4.0 Base Year and Future Year Emission Estimates

CTDEP has adopted, or is currently pursuing adoption of, several regulations to provide in-state reductions of ozone precursor (i.e., VOC and NO_X) emissions. These in-state measures, along with national measures targeted at on-road and non-road emission sources, are expected to provide significant emission reductions through 2009 and beyond. This section documents the level of emissions in Connecticut in the baseline year of 2002, provides descriptions of the measures relied upon to meet CAA reasonable further progress (RFP) and attainment requirements, and summarizes estimates of projected future emissions resulting from these state and federal measures.

4.1 2002 Base Year Typical Summer Day Inventory

The development and refinement of Connecticut's 2002 base year inventory is described below.

4.1.1 CTDEP's 2002 Periodic Emissions Inventory

EPA's Phase 2 Ozone Implementation Rule[1] established 2002 as the baseline year for determining RFP compliance and recommended that states use 2002 as the baseline year for photochemical grid modeling. Section 182(a)(3) of the CAA requires states with moderate or above ozone nonattainment areas to prepare periodic emission inventories (PEIs) every three years, starting in 1990, estimating actual emissions from all sources.

As required, CTDEP has routinely prepared PEIs since 1990. The most recent version of the 2002 PEI was provided to EPA in December 2005. The 2002 PEI provides estimates of actual VOC and NO_X emissions for each county in Connecticut, with sources grouped into the following general categories:

- Stationary Point Sources: Industrial or commercial operations that are either classified as major sources or have 2002 actual emissions of 10 tons or more per year (tpy) of VOC or NO_X are included in the point source inventory. Examples include power plants, factories, large industrial and commercial boilers or other fuel burning equipment.
- Stationary Area Sources: Emission sources too small to be inventoried individually are classified as area sources. Examples include small industrial or commercial facilities such as gasoline stations, printing shops, dry cleaners, and auto refinishing shops.
- On-Road Mobile Sources: These include exhaust and evaporative emissions from cars, buses, motorcycles and trucks traveling on state and local roads.
- Non-Road Mobile Sources: Exhaust and evaporative emissions from mobile sources that are not generally traveling on state and local roads are designated non-road mobile sources. Examples include construction equipment such as backhoes and graders, recreational equipment such as all-terrain vehicles and off-road motorcycles, commercial and residential lawn and garden equipment such as lawn mowers and leaf blowers, industrial equipment such as forklifts and sweepers, airport equipment such as aircraft and ground support vehicles, and marine equipment such as commercial and recreational watercraft.

[1] 70 FR 71612

The 2002 PEI (December 2005 version) contains full documentation of the procedures and data used to develop the 2002 emissions estimates. Summaries of VOC and NO_X emission estimates are provided in Tables 4.1.1.1 and 4.1.1.2 for both of Connecticut's 8-hour ozone nonattainment areas. As described below, the December 2005 version of the PEI, with some modifications, will serve as the 2002 Base Year Inventory for determining compliance with 8-hour ozone reasonable further progress obligations.

Table 4.1.1.1
Summary of Connecticut's 2002 VOC Periodic Emissions Inventory*
(tons / summer day)

Source Category	Greater CT	Southwest CT	State Total
Stationary Point	4.6	11.3	15.9
Stationary Area	69.1	77.1	146.2
On - Road Mobile	45.8	47.3	93.1
Non - Road Mobile	37.2	57.7	94.9
Total Anthropogenic VOC	**156.7**	**193.4**	**350.1**
Biogenic VOC	268.6	125.6	394.2
Total VOC	**425.3**	**318.9**	**744.2**

*These estimates of actual 2002 emissions are from CTDEP's December 2005 version of the 2002 periodic emissions inventory. See Section 4.1.2 for a description of modifications made to the 2002 PEI estimates to ensure the 2002 Base Year Inventory (used for determining reasonable further progress) is based on the most recent emission estimation techniques.

Table 4.1.1.2
Summary of Connecticut's 2002 NO_X Periodic Emissions Inventory*
(tons / summer day)

Source Category	Greater CT	Southwest CT	State Total
Stationary Point	19.0	37.8	56.8
Stationary Area	6.4	7.2	13.6
On - Road Mobile	90.7	100.3	191.0
Non - Road Mobile	31.9	51.6	83.5
Total Anthropogenic NO_X	**148.0**	**196.9**	**344.9**
Biogenic NO_X	1.3	0.7	2.0
Total NO_X	**149.3**	**197.6**	**346.9**

*These estimates of actual 2002 emissions are from CTDEP's December 2005 version of the 2002 periodic emissions inventory. See Section 4.1.2 for a description of modifications made to the 2002 PEI estimates to ensure the 2002 Base Year Inventory (used for determining reasonable further progress) is based on the most recent emission estimation techniques.

4.1.2 Updates to the 2002 PEI to Determine 2002 Base Year Emissions

Subsequent to the preparation of the 2002 PEI, updated emission estimation techniques became available for a few source categories. These included a new release of EPA's NONROAD model used for estimating emissions from most non-road emission sources, updates to traffic-related parameters used as inputs to EPA's MOBILE model, and new procedures to account for evaporative VOC emissions resulting from storage and use of portable fuel containers (i.e., gasoline cans) and from the manufacture and use of adhesives and sealants. As described below, emission estimates from the December 2005 version of the 2002 PEI were updated to incorporate each of these new procedures.

Updated Non-Road Emission Estimates for 2002

Emissions from the non-road sector were updated using NONROAD2005,[2] EPA's most recent release of the NONROAD emissions model. The new version of the model incorporates all of EPA's non-road engine emission and fuel standards finalized through the end of 2005.[3] As with previous versions of the model, NONROAD2005 calculates past, present and future emission estimates for all non-road equipment categories except commercial marine, locomotives, and aircraft. Emissions for those three categories remain unchanged from the 2002 PEI provided to EPA in December 2005. Table 4.1.2.1 lists the local inputs used in the NONROAD2005 runs for 2002. Complete input data files are included in Appendix 4A.

Table 4.1.2.1: Local Inputs to EPA's NONROAD2005 Model

Gasoline RVP (psi)	6.86	**Minimum Temperature (F)** **Greater Connecticut:** **Southwest Connecticut:**	 67.7 66.5
Gasoline Oxygen Weight %	2.1	**Maximum Temperature (F)** **Greater Connecticut:** **Southwest Connecticut:**	 95.5 91.6
Gasoline Sulfur %	0.0106	**Average Temperature (F)** **Greater Connecticut:** **Southwest Connecticut:**	 86.2 83.2
Diesel Sulfur %	0.2318	**Year**	2002
Marine Diesel Sulfur %	0.2637	**Season**	Summer
CNG/LPG Sulfur %	0.003	**Day Type**	Typical Weekday
Stage II Control %	0.0	**Sources**	All

Overall, for Connecticut, EPA's new version of the model projects non-road VOC emissions to be about 29% higher and non-road NO_X emissions to be about 17% lower than estimates produced by the April 2004 draft NONROAD model used in the December 2005 version of the 2002 PEI.

