area Sources-Agricultural Crop Usage-Agriculture Silage-Mixing
2401015000	Solvent Utilization-Surface Coating-Factory Finished Wood: SIC 2426 thru 242-Total: All Solvent Types	2802004003	Miscellaneous Area Sources-Agricultural Crop Usage-Agriculture Silage-Feeding
2401020000	Solvent Utilization-Surface Coating-Wood Furniture: SIC 25-Total: All Solvent Types	2805002000	Miscellaneous Area Sources-Agriculture Production - Livestock-Beef cattle production composite-Not Elsewhere Classified
2401025000	Solvent Utilization-Surface Coating-Metal Furniture: SIC 25-Total: All Solvent Types	2805007100	Miscellaneous Area Sources-Agriculture Production - Livestock-Poultry Waste-Poultry Production - Layers with Dry Manure Management Systems: Confinement
2401040000	Solvent Utilization-Surface Coating-Metal Cans: SIC 341-Total: All Solvent Types	2805009100	Miscellaneous Area Sources-Agriculture Production - Livestock-Poultry production - broilers-Confinement
2401055000	Solvent Utilization-Surface Coating-Machinery and Equipment: SIC 35-Total: All Solvent Types	2805010100	Miscellaneous Area Sources-Agriculture Production - Livestock-Poultry production - turkeys-Confinement
2401065000	Solvent Utilization-Surface Coating-Electronic and Other Electrical: SIC 36 - 363-Total: All Solvent Types	2805018000	Miscellaneous Area Sources-Agriculture Production - Livestock-Dairy cattle composite-Not Elsewhere Classified
2401070000	Solvent Utilization-Surface Coating-Motor Vehicles: SIC 371-Total: All Solvent Types	2805025000	Miscellaneous Area Sources-Agriculture Production - Livestock-Swine production composite-Not Elsewhere Classified (see also 28-05-039, -047, -053)

SCC	Description	SCC	Description
2401075000	Solvent Utilization-Surface Coating-Aircraft: SIC 372-Total: All Solvent Types	2805035000	Miscellaneous Area Sources-Agriculture Production - Livestock-Horses and Ponies Waste Emissions-Not Elsewhere Classified
2401080000	Solvent Utilization-Surface Coating-Marine: SIC 373-Total: All Solvent Types	2805040000	Miscellaneous Area Sources-Agriculture Production - Livestock-Sheep and Lambs Waste Emissions-Total
2401085000	Solvent Utilization-Surface Coating-Railroad: SIC 374-Total: All Solvent Types	2805045000	Miscellaneous Area Sources-Agriculture Production - Livestock-Goats Waste Emissions-Not Elsewhere Classified

The 2022 annual and ozone season tons per day emissions developed from the 2022 v1 EMP and EMF for each pollutant, SCC, and jurisdiction as well as the resulting OStd/annual ratios are provided in the spreadsheet entitled, "Annual to OS Comparison_Nonpoint.xlsx."

SCCs Describing Oil and Gas Operations

The area has little activity in the oil and gas sector, beyond emissions from natural gas compressor stations that are included in the point category. Two jurisdictions show slight emissions in the 2022 v1 EMP from abandoned wells. Table 2 provides the jurisdictions, SCC descriptions, and 2022 v1 EMP emission estimates for these SCCs as well as the emissions in units of tpy and OStd.

Table 2: Nonpoint Oil and Gas

FIPS	Jurisdiction	SCC	SCC Description	2022 VOC, tpy	2022 VOC, OStd	Ratio
51153	Prince William	2310111802	Industrial Processes-Oil & Gas Exploration and Production; On-Shore Oil Exploration; Abandoned Well: Unplugged	0.3234	0.0008807	0.0027
24017	Charles	2310121802	Industrial Processes-Oil & Gas Exploration and Production; On-Shore Gas Exploration; Abandoned Well: Unplugged	0.0141	0.0000384	0.0027

The EMF query output for nonpoint oil and gas SCCs is located in the file called 2022hc_NPoilgas_Temp_Alloc_Episodic_020951472_28aug2025_v0.xlsx.

SCCs Describing Airport Operations

For SCCs describing activity and emissions from airport operations, the EMF tool used the inventory provided in the following file:

- 2022proj_airports_2022_point_20240626_top51_adjusted_26jun2024_v0.csv

This file contained annual emission estimates for the SCCs listed in Table 3.

Table 3: Airport SCCs and Descriptions

SCC	Description
2265008005*	Mobile Sources-Off-highway Vehicle Gasoline-Airport Ground Support Equipment-4-Stroke Airport Ground Support Equipment
2270008005*	Mobile Sources-Off-highway Vehicle Diesel-Airport Ground Support Equipment-Airport Ground Support Equipment
2275001000	Mobile Sources-Aircraft-Military Aircraft-Total
2275020000	Mobile Sources-Aircraft-Commercial Aircraft-Total: All Types
2275050011	Mobile Sources-Aircraft-General Aviation-Piston
2275050012	Mobile Sources-Aircraft-General Aviation-Turbine
2275060011	Mobile Sources-Aircraft-Air Taxi-Piston
2275060012	Mobile Sources-Aircraft-Air Taxi-Turbine
2275070000	Mobile Sources-Aircraft-Aircraft Auxiliary Power Units-Total

* Emissions for these two SCCs belonging to airport ground support equipment (GSE) were developed using two different methods. Emissions were present in EMP 2002v1 database for Prince George's, Arlington, and Loudoun counties. MOVES5.0.0 nonroad model was used to develop emissions for other jurisdictions. This model didn't produce any GSE emissions for the District.

Table 4a provides a summary by jurisdiction and pollutant of the annual and daily ozone season airport emissions from these SCCs in the 2022 v1 EMP. Emissions by SCC, jurisdiction, and pollutant as well as OStd to annual ratios for each pollutant, SCC, and jurisdiction combination are located in the spreadsheet entitled, "Annual to OS comparison_Airports.xlsx."

Table 4a: 2022 Emission Estimates for Airport Operations

Jurisdiction	CO (tpy)	NOx (tpy)	VOC (tpy)	CO (OStd)	NOx (OStd)	VOC (OStd)
DC-District of Columbia	1.10	0.02	0.04	0.00319	0.00005	0.00011
MD-Calvert	2.41	0.10	0.14	0.00699	0.00030	0.00042
MD-Charles	62.49	3.72	3.37	0.18103	0.01078	0.00977
MD-Frederick	235.08	7.23	9.75	0.68100	0.02096	0.02824
MD-Montgomery	140.33	2.22	4.69	0.40651	0.00642	0.01359
MD-Prince George's	456.32	285.57	141.18	1.32189	0.82726	0.40898
VA-Arlington	1,395.52	897.17	146.61	4.04262	2.59896	0.42471
VA-Loudoun	1,881.63	1,066.18	201.83	5.45083	3.08857	0.58467
VA-Manassas city	269.23	17.55	16.51	0.77993	0.05084	0.04784
Totals:	4,444.12	2,279.75	524.13	12.87398	6.60412	1.51833

The majority of airport operation emissions are from Dulles International Airport and Ronald Reagan Washington National Airport. The EPA profile assigned to these SCCS assumed a nearly uniform distribution such that the ratio of ozone season daily emissions to annual emissions is 0.002897 (approximately 1/345) for all pollutant, SCC, and jurisdiction combinations.

Quasi-Point Sources

Emissions for Andrews Air Force Base, Dulles International Airport, and Ronald Reagan National Airport were kept in a separate source category called quasi-point source. There are other small airports in these jurisdictions. Their emissions together with the above three bigger airports are included in Table 4a.

Table 4b below includes emissions for Andrews Air Force Base, Dulles International Airport, and Ronald Reagan National Airport

Table 5b: 2022 Emission Estimates for Quasi-Point Sources

Jurisdiction	Airport	NOx (OStd)	VOC (OStd)
MD-Prince George's	Andrews Air Force Base	0.82281	0.40085
VA-Arlington	Ronald Reagan National Airport	2.59896	0.42471
VA-Loudoun	Dulles International Airport	3.05374	0.54400
Totals:		6.47551	1.36956

SCCs Describing Rail Operations

For SCCs describing activity and emissions from rail operations, the EMF tool used the inventory provided in the following file:

- 2022v1_platform_railyards_2022_27june2024_nf_v2.csv

This file contained annual emission estimates for the SCCs listed in Table 5.

Table 6: Rail Operation SCCs and Descriptions

SCC	Description
28500201	Internal Combustion Engines-Railroad Equipment-Diesel-Yard Locomotives
2285002006	Mobile Sources-Railroad Equipment-Diesel-Line Haul Locomotives: Class I Operations
2285002007	Mobile Sources-Railroad Equipment-Diesel-Line Haul Locomotives: Class II / III Operations
2285002008	Mobile Sources-Railroad Equipment-Diesel-Line Haul Locomotives: Passenger Trains (Amtrak)
2285002009	Mobile Sources-Railroad Equipment-Diesel-Line Haul Locomotives: Commuter Lines

Table 6 provides a summary by jurisdiction and pollutant of the annual and daily ozone season airport emissions from these SCCS in the 2022 v1 EMP. Emissions by SCC, jurisdiction, and

pollutant as well as OStd to annual ratios for each pollutant, SCC, and jurisdiction combination are located in the spreadsheet entitled, "Annual to OS comparison_Rail.xlsx."

Table 7: 2022 Emission Estimates for Rail Operations

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
DC-District of Columbia	60.24	272.87	14.86	0.16459	0.74552	0.04058
MD-Charles	0.37	1.70	0.07	0.00103	0.00469	0.00019
MD-Frederick	63.42	307.09	13.34	0.17394	0.84212	0.03656
MD-Montgomery	59.00	270.49	10.99	0.16167	0.74115	0.03012
MD-Prince George's	45.98	215.49	9.07	0.12575	0.58930	0.02479
VA-Arlington	4.49	21.68	0.95	0.01231	0.05935	0.00259
VA-Fairfax	40.83	197.54	8.77	0.11172	0.54032	0.02398
VA-Prince Wiliam	33.05	157.05	6.71	0.09061	0.43049	0.01838
VA-Alexandria city	14.72	70.41	3.04	0.04029	0.19268	0.00832
VA-Manassas city	4.56	21.57	0.92	0.01245	0.05894	0.00252
VA-Manassas Park city	1.03	4.92	0.21	0.00281	0.01343	0.00058
Totals:	327.70	1540.82	68.93	0.89717	4.21800	0.18860

The EPA profile assigned to these SCCS assumed a uniform distribution such that the ratio of ozone season daily emissions to annual emissions is 0.002723 (approximately 1/365) for all pollutant, SCC, and jurisdiction combinations.

SCCs with Unique Profile Identification Numbers

Some SCCs had unique profile identification numbers. The daily ozone season emissions were calculated separately using a variety of approaches for these SCCs. The following sections describe the process for estimating the daily ozone season emissions and for estimating the ratio of OStd/annual emissions by pollutant, SCC, and jurisdiction for these SCCs. Table 7 summarizes the ratios developed from the 2022 EMP and the temporal profiles for these SCCs. Emission estimates and the Ostd/annual ratios are provided in the spreadsheet entitled, "RWC_BBQ_Crem_RxFires_AgFires_annual to OS comparison_2025-11-17.xlsx."

Table 8: Ratio Summary for Select SCCs

SCC	Ratio	Comments
2810025000	0.005484	Ratio uses July (month with highest percentage of activity/emissions) and 31 days. 0.71/31
2810060100	0.00274	Temporal profile shows no monthly variability.
2104008530	0	Temporal profile assigns no activity or emissions to June, July, or August.
2104008620	0.000454	Temporal profile showed 6.94% of activity occurs in May through September (153 days). 0.00694/153
2104008630	0.000454	Temporal profile showed 6.94% of activity occurs in May through September (153 days). 0.00694/153
2801500141	0.00274	Temporal profile shows no monthly variability.
2801500150	0.00274	Temporal profile shows no monthly variability.
2801500171	0.00274	Temporal profile shows no monthly variability.
2801500262	0.00274	Temporal profile shows no monthly variability.
2810005001	0	Temporal profile assigns no activity or emissions to June, July, or August.
2811015001	n/a	No ratio needed-Future year emissions are equivalent to 2022 emissions.

SCC	Ratio	Comments
2811015002	n/a	No ratio needed-Future year emissions are equivalent to 2022 emissions.

SCC 2810025000, BBQ Emissions

The SCC 2810025000 (Miscellaneous Area Sources-Other Combustion-Residential Grilling (see 23-02-002-xxx for Commercial)-Total) used a profile identification of "BBQ". Table 8 provides the profile description for this emissions category.

Table 9: Profile Description for SCC 2810025000

Month	% of Annual Activity/ Emissions
January	0.03
February	0.03
March	0.06
April	0.07
May	0.10
June	0.14
July	0.17
August	0.14
September	0.10
October	0.07
November	0.06
December	0.03

The month of July has the highest percentage of activity and will be used to estimate grilling daily emissions, using 31 days in the month:

$$\frac{0.17}{31} = 0.0055$$

Table 9 provides the 2022 annual and ozone season tons per day for SCC 2810025000 (Miscellaneous Area Sources-Other Combustion-Residential Grilling (see 23-02-002-xxx for Commercial)-Total). Note that the 2022 v1 EMP did not assign SO_2 or ammonia emissions to this SCC.