[2] The NONROAD2005 model includes the following modules: 1) Core Model version 2005a (February 2006); 2) Graphical User Interface version 2005.1.0 (June 2006); 3) Reporting Utility version 2005c (March 2006); and 4) Data File updates (February 2006).

[3] See Section 4.2.1 for a summary of federal rulemakings for non-road engines.

Updated On-Road Emission Estimates for 2002

The December 2005 version of the 2002 PEI was based on the best estimates of 2002 traffic data available from the Connecticut Department of Transportation (CTDOT) at that time (i.e., CTDOT's Series 27 traffic estimates). Subsequently, CTDOT produced refined estimates of traffic data for 2002 that serve as the basis for their most recent projections of future year traffic levels (i.e., Series 28D). In order to incorporate CTDOT's more recent data, CTDEP updated the MOBILE6.2[4] model runs using the Series 28D traffic estimates, which are summarized in Table 4.1.2.2 for each of Connecticut's nonattainment areas. More detailed listings of model inputs that differ from the December 2005 version of the 2002 PEI are included in Appendix 4A.

Table 4.1.2.2
CTDOT Series 28D Vehicle Miles Traveled Estimates for 2002
(Average Daily Summer Traffic)

Area	Average Summer Day Traffic (Vehicle Miles Traveled)
Greater Connecticut	44,425,646
Southwest Connecticut	48,419,485
State Total	**92,845,131**

Inclusion of the revised 2002 traffic data from CTDOT makes very little difference in emission estimates. On a statewide basis, the updated estimates of on-road VOC and NO_X emissions differ by 0.3% and 0.5%, respectively, compared to the on-road estimates in the December 2005 version of the 2002 PEI.

Portable Fuel Container Emission Estimates for 2002

The December 2005 version of the 2002 PEI does not include most of the evaporative VOC emissions that occur from the storage and use of portable fuel containers (PFCs, a.k.a. gasoline cans). PFC's have five different emission modes: permeation and diurnal (associated with storage), transport-spillage (associated with filling and transporting the PFC), equipment refueling spillage and refueling-vapor displacement (associated with equipment refueling). Although the emissions resulting from equipment refueling are accounted for by the EPA's NONROAD2005 model and included in the non-road portion of the inventory, the emissions associated with PFC transport- spillage and storage were not included in the December 2005 version of the 2002 PEI or in PEI's prepared for previous years (i.e., 1990, 1993, 1996 or 1999).

To address this issue for the 2002 base year inventory used in RFP calculations, the December 2005 version of the 2002 PEI has been modified to more fully account for PFC evaporative VOC emissions using a methodology developed by the California's Air Resource Board (CARB).[5] The CARB method is currently being used by CTDEP's Inventory Group to prepare a draft

[4] "User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model"; EPA420-R-03-010; August 2003; See http://www.epa.gov/omswww/m6.htm.
[5] Notice of Public Meeting to Consider the Approval of California's Portable Gasoline-Container Emissions Inventory, California Air Resources Board, Sacramento, CA, September 1999.

version of the 2005 PEI. As described below, estimates of 2002 PFC emissions were developed from the draft 2005 PEI PFC results by using 2002 activity factors and control levels.

The CARB methodology calculates PFC emission estimates based on the storage condition of the gasoline can (open or closed), the material of construction (metal or plastic) and the type of usage (residential or commercial). A gas can is considered open when it is stored with an open breathing hole or an uncapped nozzle. A closed system exists when the breathing hole is closed, and the nozzle is capped. The permeation rate of gasoline vapors is dependent on the material of construction. Emissions are calculated separately for residential and commercial use because of differing usage profiles.

Appendix 4B contains the PFC section from CTDEP's draft 2005 PEI, documenting procedures and calculations used to determine PFC emissions for 2005. The following adjustments were made to the draft 2005 calculations to develop estimates of PFC emissions in 2002:

- Exclusion of PFC Controls Implemented in 2004
  Connecticut's PFC regulation initially became effective on May 1, 2004.[6] The PFC emission calculations in the draft 2005 PEI include the effect of that regulation, accounting for a reduction in VOC emissions of 6.82 percent. Calculations for 2002 PFC emissions were adjusted upwards by excluding the effects of the 2004 regulations.

- Removal of Growth in Activity Levels Between 2002 and 2005
  As documented in Section 4.3.1, growth in activity levels for the gasoline-marketing sector is based on actual gasoline usage data for Connecticut for the period from 1996 through 2005. Based on activity data tracked by the Federal Highway Administration, Connecticut's gasoline usage in 2002 was 5.4% less than in 2005.[7] PFC emission estimates for 2002 were adjusted accordingly.[8]

After removing both the 2004 controls and the activity growth occurring between 2002 and 2005, the resulting PFC VOC emissions for 2002 are estimated to be 4.0 tons/day in the Greater Connecticut nonattainment area and 4.7 tons/day in Southwest Connecticut portion of the NY/NJ/CT nonattainment area.

Adhesives and Sealants Emission Estimates for 2002

The December 2005 version of the 2002 PEI does not include area source VOC emission estimates for the manufacture and industrial/commercial use of adhesives, sealants, adhesive primers and sealant primers. VOC emissions from this category result from evaporation of solvents during transfer, drying, surface preparation and cleanup operations. Examples of industrial and commercial operations using these products are upholstery shops, wood product manufacturers, building contractors, floor covering installers and roof repairers.

[6] RCSA Section 22a-174-43.
[7] FHWA's annual Highway Statistics documents (Table MF-21). See http://www.fhwa.dot.gov/policy/ohpi/qffuel.htm.
[8] Appendix 4E includes documentation of how 2002 PFC emissions were determined from 2005 estimates.

To address this issue for the 2002 base year inventory used in RFP calculations, the December 2005 version of the 2002 PEI was modified to include area source adhesive and sealant emission estimates from the MANE-VU 2002 inventory, estimated to be 2.4 tons/day in both the Greater Connecticut and Southwest Connecticut areas.[9]

4.1.3 Summary of Resulting 2002 Base Year Inventory

The adjustments described above were made to the December 2005 version of the 2002 PEI emission estimates to account for recent updates to emission calculation methods and inputs. The resulting updated 2002 emission estimates, which will be used as the 2002 Base Year Inventory for demonstrating reasonable further progress compliance, are summarized in Tables 4.1.3.1 and 4.1.3.2 and in Figures 4.1.3.1 and 4.1.3.2.