Table 10: 2022 Emission Estimates for SCC 2810025000

Jurisdiction	CO (tpy)	NOx (tpy)	VOC (tpy)	CO (OStd)	NOx (OStd)	VOC (OStd)
DC-District of Columbia	119.88	2.48	6.69	0.65742	0.01359	0.03669
MD-Calvert	27.96	0.58	1.56	0.15332	0.00317	0.00856
MD-Charles	47.61	0.98	2.66	0.26107	0.00540	0.01457
MD-Frederick	73.03	1.51	4.08	0.40050	0.00828	0.02235
MD-Montgomery	227.53	4.71	12.70	1.24775	0.02580	0.06964
MD-Prince George's	198.74	4.11	11.09	1.08986	0.02254	0.06083
VA-Alexandria city	25.46	0.53	1.42	0.13960	0.00289	0.00779
VA-Arlington	38.99	0.81	2.18	0.21380	0.00442	0.01193
VA-Fairfax	258.95	5.35	14.45	1.42005	0.02937	0.07925

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
VA-Fairfax city	6.13	0.13	0.34	0.03364	0.00070	0.00188
VA-Falls Church city	2.76	0.06	0.15	0.01516	0.00031	0.00085
VA-Loudoun	100.63	2.08	5.62	0.55181	0.01141	0.03080
VA-Manassas city	9.13	0.19	0.51	0.05007	0.00104	0.00279
VA-Manassas Park city	3.19	0.07	0.18	0.01751	0.00036	0.00098
VA-Prince William	108.17	2.24	6.04	0.59321	0.01227	0.03311
Totals:	1,248.17	25.81	69.66	6.84478	0.14155	0.38201

SCC 2810060100, Cremation

The temporal profile identification number for the SCC 2810060100 (miscellaneous area sources-other combustion-cremation-humans) was 262. This temporal profile assigns uniform activity to each month of the year. Daily emissions are therefore 1/365 of annual emissions. Table 10 provides the 2022 annual and daily emissions for each jurisdiction from this SCC in units of tpy and OStd, respectively.

Table 11: 2022 Emission Estimates for SCC 2810060100

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
DC-District of Columbia	0.39	0.47	0.04	0.00106	0.00128	0.00011
MD-Calvert	0.06	0.07	0.01	0.00016	0.00019	0.00002
MD-Charles	0.10	0.12	0.01	0.00027	0.00033	0.00003
MD-Frederick	0.15	0.18	0.02	0.00041	0.00050	0.00004
MD-Montgomery	0.47	0.56	0.05	0.00128	0.00155	0.00013
MD-Prince George's	0.51	0.62	0.05	0.00140	0.00169	0.00014
VA-Alexandria city	0.06	0.07	0.01	0.00016	0.00019	0.00002
VA-Arlington	0.07	0.09	0.01	0.00020	0.00024	0.00002
VA-Fairfax	0.38	0.46	0.04	0.00105	0.00127	0.00011
VA-Fairfax city	0.02	0.02	0.00	0.00005	0.00006	0.00000
VA-Falls Church city	0.01	0.01	0.00	0.00002	0.00002	0.00000
VA-Loudoun	0.12	0.15	0.01	0.00034	0.00041	0.00003
VA-Manassas city	0.02	0.02	0.00	0.00005	0.00006	0.00000
VA-Manassas Park city	0.00	0.00		0.00000	0.00000	0.00000
VA-Prince William	0.16	0.20	0.02	0.00045	0.00054	0.00005
Totals:	2.51	3.03	0.25	0.00688	0.00831	0.00070

Residential Wood Combustion

In addition to the residential wood combustion (RWC) SCCs listed in Table 1, the 2022 v1 EMP inventory contains three additional RWC SCCs: 2104008530 (stationary source fuel combustion-residential-wood furnace: indoor, pellet-fired, general), 2104008620 (stationary source fuel combustion-residential-wood-hydroponic heater: indoor), and 2104008630 (stationary source fuel combustion-residential-wood-hydroponic heater: pellet-fired). These three SCCs used specific temporal profiles with a distinct monthly pattern. Therefore, these three SCCs have OStd emissions created separately.

The SCCs 2104008620 (stationary source fuel combustion-residential-wood-hydronic heater: indoor) and 2104008630 (stationary source fuel combustion-residential-wood-hydronic heater: pellet-fired) use a profile identification number of 17751. The breakdown of annual emissions by month for this profile identification number is shown in Table 11.

Table 12: Profile Description for SCC 2104008530

Month	% of Annual Activity/ Emissions
January	0.1409
February	0.1319
March	0.1409
April	0.1181
May	0.0228
June	0.0129
July	0.0079
August	0.0089
September	0.0169
October	0.1171
November	0.1339
December	0.1478

This profile shows that the months of May through September account for 6.94% of the annual emissions. The "high" summer months of June, July, and August account for 2.98% of annual emissions. Using the months of May through September, with a total day count of 153, provides for a somewhat higher, and therefore conservative, estimate of OStd emissions. The ratio for ozone season day to annual emissions is as follows:

$$\frac{0.0694}{153} = 0.0004536$$

Not all jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area have activity and emissions assigned to these SCCs. Table 12 provides the 2022 CO, NO_X, and VOC annual and OStd emissions from the SCC 2104008620 by jurisdiction, and Table 13 provides the 2022 CO, NO_X, and VOC annual OStd emissions from the SCC 2104008630 by jurisdiction.

Table 13: 2022 Emission Estimates for SCC 2104008620

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Calvert	62.09	0.34	11.62	0.02818	0.00016	0.00528
MD-Charles	93.23	0.52	17.46	0.04232	0.00024	0.00792
MD-Frederick	145.53	0.81	27.25	0.06605	0.00037	0.01237
MD-Montgomery	24.56	0.14	4.60	0.01115	0.00006	0.00209
MD-Prince George's	48.20	0.27	9.02	0.02188	0.00012	0.00410
VA-Fairfax	2.75	0.02	0.52	0.00125	0.00001	0.00023
VA-Fairfax city	0.00		0.00	0.00000	0.00000	0.00000
VA-Loudoun	146.07	0.81	27.35	0.06630	0.00037	0.01241

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
VA-Manassas city	0.01		0.00	0.00000	0.00000	0.00000
VA-Prince William	124.15	0.69	23.24	0.05635	0.00031	0.01055
Totals:	646.60	3.59	121.06	0.29348	0.00163	0.05495

Table 14: 2022 Emission Estimates for SCC 2104008630

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Calvert	0.12	0.03	0.02	0.00005	0.00001	0.00001
MD-Charles	0.18	0.04	0.02	0.00008	0.00002	0.00001
MD-Frederick	0.28	0.07	0.04	0.00013	0.00003	0.00002
MD-Montgomery	0.05	0.01	0.01	0.00002	0.00001	0.00000
MD-Prince George's	0.09	0.02	0.01	0.00004	0.00001	0.00001
VA-Fairfax	0.01	0.00	0.00	0.00000	0.00000	0.00000
VA-Loudoun	0.28	0.07	0.04	0.00013	0.00003	0.00002
VA-Prince William	0.24	0.06	0.03	0.00011	0.00003	0.00001
Totals:	1.37	0.33	0.19	0.00062	0.00015	0.00009

The SCC 2104008530 (stationary source fuel combustion-residential-wood-furnace: indoor, pellet-fired, general) had different profile identification numbers for each jurisdiction. However, the activity in June, July, and August for this SCC is estimated to be zero in the federal data for all temporal profiles. Therefore, the ratio of OStd to annual emissions for this SCC is zero. Table 14 provides the 2022 annual emissions estimates by jurisdiction for this SCC in the 2022 v1 EMP inventory.

Table 15: 2022 Annual Emission Estimates for SCC 2104008530

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)
MD-Calvert	0.358	0.085	0.049
MD-Charles	0.537	0.128	0.074
MD-Frederick	0.838	0.200	0.116
MD-Montgomery	0.141	0.034	0.020
MD-Prince George's	0.278	0.066	0.038
VA-Fairfax	0.016	0.004	0.002
VA-Loudoun	0.842	0.201	0.116
VA-Prince William	0.715	0.171	0.099
Totals:	3.725	0.890	0.515

Agricultural Burning

The SCCs shown in Table 15 are agriculture field burning emissions categories. These SCCs have a temporal profile identification of 262, which distributes emissions uniformly across the months. Therefore, the OStd to annual emission ratio is 1/365 or 0.00274.

Table 16: Agriculture Field Burning SCCs

SCC	Description
2801500141	Miscellaneous Area Sources-Agriculture Production - Crops-Agricultural Field Burning - whole field set on fire-Field Crop is Bean (red): Headfire Burning
2801500150	Miscellaneous Area Sources-Agriculture Production - Crops-Agricultural Field Burning - whole field set on fire-Field Crop is Corn: Burning Techniques Not Important
2801500171	Miscellaneous Area Sources-Agriculture Production - Crops-Agricultural Field Burning - whole field set on fire-Fallow
2801500262	Miscellaneous Area Sources-Agriculture Production - Crops-Agricultural Field Burning - whole field set on fire-Field Crop is Wheat: Backfire Burning

Table 16, Table 17, Table 18, and Table 19 show the annual and OStd values for CO, NO_X, and VOC for these four SCCs. Not every jurisdiction has emissions assigned to these SCCs.

Table 17: 2022 Emission Estimates for SCC 281500141

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Calvert	19.16	0.95	2.77	0.05248	0.00260	0.00759
MD-Charles	9.58	0.47	1.39	0.02624	0.00130	0.00380
MD-Frederick	23.94	1.19	3.46	0.06560	0.00325	0.00949
MD-Montgomery	4.79	0.24	0.69	0.01312	0.00065	0.00190
MD-Prince George's	4.79	0.24	0.69	0.01312	0.00065	0.00190
VA-Loudoun	4.79	0.24	0.69	0.01312	0.00065	0.00190
VA-Prince William	9.58	0.47	1.39	0.02624	0.00130	0.00380
Totals:	76.62	3.80	11.08	0.20992	0.01040	0.03037

Table 18: 2022 Emission Estimates for SCC 2801500150

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Calvert	7.48	0.40	1.16	0.02049	0.00110	0.00319
MD-Charles	59.83	3.21	9.31	0.16391	0.00878	0.02551
VA-Loudoun	7.48	0.40	1.16	0.02049	0.00110	0.00319
VA-Prince William	22.44	1.20	3.49	0.06147	0.00329	0.00957
Totals:	97.22	5.21	15.13	0.26635	0.01427	0.04145

Table 19: 2022 Emission Estimates for SCC 2801500171

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Frederick	4.18	0.18	0.60	0.01145	0.00050	0.00165

Table 20: 2022 Emission Estimates for SCC 2801500262

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
VA-Loudoun	7.10	0.29	1.21	0.01946	0.00080	0.0031

SCC 2810005001, Pile Burning

The SCC 2810005001 had minimal emissions assigned in the 2022 v1 EMP to jurisdictions within the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area. Only Charles County had emissions assigned, and these emissions are provided in Table 20. The profile assigned to this SCC showed no activity in June, July, or August so that the ratio of OStd to annual emissions is zero.

Table 21: 2022 Emission Estimates for SCC 2810005001

Jurisdiction	CO (tpy)	NOx (tpy)	VOC (tpy)	CO (OStd)	NOx (OStd)	VOC (OStd)
MD-Charles	0.03	0.00	0.00	0.00000	0.00000	0.00000

SCCs 2811015001, 2811015002, Prescribed Fires

EPA handles prescribed fires as singular events and assigned emissions to specific days and jurisdictions. As noted in the EPA document entitled, "Documentation of 2022v1 Emissions Released in October 2024," EPA does not apply growth or control factors when developing future year prescribe fire inventories.[9] Future year emissions are assumed to be equal to 2022 emission estimates. Therefore, developing an OStd to annual ratio is not needed. The 2022 emissions can be included in the 2032 and 2038 emissions inventories with no additional modifications.

Using EMF, MARAMA culled the daily emissions by pollutant, SCC, and jurisdiction from EPA's SMOKE-ready input files for SCCs 2811015001 (Miscellaneous Area Source-Other Combustion-Managed Burning, Slash (Logging Debris)-Pile Burning) and 2811015002 (Miscellaneous Area Sources-Other Combustion - as Event-Prescribed Forest Burning-Flaming). To create OStd estimates, the emissions of each pollutant from each jurisdiction and SCC were summed for the months of May through September. This total was divided by the number of activity days in each jurisdiction for these months. Not every Metropolitan Washington, D.C. jurisdiction had emissions assigned to these two SCCs in 2022. Also, those jurisdictions with emissions assigned to these two SCCs may not have had any activity during the months of May through September. Table 21 and Table 22 summarize the annual and OStd estimates for the jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area for 2811015001 and 2811015002, respectively.