On a statewide basis in 2002, biogenic sources contributed 50% of the total summer day VOC emissions, with the bulk of the remaining emissions accounted for by stationary area sources (20%), non-road mobile sources (16%) and on-road mobile sources (12%). For statewide NO_X emissions in 2002, the largest contributing category was on-road mobile sources (57%), with large contributions from the non-road mobile (21%) and stationary point (17%) source sectors as well. A more complete source category breakdown of 2002 base year emissions is included in Appendix 4C.

[9] "Technical Support Document for 2002 MANE-VU SIP Modeling Inventories – Version 3"; MANE-VU; April 2007; See http://www.marama.org/visibility/EmissionsInventory/index.htm and ftp://marama.org/2002 Version 3/Documentation/ (use UserID: mane-vu and Password: exchange)

Table 4.1.3.1
Summary of Connecticut's 2002 Base Year VOC Inventory*
(tons / summer day)

Source Category	Greater CT	Southwest CT	State Total
Stationary Point	4.6	11.3	15.8
Stationary Area	75.5	84.1	159.7
On - Road Mobile	45.1	48.3	93.4
Non - Road Mobile	56.2	66.0	122.2
Total Anthropogenic VOC	**181.4**	**209.7**	**391.1**
Biogenic VOC	268.6	125.6	394.2
Total VOC	**450.0**	**335.3**	**785.3**

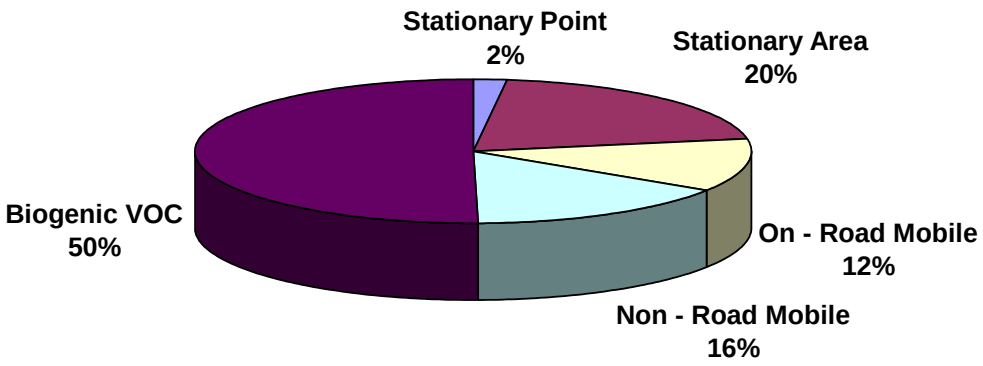
*As described in the text, the 2002 Base Year VOC Inventory is an updated version of CTDEP's December 2005 version of the 2002 periodic emissions inventory. Updates include incorporation of emission estimates from EPA's most recent version of the NONROAD model, more recent traffic information input to the MOBILE6.2 model, and inclusion of evaporative VOC emissions from portable fuel containers (i.e., gasoline cans).

Table 4.1.3.2
Summary of Connecticut's 2002 Base Year NO_X Inventory*
(tons / summer day)

Source Category	Greater CT	Southwest CT	State Total
Stationary Point	19.0	37.7	56.8
Stationary Area	6.4	7.2	13.5
On - Road Mobile	89.3	102.7	192.0
Non - Road Mobile	30.8	38.7	69.5
Total Anthropogenic NO_X	**145.5**	**186.3**	**331.8**
Biogenic NO_X	1.3	0.7	1.9
Total NO_X	**146.8**	**187.0**	**333.7**

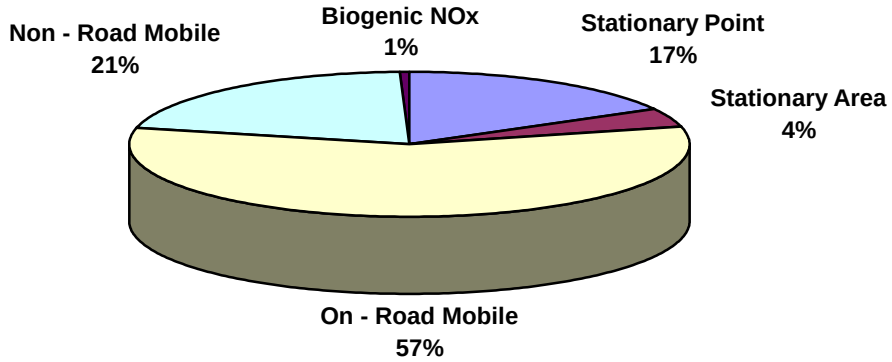
*As described in the text, the 2002 Base Year NO_X Inventory is an updated version of CTDEP's December 2005 version of the 2002 periodic emissions inventory. Updates include incorporation of emission estimates from EPA's most recent version of the NONROAD model and more recent traffic information input to the MOBILE6.2 model.

Figure 4.1.3.1: Connecticut's 2002 Base Year VOC Inventory (State Total = 785 tons / summer day)



As described in the text, the 2002 Base Year VOC Inventory is an updated version of CTDEP's December 2005 version of the 2002 periodic emissions inventory. Updates include incorporation of emission estimates from EPA's most recent version of the NONROAD model, more recent traffic information input to the MOBILE6.2 model, and inclusion of evaporative VOC emissions from portable fuel containers (i.e., gasoline cans).

Figure 4.1.3.2: Connecticut's 2002 Base Year NOx Inventory (State Total = 334 tons / summer day)



As described in the text, the 2002 Base Year NO_X Inventory is an updated version of CTDEP's December 2005 version of the 2002 periodic emissions inventory. Updates include incorporation of emission estimates from EPA's most recent version of the NONROAD model and more recent traffic information input to the MOBILE6.2 model.

4.2 Post-2002 Control Measures Included in Future Year Projections

CTDEP has implemented all emission control programs mandated by the 1990 CAA, and is currently pursuing completion of adoption of additional measures necessary to meet RFP requirements and to demonstrate a reasonable probability of attaining the 8-hour ozone NAAQS, as expeditiously as practicable. Section 4.2.1 describes mobile source control programs. Section 4.2 describes twelve new stationary and area source control measures CTDEP has recently adopted or is pursuing adoption. Section 4.3 includes a discussion of the level of emission reductions resulting from the post-2002 control measures described in this section.

Many of the measures identified in this section came out of a regional planning activities coordinated by the Ozone Transport Commission (OTC). These regional planning activities focused on the identification of potential emission control measures and preparation of materials for 1-hour and 8-hour ozone attainment plans being developed by the OTC member states. The materials included model rules to regulate products, activities and stationary sources to reduce ozone precursor emissions. Model rules were prepared in 2001-2002 to serve 1-hour ozone NAAQS purposes and in 2005-2006 to serve as templates for creating additional reductions for 8-hour ozone NAAQS purposes. Additional information regarding the process of identifying control measures suitable for 8-hour ozone NAAQS planning is included in Section 6.0.

4.2.1 On-Road and Non-Road Mobile Sources and Fuels

There are various federal measures that reduce ozone precursors through more stringent emission standards for vehicles, engines and equipment; changes to fuel type and quality; and influences on human behavior associated with vehicle use. Such federal control measures, along with state counterparts, provide emissions reductions through 2007 and beyond.

4.2.1.1 On-Road Mobile Sources

The Post-1999 Rate of Progress (ROP) Plan (CTDEP, 2001) included a list of control strategies resulting in emission reductions during the period from 2000 to 2007. This list has been expanded to include all post-2002 control programs resulting in emission reductions incorporated into this attainment demonstration. The following table, Table 4.2.1.1, includes the relevant control programs for on-road mobile sources. A brief summary of each strategy is provided in the following paragraphs. All the post-2002 control programs for on-road sources are summarized in Table 4.2.1.1. Explanation of the listed measures that impact ozone attainment follows. More detail concerning the emission reduction calculations is provided in sections 4.3 and 7.0.

Reformulated Gasoline

The federal reformulated gasoline (RFG) program is mandated by CAA Section 211. Its primary purpose is to reduce motor vehicle emissions of smog-forming pollutants such as VOCs and NO_X as well as certain toxic or hazardous air pollutant emissions. The lower volatility of RFG

Table 4.2.1.1: On-Road Mobile Sources Control Strategies

Control Strategy	Pollutant		Federal Program	State Program	Rule Approval Date[1]	Initial Year of Implementation[2]
	VOC	NO_X				
Reformulated Gasoline - Phase I[3]	●	●	●		12/23/1991[4]	1995
Reformulated Gasoline - Phase II[3]	●	●	●		2/16/1994[4]	2000
Tier 1 Motor Vehicle Controls	●	●	●		6/5/1991	1994
National Low Emission Vehicle Program	●	●	●		3/02/1998[5]	1998 (in CT)
Tier 2 Motor Vehicle Controls/Low Sulfur Gasoline	●	●	●		2/10/2000	2004-2008
On-board Refueling Vapor Recovery	●		●		4/6/1994	1997-2005
Heavy-Duty Diesel Vehicle Controls and Fuels	●	●	●		10/6/2000	2004-2005
2007 Highway Rule	●	●	●		1/18/2001	2006-2007
California Low Emission Vehicle Phase 2 (CALEV2)	●	●	●	●	[6]	2007
Enhanced I/M (ASM 2525 phase-in standards)	●	●		●	3/10/1999	2000
Enhanced I/M (ASM 2525 final standards)	●	●		●	10/27/2000	2004
OBD-II Enhanced I/M	●	●		●	[7]	2004
Highway Motorcycle Exhaust Emission Standards	●	●	●		1/15/2004	2006-2010
Mobile Source Air Toxics Rule	●	●	●		3/29/2001	2002
Control of Hazardous Air Pollutants	●	●	●		2/26/2007	2009-2015
Renewable Fuel Standard Program[8]	●	●	●		5/01/2007	2006,2007-2012

[1] Unless otherwise noted, this is the date of Federal Register publication of either a final federal rule or EPA's approval of a state SIP submittal, as appropriate for the indicated control strategy.

[2] A range of implementation years is listed for some strategies due to phase-in of standards. In addition, all listed mobile source strategies (except enhanced I/M and reformulated gasoline) result in increased levels of emission reductions through and beyond 2007 due to the gradual turnover of the affected fleets.

[3] Reformulated gasoline requirements also result in a reduction in evaporative VOC emissions throughout the gasoline distribution system.

[4] Promulgated statewide under 40 CFR 80.70. Approved for 15% rate-of-progress on 03/10/99.

[5] EPA determined that the NLEV program was in place on 03/02/98. As a result, rules published on 06/06/97 and 01/07/98 went into effect.

[6] Regulation adopted 12/03/04. Not submitted to EPA as of the date of this submission. Emission calculations do not take credit for the CALEV2 program.

[7] Amendment to incorporate OBD-II adopted 08/25/04. CTDEP submitted the OBD-II SIP revision to EPA on December 20, 2007. Emission calculations reflect the inclusion of the OBD-II component in the I/M program.

[8] Renewable fuels may be blended into conventional gasoline or diesel fuel. Eventually, emission impacts may be witnessed in the non-road category, in addition to the on-road emission impacts.

also results in reduced evaporation of VOC as the gasoline makes its way through the gasoline distribution. The CAA required the federal RFG program to be implemented in two phases. Phase I was implemented in 1995 and Phase II went into effect in 2000. Phase II RFG performance standards require a minimum emission reduction of 27% for VOC and 7% for NO_X (as well as at least a 22% reduction in toxics) relative to conventional gasoline.

Light-Duty Motor Vehicle Emission Standards

Federal emission standards for on-road vehicles have become increasingly more stringent since the Clean Air Act was amended in 1990. In June of 1991, EPA published a final rule establishing "Tier 1" emission standards to supplement previous federal standards (i.e., "Tier 0" standards established prior to the 1990 CAA Amendments) for light-duty vehicles and trucks.[10] The final rule implemented the mandates of CAA sections 202(g) and 202(h), setting both certification and useful life standards for emissions of NO_X and VOC (as well as carbon monoxide and particulate matter), phased-in over model years from 1994 through 1996.[11]

Light-duty vehicle emission standards were reduced in 1998 through the National Low Emission Vehicle (NLEV) Program, a voluntary agreement reached between 23 vehicle manufacturers and 9 northeastern states, including Connecticut.[12] The NLEV Program required the phase-in of lower emitting vehicles, beginning with model year 1999 in the Northeast, and with model year 2001 throughout the remainder of the country.

More recently, EPA adopted final rules requiring more protective emission standards for all new passenger vehicles, including cars, sport utility vehicles (SUVs), minivans, vans, and pick-up trucks. These "Tier 2" standards, published on February 10, 2000,[13] marked the first time that the largest passenger vehicles were subject to the same emission standards as cars. Manufacturers of new vehicles weighing less than 6000 pounds have a phase-in period between 2004 and 2007. Manufacturers of heavier passenger vehicles are provided a longer phase-in period, from 2004 through 2009.

The Tier 2 standards result in cars that are 77 percent cleaner and light-duty trucks that are up to 95 percent cleaner than Tier 1 models. On a national level, EPA estimates that the Tier 2 standards will reduce NO_X emissions from passenger vehicles by over 70% by 2030. Additional reductions of VOC (and particulate matter) emissions will also be realized.