Table 22: 2022 Emission Estimates for SCC 2811015001

Jurisdiction	CO (tpy)	NOx (tpy)	VOC (tpy)	CO (OStd)	NOx (OStd)	VOC (OStd)
MD-Calvert	14.29	0.0000	2.82	0.0000	0.0000	0.0000
MD-Charles	80.06	0.0005	15.81	4.6215	0.0001	0.9132
MD-Frederick	10.74	0.0000	2.12	2.3990	0.0000	0.4733
MD-Montgomery	2.51	0.0000	0.49	0.0000	0.0000	0.0000
MD-Prince George's	106.65	0.0011	21.07	6.5585	0.0001	1.2959
VA-Fairfax	4.39	0.0000	0.87	0.0000	0.0000	0.0000
VA-Loudoun	78.46	0.0000	15.48	0.0000	0.0000	0.0000
VA-Prince William	78.48	0.0015	15.51	0.0000	0.0000	0.0000
Totals:	375.57	0.0032	74.15	13.5791	0.0002	2.6823

[9] URL: https://gaftp.epa.gov/Air/emismod/2022/v1/2022v1_emissions_docn.pdf

Table 23: 2022 Emission Estimates for SCC 2811015002

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
MD-Calvert	150.69	2.25	28.35	0.0000	0.0000	0.0000
MD-Charles	555.05	9.89	104.57	28.1637	0.3849	5.5168
MD-Frederick	230.01	3.42	43.33	14.7668	0.2475	2.7621
MD-Montgomery	56.34	0.85	10.64	0.0000	0.0000	0.0000
MD-Prince George's	635.05	10.94	117.97	26.0056	0.4647	4.8435
VA-Fairfax	34.67	0.77	6.86	0.0000	0.0000	0.0000
VA-Loudoun	939.64	16.34	176.70	0.0000	0.0000	0.0000
VA-Prince William	470.78	8.70	86.39	0.0000	0.0000	0.0000
Totals:	3,072.23	53.17	574.83	68.9360	1.0970	13.1224

Profiles From Other Sources

In some cases, SMOKE temporal allocation files were not used by the modeling tools to develop future year emissions. In these situations, which include biogenic emissions and CMV emissions, SMOKE outputs were examined with novel scripts to sum emissions by day for each pollutant/FIPS combination. The following sections describe the approach used for these two sectors.

Biogenic Emissions

The SCCs associated with biogenic emissions are 2701200000 (emissions from vegetation) and 2701220000 (emissions from vegetation/agriculture). The temporal profile supplied to EMF showed a uniform distribution of emissions from these SCCs over 2022, which is a highly unlikely pattern. Therefore, New York State Department of Environmental Conservation (NYSDEC) staff developed a novel script to extract daily biogenic emissions from SMOKE outputs. The CMAQ inline option to generate MEGAN biogenic emissions on-the-fly was used while NYSDEC ran CAMQ over the 12-kilometer continental United States domain.

The CMAQ MEGAN biogenic output files (one file per day) is named using the following convention:
CCTM_DESID1_MIOG_v54p5_intel_cb6r5_ae7_aq_HEMI_M3DRY_2022hc_${YYYY}${MM}${DD}.nc

Hourly speciated and gridded MEGAN biogenic emissions are available in CMAQ output files, and CMAQ utilities may be used to create gridded daily NO_X, VOC, and CO output files. Each grid cell was assigned to a county using the script developed by NYSDEC. The NYSDEC script summed grid cells to jurisdictions, and to ensure accuracy, the annual emission sums for each jurisdiction were compared to EPA's annual biogenic estimates. [10] The output from the

[10] URL:
https://gaftp.epa.gov/Air/emismod/2022/v1/reports/2022v1_2016v3_state_sector_report_13jan2025.xlsx

NYSDEC script provided similar annual values. The spreadsheet entitled, "MEGAN_county_daily_emissions_2025-08-06.xlsx" contains the data provided by NYSDEC and the daily jurisdictional emissions for these two SCCs.

Biogenic emissions are not grown. Rather, future year estimates of these emissions are assumed to be equivalent to the attainment year emissions. Therefore, ratios of the OStd to annual values of each pollutant for the biogenic SCCs were not needed.

Table 23 summarizes the biogenic 2022 annual and ozone season average daily emissions obtained from the 2022 EMP for jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area.

Table 24: 2022 Biogenic Emission Estimates

FIPS	Jurisdiction	NO_X (tpy)	VOC (tpy)	CO (tpy)	NO_X (OStd)	VOC (OStd)	CO (OStd)
11001	DC	64.9	1,344.5	46.8	0.4	10.3	0.4
24009	Calvert County	117.9	4,261.1	149.6	0.6	32.8	1.2
24017	Charles County	213.0	11,370.5	348.6	1.0	86.8	2.7
24021	Frederick County	680.5	7,342.8	409.5	3.8	55.8	3.1
24031	Montgomery County	466.8	8,819.1	372.5	2.6	67.1	2.9
24033	Prince George's County	356.5	10,403.7	378.8	2.0	80.1	2.9
51013	Arlington County	23.9	624.7	19.7	0.1	4.8	0.2
51059	Fairfax County	300.3	10,016.6	313.5	1.6	76.3	2.4
51107	Loudoun County	367.7	7,087.8	369.8	2.0	53.1	2.8
51153	Prince William County	160.0	8,172.7	268.0	0.7	61.6	2.0
51510	City of Alexandria	12.5	312.4	11.1	0.1	2.4	0.1
51600	City of Fairfax	5.4	186.2	5.2	0.0	1.4	0.0
51610	City of Falls Church	1.9	53.7	1.6	0.0	0.4	0.0
51683	City of Manassas	4.2	270.7	8.0	0.0	2.0	0.1
51685	City of Manassas Park	1.3	87.1	2.5	0.0	0.7	0.0
	Totals:	2,776.9	70,353.4	2,705.3	15.0	535.7	20.7

Wildfire Emissions

Wildfire emissions are not considered anthropogenic emission sources since emissions from wildfires are generally not caused by manmade actions and since controls on this emissions sector are not possible. The emissions from the wildfire SCCs, 2801001001 (Miscellaneous Area Sources-Other Combustion-Forest Wildfires-Smoldering) and 2801001002 (Miscellaneous Area Sources-Other Combustion-Forest Wildfires-Flaming) are included in the biogenic sector.

Wildfire emissions are significant in some areas of the country depending on which year is being examined. In 2022, the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area experienced some wildfire activity, particularly in Prince William County. However, much of the wildfire activity in the nonattainment area occurred outside of the May through September time period.

In projection year inventory development, wildfire activity and emissions are not grown. Rather, the future year activity and emissions are assumed to be equal to the activity and emissions in the attainment year. To estimate ozone season tons per day activity from these SCCs, the SMOKE-ready inventory file named "ptday_sf2_2022v1_20240802_caps_wf_02aug2024_v0.csv" was parsed to the jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area and for the wildfire SCCs.

The data is available by day and jurisdiction as well as by pollutant and SCC. Days during the ozone season (May through September) were summed to determine total ozone season emissions of each pollutant. The ozone season total for each jurisdiction, SCC, and pollutant was divided by the number of days during the ozone season that showed activity and emissions. Data calculations are available in the spreadsheet entitled, "Annual_Ozone_Season_Wildfire_Data_2022_MetroDC_2025-11-20.xlsx" and included in summary format in the spreadsheet entitled, "RWC_BBQ_Crem_RxFires_AgFires_Wildfires_annual to OS comparison_2025-11-19.xlsx." Table 24 and Table 25 provided a summary of the annual and OStd values for each jurisdiction in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area for SCCs 2801001001 and 2801001002, respectively. Note that not all jurisdictions had emissions and activity for these SCCs in the 2022 EMP.

Table 25: 2022 Emission Estimates for SCC 2810001001

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
Calvert County	1.669707	0.000464	0.336988	0.0420035	0.0000120	0.0084775
Charles County	1.303018	0.000287	0.261775	0.1738450	0.0000190	0.0346060
Frederick County	0.540136	0.000238	0.110462	0.0187630	0.0000000	0.0037010
Prince George's County	1.647460	0.000445	0.332289	1.0500780	0.0002920	0.2119390
Fairfax County	0.262520	0.000075	0.052986	0.1281100	0.0000360	0.0258570
Loudoun County	0.245143	0.000005	0.048446	n/c	n/c	n/c
Prince William County	186.698255	0.067150	37.932260	0.0030890	0.0000010	0.0006230
Totals:	192.366239	0.068664	39.075206	1.4158885	0.0003600	0.2852035

Table 26: 2022 Emission Estimates for SCC 2810001002

Jurisdiction	CO (tpy)	NO_X (tpy)	VOC (tpy)	CO (OStd)	NO_X (OStd)	VOC (OStd)
Calvert County	13.622198	0.318748	2.507244	0.3344620	0.0080740	0.0614125
Charles County	9.260769	0.206613	2.056172	1.6262270	0.0344780	0.5572130
Frederick County	4.111004	0.099079	0.754058	0.1611380	0.0039700	0.0299750
Prince George's County	13.476229	0.316219	2.622132	8.5078520	0.2034620	1.5633730
Fairfax County	2.090389	0.050464	0.383829	1.0201100	0.0246260	0.1873080
Loudoun County	1.812048	0.037178	0.367543	n/c	n/c	n/c
Prince William County	1,512.510626	34.754119	281.070749	0.0135510	0.0002940	0.0023270
Totals:	1,556.883263	35.782420	289.761727	11.663340	0.274904	2.401609

CMV Emissions

Emissions from the CMV sector are included in the 2022 v1 EMP for the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area. Table 26 provides the CMV SCCs and SCC descriptions included in the 2022 v1 EMP for the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area.

Table 27: CMV SCCs and Descriptions

SCC	Description
2280201123	Mobile Sources-Marine Vessels, Commercial-Diesel Barge-C1C2 Underway emissions: Main Engine
2280201124	Mobile Sources-Marine Vessels, Commercial-Diesel Barge-C1C2 Underway emissions: Auxiliary Engine
2280202123	Mobile Sources-Marine Vessels, Commercial-Diesel Offshore support-C1C2 Underway emissions: Main Engine
2280202124	Mobile Sources-Marine Vessels, Commercial-Diesel Offshore support-C1C2 Underway emissions: Auxiliary Engine
2280202323	Mobile Sources-Marine Vessels, Commercial-Diesel Offshore support-C3 Underway emissions: Main Engine
2280202324	Mobile Sources-Marine Vessels, Commercial-Diesel Offshore support-C3 Underway emissions: Auxiliary Engine
2280203323	Mobile Sources-Marine Vessels, Commercial-Diesel Bulk Carrier-C3 Underway emissions: Main Engine
2280203324	Mobile Sources-Marine Vessels, Commercial-Diesel Bulk Carrier-C3 Underway emissions: Auxiliary Engine
2280204123	Mobile Sources-Marine Vessels, Commercial-Diesel Commercial Fishing-C1C2 Underway emissions: Main Engine
2280204124	Mobile Sources-Marine Vessels, Commercial-Diesel Commercial Fishing-C1C2 Underway emissions: Auxiliary Engine
2280205323	Mobile Sources-Marine Vessels, Commercial-Diesel Container Ship-C3 Underway emissions: Main Engine
2280205324	Mobile Sources-Marine Vessels, Commercial-Diesel Container Ship-C3 Underway emissions: Auxiliary Engine
2280207123	Mobile Sources-Marine Vessels, Commercial-Diesel General Cargo-C1C2 Underway emissions: Main Engine
2280207124	Mobile Sources-Marine Vessels, Commercial-Diesel General Cargo-C1C2 Underway emissions: Auxiliary Engine
2280207323	Mobile Sources-Marine Vessels, Commercial-Diesel General Cargo-C3 Underway emissions: Main Engine
2280207324	Mobile Sources-Marine Vessels, Commercial-Diesel General Cargo-C3 Underway emissions: Auxiliary Engine
2280208123	Mobile Sources-Marine Vessels, Commercial-Diesel Government-C1C2 Underway emissions: Main Engine
2280208124	Mobile Sources-Marine Vessels, Commercial-Diesel Government-C1C2 Underway emissions: Auxiliary Engine
2280209123	Mobile Sources-Marine Vessels, Commercial-Diesel Miscellaneous-C1C2 Underway emissions: Main Engine
2280209124	Mobile Sources-Marine Vessels, Commercial-Diesel Miscellaneous-C1C2 Underway emissions: Auxiliary Engine
2280209323	Mobile Sources-Marine Vessels, Commercial-Diesel Miscellaneous-C3 Underway emissions: Main Engine
2280209324	Mobile Sources-Marine Vessels, Commercial-Diesel Miscellaneous-C3 Underway emissions: Auxiliary Engine
2280210123	Mobile Sources-Marine Vessels, Commercial-Diesel RollOn RollOff-C1C2 Underway emissions: Main Engine
2280210124	Mobile Sources-Marine Vessels, Commercial-Diesel RollOn RollOff-C1C2 Underway emissions: Auxiliary Engine
2280210323	Mobile Sources-Marine Vessels, Commercial-Diesel RollOn RollOff-C3 Underway emissions: Main Engine
2280210324	Mobile Sources-Marine Vessels, Commercial-Diesel RollOn RollOff-C3 Underway emissions: Auxiliary Engine
2280211123	Mobile Sources-Marine Vessels, Commercial-Diesel Tanker-C1C2 Underway emissions: Main Engine
2280211124	Mobile Sources-Marine Vessels, Commercial-Diesel Tanker-C1C2 Underway emissions: Auxiliary Engine
2280211323	Mobile Sources-Marine Vessels, Commercial-Diesel Tanker-C3 Underway emissions: Main Engine
2280211324	Mobile Sources-Marine Vessels, Commercial-Diesel Tanker-C3 Underway emissions: Auxiliary Engine
2280212123	Mobile Sources-Marine Vessels, Commercial-Diesel Tour Boat-C1C2 Underway emissions: Main Engine
2280212124	Mobile Sources-Marine Vessels, Commercial-Diesel Tour Boat-C1C2 Underway emissions: Auxiliary Engine
2280213123	Mobile Sources-Marine Vessels, Commercial-Diesel Tug-C1C2 Underway emissions: Main Engine
2280213124	Mobile Sources-Marine Vessels, Commercial-Diesel Tug-C1C2 Underway emissions: Auxiliary Engine
2280213323	Mobile Sources-Marine Vessels, Commercial-Diesel Tug-C3 Underway emissions: Main Engine
2280213324	Mobile Sources-Marine Vessels, Commercial-Diesel Tug-C3 Underway emissions: Auxiliary Engine
2280215323	Mobile Sources-Marine Vessels, Commercial-Diesel Cruise-C3 Underway emissions: Main Engine
2280215324	Mobile Sources-Marine Vessels, Commercial-Diesel Cruise-C3 Underway emissions: Auxiliary Engine