On-Board Refueling Vapor Recovery for Motor Vehicles

CAA Section 202 (a)(6) contains provisions requiring passenger cars to capture refueling emissions. In 1994, EPA published regulations, which require that vehicles meet refueling emission standards.[14] On-board Refueling Vapor Recovery (ORVR) began to be phased in on light-duty cars in model year 1998 (cars on the road in calendar year 1997). By 2005, all 2006

[10] 56 FR 25724, June 5, 1991.
[11] See http://www.epa.gov/otaq/stds-ld.htm.
[12] See http://www.epa.gov/oms/regs/ld-hwy/lev-nlev/subpt-r.pdf.
[13] 65 FR 6698; see also http://www.epa.gov/otaq/regs/ld-hwy/tier-2/index.htm.
[14] 59 FR 16262, April 6, 1994.

model year light-duty cars and trucks up to 8,500 pounds (lbs) gross vehicle weight rating (GVWR) were equipped with ORVR systems.

Heavy-Duty Motor Vehicle Emission Standards

In addition to more stringent light-duty vehicle standards, EPA has also finalized rules requiring emission reductions from on-road vehicles equipped with heavy-duty engines. In October of 2000, EPA published final rules affirming more stringent NO_X and hydrocarbon (HC) emission standards for heavy-duty diesel engines and vehicles (starting with vehicle model year 2004) and establishing tighter NO_X and HC standards for heavy-duty gasoline engines and vehicles (starting with vehicle model year 2005).[15] Standards vary by GVWR and fuel-type, and require new test procedures and diagnostic systems to ensure that in-use emissions are properly controlled.[16] The October 2000 final rule also requires that heavy-duty vehicles (HDVs), up to 10,000 lbs GVWR, be equipped with ORVR systems. The ORVR systems for HDVs began to be equipped on model year 2004 vehicles and were fully phased in on HDVs by model year 2006.

On January 18, 2001 EPA published a final rule, referred to as the "2007 Heavy-Duty Highway Rule."[17] The 2007 Heavy-Duty Highway Rule serves as a second phase to the heavy-duty motor vehicle emission standards implemented for heavy-duty vehicles starting with model year 2004. The 2007 Highway Rule required additional, significant reductions of NO_X and HC (as well as particulate matter) emissions from heavy-duty engines and vehicles, beginning with vehicle model year 2007. This rule also requires lowering the sulfur content of diesel fuel to 15 ppm from previous levels of 500 ppm, beginning in 2006. The 15 ppm sulfur fuel enables the proper operability of advanced pollution control technology for cars, trucks and buses so that engine manufacturers can meet the 2007 emission standards.

California Low Emission Vehicle Phase 2 (CALEV2)

The State of Connecticut has revised the Regulations of Connecticut State Agencies (R.C.S.A.) section 22a-174-36b, concerning the second phase of the California Low Emission Vehicle Program. The State of Connecticut will be implementing the light-duty motor vehicle emission standards of the State of California applicable to motor vehicles of model year 2008 and later. California's revision of their Low Emission Vehicle (LEV) standards also includes adoption of green house gas emission standards for passenger cars, light-duty trucks and medium duty passenger vehicles commencing with 2009 and subsequent model year vehicles. Further information on the status of the California rulemaking proceeding, including a final statement of reasons issues by the California Air Resources Board (CARB), can be found at the CARB website.[18] Note that emission calculations in this attainment demonstration do not take credit for the CALEV2 program.

[15] 65 FR 59895, October 6, 2000.
[16] See http://www.epa.gov/otaq/regs/hd-hwy/2000frm/f00026.pdf.
[17] 66 FR 5001, January 18, 2001, see EPA summary at http://www.epa.gov/otaq/highway-diesel/index.htm.
[18] See www.arb.ca.gov/regact/grnhsgas/grnhsgas.htm.

Enhanced Inspection and Maintenance Program

CAA Section 182(c)(3) requires Connecticut to adopt an enhanced vehicle emission inspection and maintenance (I/M) program throughout most of the state. In response to this requirement, Connecticut began statewide testing of vehicles in January 1998 subjecting vehicles to Acceleration Simulation Mode (ASM 2525) testing, a tailpipe emission test conducted on a treadmill simulating travel at 25 miles per hour at a 25% load factor. The ASM 2525 test replaced the previous single-speed idle test, which began implementation in 1983.

Since 2003, Connecticut has operated a decentralized I/M testing infrastructure. As part of the decentralized infrastructure, Connecticut has implemented an On-Board Diagnostics-II (OBD-II) test on all 1996 and newer vehicles having a GVWR of 8,500 lbs or less.

EPA published final approval of Connecticut's enhanced inspection and maintenance program on October 27, 2000.[19] This final rule approves Connecticut's enhanced inspection and maintenance program to use the ASM 2525 testing protocol. Connecticut's contract with its current I/M vendor has been in place since 2003. The contract requires the vendor to operate an enhanced I/M program, which consists of OBD-II testing in addition to ASM 2525 testing. The CTDEP filed a SIP revision with EPA on December 20, 2007 to incorporate these changes to the I/M program. Emission calculations in this attainment demonstration account for the I/M program revisions.

Highway Motorcycle Exhaust Emission Standards

In 2004, EPA published a final rule to implement improved exhaust emission standards on new highway motorcycles.[20] The new exhaust emission standards apply to all 2006 model year and beyond motorcycles. The biggest of new motorcycles, 280 cubic centimeters (cc) displacement and above, will be subject to more stringent HC and NO_X emission standards beginning with model year 2010, in addition to the emission standards that were required in model year 2006. Prior to this final rule, the exhaust emission standards that applied to motorcycles had not been updated in over 20 years. Thus, a model year 2005 motorcycle produces more harmful emissions per mile than even the largest of passenger cars of the same age. This rule marks the first time that exhaust emissions from motorcycles with engines of less than 50cc displacement (scooters and mopeds) will be regulated.

4.2.1.2 Non-Road Mobile Sources

Non-road engines are used in a variety of applications such as construction equipment, outdoor power equipment, farm equipment, lawn and garden equipment, marine vessels, locomotives, and aircraft. Prior to the mid-1990's, emissions from these engines were largely unregulated. EPA has since issued several rules regulating emissions from new non-road engines.[21]

As listed in Table 4.2.1.2 and described below, non-road mobile source controls contained in this

[19] 65 FR 64357.
[20] 69 FR 2398, January 15, 2004.
[21] See http://www.epa.gov/otaq/nonroad.htm.

attainment demonstration include the adoption of several different standards for compression-ignition engines, spark-ignition engines, marine diesel engines, locomotives and aircraft; as well as relevant changes to the fuel for powering engines in the non-road source category.

Non-Road Compression Ignition (Diesel) Engines

EPA rules have established four tiers of emission standards for new non-road diesel engines. EPA's first non-road regulations were finalized in 1994,[22] when (Tier 1) emission standards were issued for most large, greater than 50 horsepower (hp), land-based non-road compression-ignition (CI, or diesel) engines used in applications such as agricultural and construction equipment, which were phased in between 1996 and 2000.

In 1998, EPA subsequently promulgated Tier 1 standards for smaller (< 50 hp) diesel engines, including marine propulsion and auxiliary engines, which required phase-in between 1999 and 2000.[23] At the same time, EPA also issued more stringent Tier 2 emission standards for all non-road diesel engine sizes to be phased in from 2001 to 2006 and Tier 3 standards requiring additional reductions from new diesel engines between 50 and 750 hp to be phased in from 2006 to 2008.

EPA's final rules to reduce emissions from non-road diesel engines were published in 2004. These integrated new diesel engine emission standards (Tier 4 standards) and finalized fuel requirements that will decrease the allowable levels of sulfur in non-road diesel fuel.[24] This rule is also known as the Clean Air Non-road Diesel Rule.

The Clean Air Non-road Diesel Tier 4 Final Rule sets new emission standards for diesel engines used in most construction, agricultural, industrial, and airport equipment. The standards will take effect for new engines beginning in 2008 and be fully phased in for most engines by 2014. Larger engines (greater than 750 hp) have one year of additional flexibility to meet the Tier 4 emission standards. These emission standards do not apply to diesel engines used in locomotives and marine vessels. However, fuel requirements for these categories are covered in this rule.

Decreasing the sulfur levels in non-road diesel fuel will prevent damage to emission-control systems used to meet the new Tier 4 engine exhaust emission standards. The Non-road Diesel Rule will reduce current sulfur levels in two steps. First, current sulfur levels of about 3,000 ppm will be limited to a maximum of 500 ppm in 2007. This limit also covers fuels used in locomotive and marine applications (though not to the marine residual fuel used by very large engines on ocean-going vessels). The second step consists of reducing fuel sulfur levels in non-road diesel fuel to 15 ppm in 2010 (except for locomotive and marine diesel fuel which will be reduced to 15 ppm in 2012).

[22] 59 FR 31306.
[23] 63 FR 56968.
[24] 69 FR 38958, June 29, 2004.

TABLE 4.2.1.2: Non-Road Mobile Sources Control Strategies

Non-Road Engine Category	Date of Final Rule	Implementation Phase-In Period
Compression Ignition (diesel) Engines		
Tier 1: Land-Based Diesel Engines > 50 hp	06/17/1994 (59 FR 31306)	1996-2000
Tier 1: Small Diesel Engines < 50 hp	10/23/1998 (63 FR 56968)	1999-2000
Tier 2: Diesel Engines (all sizes)	10/23/1998 (63 FR 56968)	2001-2006
Tier 3: Diesel Engines 50 - 750 hp	10/23/1998 (63 FR 56968)	2006-2008
Tier 4: All Diesel Engines (Except locomotive and marine vessels)	06/29/2004 (69 FR 38958)	2008-2015
Spark-Ignition (e.g., gasoline) Engines		
Phase 1: SI Engines < 25 hp (except marine & recreational)	07/03/1995 (60 FR 34581)	1997
Phase 2: Non-Handheld SI Engines < 25 hp	03/30/1999 (64 FR 15208)	2001-2007
Phase 2: Handheld SI < 25 hp	04/25/2000 (65 FR 24268)	2002-2007
Gasoline SI Marine Engines (outboard & personal watercraft)	10/04/1996 (61 FR 52088)	1998-2000
Large Spark-Ignition Engines >19 kW (or >25 hp)	11/08/2002 (67 FR 68242)	2004/2007
Recreational Land-Based Spark-Ignition Engines	11/08/2002 (67 FR 68242)	2006-2012
Marine Diesel Engines		
MARPOL: New/Old Engines on Vessels Constructed Starting 1/1/2000	09/27/1997 MARPOL (Annex VI of International Convention on Prevention of Pollution from Ships)	2000
Commercial Marine Diesel Engines[1] (US-flagged vessels)	12/29/1999 (64 FR 73300)	2004/2007
Recreational Marine Diesel Engines >37 kW (or >50 hp)	11/08/2002 (67 FR 68242)	2006-2009
Marine Diesel Engines (US-flagged vessels) >30 liters/cylinder	02/28/2003 (68 FR 9746)	2004
Locomotives		
New & Remanufactured Locomotives and Locomotive Engines[2]	04/16/1998 (63 FR 18978)	(see note 2) Tier 0: 1973-2001 Tier 1: 2002-2004 Tier 2: 2005 +
Non-Road Diesel Fuel	06/29/2004 (69 FR 38958)	2007/2010
Aircrafts		
Control of Air Pollution From Aircraft and Aircraft Engines 1	05/08/1997 (62 FR 25356)	1997
Control of Air Pollution From Aircraft and Aircraft Engines 2	11/17/2005 (70 FR 69664)	2005
Future Control Measures		
Proposed Locomotive & Marine Diesel Rule	04/03/2007[3] (72 FR 15938)	2008-2015
Proposed Spark-Ignition Engines, Equipment, and Vessels Rule	05/18/2007[3] (72 FR 28098)	2009, 2011-2012

[1] Only applies to commercial marine diesel engines with displacements under 30 liters per cylinder.

[2] EPA has established three sets of locomotive standards, applied based on the date the locomotive was first manufactured (i.e. during the Tier 0, Tier 1, or Tier 2 periods). The applicable standards take effect when the locomotive or locomotive engine is first manufactured and continue to apply at each periodic remanufacture.

[3] This is a proposed rule, not yet finalized.

Non-Road Spark Ignition (e.g., Gasoline) Engines

EPA rules regulate small (less than 25 hp) non-road spark-ignition (SI) engines (except marine and recreational engines) in two phases. EPA's Phase 1 standards for new small (< 25 hp) non-road spark-ignited (SI) engines were issued in 1995.[25] These engines, which usually burn gasoline, are used primarily in lawn and garden equipment. The standards apply to model year 1997 and newer engines.

EPA subsequently issued more stringent Phase 2 emission standards for both small non-handheld engines (e.g., lawn mowers, generator sets, air compressors) and small handheld engines (e.g., leaf blowers, chain saws, augers) in 1999[26] and 2000,[27] respectively. Phase 2 standards are to be phased-in from 2001 to 2007 for non-handheld engines and from 2002 to 2007 for handheld engines.

EPA finalized emission standards for new gasoline spark-ignition marine engines in 1996[28] to be phased-in between 1998 and 2000. These engines, typically based on simple two-stroke technology, are used for outboard engines, personal watercraft, and jet boats.

On November 8, 2002, EPA published a final rule which includes new engine emission standards for large spark-ignition engines rated over 19 kilowatts (kW), or >25 hp.[29] Large spark-ignition engines are used in a variety of commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Most large spark-ignition engines are fueled with liquefied petroleum gas, with others operating on gasoline or natural gas. The standards were implemented in two tiers: Tier 1 standards started in 2004 and Tier 2 standards scheduled to start in 2007. In addition to exhaust-emission controls, manufacturers of large spark-ignition engines must take steps, starting in 2007, to reduce evaporative emissions, such as using pressurized fuel tanks. Tier 2 engines must also have engine diagnostic capabilities that alert the operator to mal-functions in the engine's emission-control system, ensuring that engine emissions are controlled during normal operating conditions.