Table 27 provides the annual emissions in units of tpy by jurisdiction and county for these SCCs in the 2022 v1 EMP.

Table 28: 2022 CMV SCC Annual Emissions by Jurisdiction (tpy)

Jurisdiction	SCC	CO (tpy)	NO_X (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)
DC-District of Columbia	2280207123	0.45	3.24	0.09	0.09	0.00	0.14
DC-District of Columbia	2280207124	7.02	46.02	1.42	1.37	1.07	1.42
DC-District of Columbia	2280208123	0.01	0.09	0.00	0.00		0.01
DC-District of Columbia	2280208124	0.49	3.09	0.08	0.08	0.00	0.09
DC-District of Columbia	2280209123	0.00	0.02	0.00	0.00		0.00
DC-District of Columbia	2280209124	0.00	0.01	0.00	0.00		0.00
DC-District of Columbia	2280212123	0.30	6.29	0.24	0.23	0.00	0.76
DC-District of Columbia	2280212124	4.62	29.48	0.74	0.72	0.02	0.85
DC-District of Columbia	2280213123	0.05	0.37	0.01	0.01		0.02
DC-District of Columbia	2280213124	0.24	1.51	0.04	0.04	0.00	0.04
MD-Calvert	2280201123	0.00	0.03	0.00	0.00		0.00
MD-Calvert	2280201124	0.01	0.06	0.00	0.00		0.00
MD-Calvert	2280202123	0.06	0.46	0.01	0.01		0.03
MD-Calvert	2280202124	0.40	2.59	0.08	0.07	0.04	0.08
MD-Calvert	2280202323	0.01	0.09	0.00	0.00	0.00	0.00
MD-Calvert	2280202324	0.00	0.00				
MD-Calvert	2280203323	1.40	11.42	0.18	0.17	0.36	0.64
MD-Calvert	2280203324	0.11	0.71	0.02	0.02	0.05	0.04
MD-Calvert	2280204123	0.01	0.05	0.00	0.00		0.00
MD-Calvert	2280204124	0.11	0.67	0.02	0.02	0.00	0.02
MD-Calvert	2280205323	1.05	8.68	0.14	0.12	0.27	0.48
MD-Calvert	2280205324	0.09	0.71	0.02	0.02	0.04	0.04
MD-Calvert	2280207123	1.70	10.99	0.28	0.27	0.01	0.34
MD-Calvert	2280207124	1.95	12.77	0.40	0.38	0.30	0.39
MD-Calvert	2280207323	0.02	0.24	0.00	0.00	0.01	0.01
MD-Calvert	2280207324	0.00	0.03	0.00	0.00	0.00	0.00
MD-Calvert	2280208123	0.34	2.29	0.06	0.06	0.00	0.08
MD-Calvert	2280208124	24.56	156.59	3.94	3.82	0.10	4.50
MD-Calvert	2280209123	0.06	0.50	0.02	0.01		0.03
MD-Calvert	2280209124	1.51	9.33	0.24	0.23	0.01	0.27
MD-Calvert	2280209323	0.29	2.70	0.05	0.04	0.10	0.14
MD-Calvert	2280209324	0.02	0.18	0.00	0.00	0.01	0.01
MD-Calvert	2280210123	0.00	0.01	0.00	0.00		0.00
MD-Calvert	2280210124		0.00				
MD-Calvert	2280210323	1.36	9.65	0.18	0.16	0.35	0.62
MD-Calvert	2280210324	0.15	1.16	0.03	0.02	0.06	0.06
MD-Calvert	2280211123	0.02	0.18	0.01	0.01		0.01
MD-Calvert	2280211124	0.57	3.76	0.12	0.12	0.11	0.12
MD-Calvert	2280211323	0.92	5.70	0.11	0.10	0.16	0.71
MD-Calvert	2280211324	5.36	43.89	1.18	1.09	2.87	2.10
MD-Calvert	2280212123	0.01	0.09	0.00	0.00		0.01
MD-Calvert	2280212124	0.22	1.37	0.03	0.03	0.00	0.04
MD-Calvert	2280213123	8.44	55.88	1.46	1.42	0.03	2.01
MD-Calvert	2280213124	2.25	14.28	0.36	0.35	0.01	0.41
MD-Calvert	2280213323	0.06	0.44	0.01	0.01	0.02	0.03
MD-Calvert	2280213324	0.00	0.00				
MD-Calvert	2280215323	0.20	2.37	0.03	0.03	0.07	0.10
MD-Calvert	2280215324	0.16	2.01	0.03	0.03	0.06	0.06
MD-Charles	2280202123	0.00	0.01				0.00
MD-Charles	2280202124	0.00	0.02	0.00	0.00		0.00
MD-Charles	2280207123	0.08	0.55	0.01	0.01	0.00	0.02
MD-Charles	2280207124	0.04	0.26	0.01	0.01	0.01	0.01
MD-Charles	2280208123	0.41	3.03	0.08	0.08	0.00	0.14
MD-Charles	2280208124	3.78	24.12	0.61	0.59	0.01	0.69
MD-Charles	2280209123	0.00	0.03	0.00	0.00		0.00
MD-Charles	2280209124	0.02	0.10	0.00	0.00		0.00
MD-Charles	2280212123	0.02	0.24	0.01	0.01		0.02