EPA's 2002 rulemaking also includes exhaust emission standards for non-road recreational spark-ignition engines and vehicles.[30] These recreational land-based engines are found in snowmobiles, off-highway motorcycles, and all-terrain-vehicles (ATVs). These standards are being phased-in between 2006 and 2007, except for snowmobiles, which have until 2009 to be fully phased-in. In addition, snowmobiles will have to meet more stringent standards that will be in effect in 2010 and 2012.

Plastic fuel tanks and rubber hoses available on recreational vehicles will also be regulated for permeation, to minimize the fuel lost through the component walls. The permeation standards for fuel tanks and fuel hoses on recreational vehicles become effective in 2008.

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[25] 60 FR 34581.
[26] 64 FR 15208.
[27] 65 FR 24268.
[28] 61 FR 52088.
[29] 67 FR 68242, November 8, 2002.
[30] Ibid.

Marine Diesel Engines

Marine diesel engines include small auxiliary and propulsion engines, medium-sized propulsion engines on coastal and harbor vessels, and very large propulsion engines on ocean-going vessels. Both new and modified marine diesel engines rated above 175 hp must adhere to international standards (i.e., MARPOL convention) if vessel construction or engine modification commences on or after January 1, 2000. Furthermore, U.S.-flagged commercial vessels with new marine diesel engines rated over 37 kW (or >50 hp, with displacements up to 30 liters per cylinder) produced after 2003 (after 2006 for very large engines) must comply with EPA standards issued in 1999.[31]

EPA published a final rule in 2002 that includes new engine emission standards for recreational marine diesel engines.[32] These are marine diesel engines rated over 37 kW, or >50 hp, which are used in yachts, cruisers, and other types of pleasure craft. The standards are phased-in, beginning in 2006, depending on the size of the engine. By 2009, emission standards will be in effect on all recreational, marine diesel engines.

On February 28, 2003, EPA finalized emission standards for exhaust emission from U.S.-flagged vessels with new marine diesel engines rated over 37 kW with displacements over 30 liters per cylinder (also known as Category 3 Marine Diesel Engines).[33] This marks the first time that emissions from very large marine diesel engines have been regulated. These diesel engines are used primarily for propulsion power on ocean-going vessels such as container ships, tankers, bulk carriers, and cruise ships. Most Category 3 marine diesel engines are used for propulsion on vessels engaged in international trade. The standards were implemented in two tiers: Tier 1 standards, which match internationally negotiated standards, took effect in 2004; and Tier 2 standards will be established in a future rulemaking.

Locomotives

EPA's final rule establishing emission standards for new and remanufactured locomotives and locomotive engines was published in 1998.[34] Three sets of standards were adopted, with applicability of the standards tied to the date a locomotive is first manufactured (i.e., 1973 through 2001, 2002 to 2004, and 2005 and later).

Aircraft

Control of air pollution from aircraft and aircraft engines was covered in a final rule published by EPA in 1997.[35] This rule adopts the international aircraft emissions standards of the United Nations International Civil Aviation Organization (ICAO), which had been in place since 1986 and amended in 1993. This rule brings the U.S. aircraft standards into alignment with the international standards and applies to newly manufactured and newly certified commercial

[31] 64 FR 73300.
[32] 67 FR 68242, November 8, 2002.
[33] 68 FR 9746, February 28, 2003.
[34] 63 FR 18978, April 16, 1998.
[35] 62 FR 25356, May 8, 1997.

aircraft gas turbine engines with rated thrust greater than 26.7 kilonewtons. ICAO adopted revised standards in 1999 for implementation beginning in 2004. In November of 2005, EPA finalized the adoption of the revised ICAO standards, to once again bring U.S. aircraft standards into alignment with international standards.[36]

Future Control Measures

Two new sets of proposed regulations, published in 2007, may have minimal impact on the 2009 attainment date because they only begin to take effect in 2008. However, they will help to ensure that Southwest Connecticut comes into attainment by 2012.

On April 3, 2007, EPA published a proposed rule to implement more stringent emission standards for locomotives and marine diesel engines.[37] This proposed rule would reduce emissions from these engines through a three-part program. The first part involves tightening emission standards for existing locomotives when they are remanufactured. These standards are effective as soon as certified remanufacture systems are available (as early as 2008). The new remanufacturing standards would not apply to the existing fleets of locomotives owned by very small railroads, such as those that comprise the bulk of the fleet in Connecticut. The second part includes setting near term engine-out (Tier 3) emission standards for new locomotives and marine diesel engines to be phased-in starting in 2009. The third part of the program entails setting longer-term (Tier 4) emission standards for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency emission control technology. The Tier 4 emission standards would begin to be phased-in starting in 2014 for marine diesel engines and 2015 for locomotives (these standards are enabled due to the availability of diesel fuel capped at 15 ppm sulfur content in 2012). All new marine diesel engines with displacements less than 30 liters per cylinder (Category 1 and Category 2 engines greater than 50 hp) installed U.S.-flagged vessels are covered in this rulemaking. This proposal also includes provisions to eliminate emissions from unnecessary locomotive idling as well as requesting comments to reduce emissions from existing marine diesel engines when they are remanufactured.

On May 18, 2007, EPA published a rule proposing exhaust emission standards for marine spark-ignition engines (more stringent than those finalized on October 4, 1996[38]) and small land-based non-road spark-ignition engines.[39] The proposed rule also includes new evaporative emission standards for equipment and vessels using these engines. The marine spark-ignition engines and vessels affected by these standards (effective starting with the 2009 model year) include outboard engines and personal watercraft, as well as sterndrive and inboard engines, which are being regulated for the first time. The small non-road spark-ignition engines and equipment affected by these standards (effective starting with the 2011 and 2012 model years) are those rated below 25 hp (19 kW) used in household and commercial applications, including lawn and garden equipment, utility vehicles, generators, and a variety of other construction, farm, and industrial equipment.

[36] 70 FR 69664, November 11, 2005.
[37] 72 FR 15938, April 3, 2007.
[38] 61 FR 52088, October 4, 1996.
[39] 72 FR 28098, May 18, 2007.