Jurisdiction	SCC	CO (tpy)	NO_X (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)
MD-Charles	2280212124	0.07	0.45	0.01	0.01	0.00	0.01
MD-Charles	2280213123	2.38	18.64	0.54	0.52	0.01	1.02
MD-Charles	2280213124	2.09	13.35	0.34	0.33	0.01	0.39
MD-Prince George's	2280207123	0.03	0.22	0.01	0.01		0.01
MD-Prince George's	2280207124	0.06	0.39	0.01	0.01	0.01	0.01
MD-Prince George's	2280208123	0.03	0.22	0.01	0.01		0.01
MD-Prince George's	2280208124	0.07	0.45	0.01	0.01	0.00	0.01
MD-Prince George's	2280209123	0.00	0.01				
MD-Prince George's	2280209124	0.00	0.00				
MD-Prince George's	2280212123	0.01	0.10	0.00	0.00		0.01
MD-Prince George's	2280212124	0.05	0.34	0.01	0.01		0.01
MD-Prince George's	2280213123	0.09	0.63	0.02	0.02	0.00	0.03
MD-Prince George's	2280213124	0.03	0.17	0.00	0.00		0.00
VA-Alexandria city	2280207123	0.00	0.09	0.00	0.00		0.01
VA-Alexandria city	2280207124	0.50	3.26	0.10	0.10	0.08	0.10
VA-Alexandria city	2280208124		0.00				
VA-Alexandria city	2280212123	0.01	0.24	0.01	0.01		0.03
VA-Alexandria city	2280212124	0.80	5.08	0.13	0.12	0.00	0.15
VA-Arlington	2280208124		0.00				
VA-Fairfax	2280208123	0.01	0.07	0.00	0.00		0.01
VA-Fairfax	2280208124	0.14	0.88	0.02	0.02	0.00	0.03
VA-Fairfax	2280212123	0.00	0.01	0.00	0.00		0.00
VA-Fairfax	2280212124	0.01	0.05	0.00	0.00		0.00
VA-Fairfax	2280213123	0.03	0.34	0.01	0.01		0.03
VA-Fairfax	2280213124	0.02	0.13	0.00	0.00		0.00
VA-Prince William	2280212123		0.01				0.00
VA-Prince William	2280212124	0.00	0.01				0.00
VA-Prince William	2280213123	0.03	0.41	0.01	0.01		0.04
VA-Prince William	2280213124	0.13	0.86	0.02	0.02	0.00	0.02
	Totals:	77.53	526.79	13.63	13.11	6.26	19.53

The EMF temporalization of these annual inventories resulted in zero emissions on a daily basis due to a monthly profile_ID of 1000 (zero emissions for all months) in the SMOKE input files. To determine emissions in units of OStd, MDE parsed the available files from the EPA website to jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area and to the months of June, July, and August. MDE averaged the daily NO_X and VOC emissions by FIPs and SCC for June, July, and August and subsequently summed the average daily NOx and VOC emissions to the FIPs level. File names of the EPA FF10 format files are listed below:

- 2022hc_CMV_c1c2_inventory_20dec2024.zip[11]
- 2022hc_CMV_c3_inventory_20dec2024.zip[12]

Table 28 summarizes the annual daily CMV 2022 v1 emissions obtained from the 2022 EMP for jurisdictions in the Metropolitan Washington, D.C. 2015 ozone NAAQS nonattainment area as well as the daily emission estimates for this sector during summer months. These data are provided in the spreadsheet called, "CMV C1C2.xlsx."

[11] URL: https://gaftp.epa.gov/Air/emismod/2022/v1/2022emissions/2022hc_CMV_c1c2_inventory_20dec2024.zip
[12] URL: https://gaftp.epa.gov/Air/emismod/2022/v1/2022emissions/2022hc_CMV_c3_inventory_20dec2024.zip

Table 29: CMV Annual and Ozone Season Daily Emissions

FIPS	Jurisdiction	NO_X (tpy)	VOC (tpy)	NO_X (OStd)	VOC (OStd)
11001	DC	90.1	3.3	0.2823	0.0105
24009	Calvert County	361.9	13.4	0.6047	0.0244
24017	Charles County	60.8	2.3	0.1419	0.0049
24021	Frederick County	0.0	0.0	0.0000	0.0000
24031	Montgomery County	0.0	0.0	0.0000	0.0000
24033	Prince George's County	2.5	0.1	0.0213	0.0009
51013	Arlington County	0.0	0.0	0.0000	0.0000
51059	Fairfax County	1.5	0.1	0.0259	0.0010
51107	Loudoun County	0.0	0.0	0.0000	0.0000
51153	Prince William County	1.3	0.1	0.0073	0.0005
51510	City of Alexandria	8.7	0.3	0.0994	0.0034
51600	City of Fairfax	0.0	0.0	0.0000	0.0000
51610	City of Falls Church	0.0	0.0	0.0000	0.0000
51683	City of Manassas	0.0	0.0	0.0000	0.0000
51685	City of Manassas Park	0.0	0.0	0.0000	0.0000
	Totals:	526.8	19.5	0.9749	0.0345

Table 29 provides the daily to annual ratio for emissions from the SCCs listed in Table 26 for each jurisdiction and pollutant.

Table 30: CMV Ozone Season Daily to Annual Ratios by Pollutant

FIPS	Jurisdiction	NO_X Ratio	VOC Ratio
11001	DC	0.0031	0.0032
24009	Calvert County	0.0017	0.0018
24017	Charles County	0.0023	0.0021
24021	Frederick County	n/a	n/a
24031	Montgomery County	n/a	n/a
24033	Prince George's County	0.0085	0.0090
51013	Arlington County	0.0000	0.0000
51059	Fairfax County	0.0173	0.0100
51107	Loudoun County	n/a	n/a
51153	Prince William County	0.0056	0.0050
51510	City of Alexandria	0.0114	0.0113
51600	City of Fairfax	n/a	n/a
51610	City of Falls Church	n/a	n/a
51683	City of Manassas	n/a	n/a
51685	City of Manassas Park	n/a	n/a

*n/a indicates no ratio is calculated since 2022 annual emission estimates are zero.

Stage II Emissions

SCCs: 250160100

Stage II refueling loss emissions were developed using MOVES5.0.0 onroad model. The methodology to develop these emissions are described in detail in Appendix D1. Appendix B3 contains these emissions for all four milestone years.

Table 30: Stage II VOC Emissions (Tons per day)*

Jurisdiction	2017	2022	2032	2038
City of Alexandria	0.117	0.082	0.058	0.048
Arlington County	0.213	0.167	0.091	0.074
Calvert County	0.111	0.077	0.046	0.037
Charles County	0.205	0.150	0.098	0.083
District of Columbia	0.125	0.103	0.221	0.215
Fairfax County	1.488	1.144	0.696	0.571
Frederick County	0.553	0.396	0.265	0.227
Loudoun County	0.414	0.341	0.242	0.200
Montgomery County	1.151	0.832	0.515	0.419
Prince George's County	1.403	1.035	0.618	0.501
Prince William County	0.596	0.450	0.281	0.238
Total	6.375	4.777	3.130	2.612

*Both Refueling Displacement Vapor Loss and Refueling Spillage Loss are combined.