4.2.2 Connecticut's Control of Stationary and Area Sources

Given federal efforts to address emissions from mobile sources, Connecticut has focused its post-2002 reduction strategy on stationary and area sources of VOC and NO_X. All twelve measures identified in Sections 4.2.2.1 through 4.2.2.3 create emissions reductions after the 2002 baseline emissions inventory year and, therefore, are creditable towards 8-hour ozone NAAQS RFP and attainment efforts. The date on which each rule became or is anticipated to become effective in Connecticut is identified in Table 4.2.2, along with the date on which the requirements apply to the regulated activities to create emissions reductions. See Section 4.3 for a discussion of the level of emission reductions resulting from the post-2002 control measures described in this section. The twelve control measures include four measures that were adopted and approved for 1-hour ozone attainment yet that have effective dates after the 2002 baseline year (Section 4.2.2.1); seven measures adopted in coordination with other states in the OTC region to assist in 8-hour ozone attainment (Section 4.2.2.2) and a regulation to satisfy Connecticut's obligations under the Clean Air Interstate Rule (Section 4.2.2.3).

4.2.2.1 One-Hour Ozone Control Measures With Post-2002 Effective Dates

The following four control measures were adopted to meet EPA's 1-hour ozone attainment requirements, but are creditable for the 8-hour attainment demonstration because they were implemented after the 2002 baseline year.

VOC Reductions from Automotive Refinishing Operations

In 2001, the OTC states endorsed a model rule to reduce VOC emissions from automotive refinishing operations. The model rule includes VOC limits for paints used in the industry, which are consistent with Federal limits for mobile equipment refinishing materials; it also establishes requirements for using improved transfer efficiency application equipment and enclosed spray gun cleaning.

On March 15, 2002, Connecticut adopted regulatory requirements in R.C.S.A. section 22a-174-3b(d) based on the OTC model rule, which, at EPA's request, were amended on April 4, 2006 to clarify the applicability requirements and operating practices. The emissions reductions associated with the requirements for automotive refinishing operations were approved for one-hour ozone attainment on August 31, 2006.[40]

VOC Reductions from Stage II Vapor Recovery at Gasoline Pumps

A May 10, 2004 amendment to R.C.S.A. section 22a-174-30 resulted in VOC emission reductions by requiring the use of "pressure-vacuum vent caps" on gasoline pumps that are subject to the Stage II vapor control regulation. The amendment also requires the use of a two-point closed system for the transfer of gasoline from a gasoline tanker truck to an underground storage tank, improves Stage II system maintenance, clarifies testing requirements and increases testing frequency. The amended requirements apply as of May 10, 2005. The

[40] 71 FR 51761.

Table 4.2.2 Connecticut's Post-2002 Control Measures Included in Future Year Projections

Control Measure	Pollutant	Section of the Regulations of Connecticut State Agencies	Status of Regulation Adoption	Date Requirements Apply to Create Emissions Reductions
VOC Content Limits for Consumer Products	VOC	22a-174-40	Adoption completed July 26, 2007	January 1, 2009
Design Improvements for Portable Fuel Containers (1) and (2)	VOC	22a-174-43	Initial rule adopted May 10, 2004; amendment adopted January 29, 2007	1) Initial rule: May 1, 2004 2) Amendment: July 1, 2007
VOC Content Limits for Architectural and Industrial Maintenance (AIM) Coatings	VOC	22a-174-41	Adoption completed July 26, 2007	May 1, 2008
Restrictions on Asphalt in Paving Operations	VOC	22a-174-20(k)	Public hearing held May 1, 2007	May 1, 2008 (anticipated)
Restrictions on the Manufacture and Use of Adhesives and Sealants	VOC	22a-174-44	Public hearing held October 16, 2007	January 1, 2009 (anticipated)
Automotive refinishing operations	VOC	22a-174-3b(d)	Adoption of amendment completed on April 4, 2006	April 4, 2006
Stage II Vapor Recovery – Gasoline Service Station Pressure Vent Valves	VOC	22a-174-30	Adoption of amendment completed on May 10, 2004	May 10, 2005
Reduced Vapor Pressure Limitation for Solvent Cleaning	VOC	22a-174-20(*l*)	Adoption completed July 26, 2007	May 1, 2008
Standards for Municipal Waste Combustion	NO_X	22a-174-38	Adoption of amendment completed October 26, 2000	May 1, 2003
NO_X Reductions from Industrial, Commercial and Institutional (ICI) Boilers	NO_X	22a-174-22	Public hearing held October 19, 2006	May 1, 2009 (anticipated)
CAIR NO_X Ozone Season Trading Program	NO_X	22a-174-22c	Adoption completed September 4, 2007	May 1, 2009

emissions reductions associated with the May 10, 2004 amendment were approved for 1-hour ozone attainment purposes on August 31, 2006.[41]

VOC Reductions from Portable Fuel Container Spillage Control

R.C.S.A. section 22a-174-43 (Section 43), which was adopted on May 10, 2004, reduces emissions of VOCs by requiring the sale of portable fuel containers (PFCs) designed to minimize spillage and fugitive evaporative emissions. This regulation is based on an OTC model rule that requires manufacturers of particular PFCs to reformulate to meet VOC limits. The 2004 regulation and the associated emissions reductions were approved for 1-hour ozone NAAQS attainment on August 31, 2006.[42]

Municipal Waste Combustor (MWC) NO_X Reductions

Connecticut has six facilities that burn municipal waste to create electricity. These six facilities account for approximately thirty percent of the actual annual NO_X emissions from the major NO_X emitters in the state and are regulated by RCSA section 22a-174-38 (Section 38). Section 38 became effective on June 28, 1999 and included NO_X emission limits that were equivalent to the emission limits established in the federal emissions guidelines for MWCs. An October 26, 2000 amendment to Section 38 reduced the NO_X emission limits below the 1999 levels beginning May 1, 2003. EPA approved the amended regulation and associated emissions reductions for 2007 1-hour ozone NAAQS attainment on December 6, 2001.[43]

4.2.2.2 Measures Adopted for 8-Hour Ozone Standard Attainment

Although currently mandated controls, including those identified in Sections 4.2.1 and 4.2.2.1, will achieve significant emission reductions over the next five to ten years, additional emission reductions beyond current requirements will be necessary for timely attainment and maintenance of the 8-hour ozone NAAQS. To address this need, Connecticut has adopted or is in pursuing adoption of seven additional control measures to influence Connecticut's nonattainment status towards attainment. These seven measures, all of which are based on OTC model rules, are described here.

Additional VOC Reductions from Portable Fuel Container Spillage Control

An amendment to Section 43 became effective on January 29, 2007. The amended version of R.C.S.A. section 22a-174-43 increases the effectiveness of the 2004 rule by simplifying PFC design requirements and minimizing the potential for misuse by expanding the definitions to include kerosene cans and utility jugs. The amendment also incorporates California's new PFC certification program, which begins July 1, 2007. Once implemented, the CARB certification process streamlines the regulatory requirements for manufacturers and simplifies compliance determinations for PFCs to meet the regulatory requirements. Amended R.C.S.A. section 22a-174-43 is consistent with a 2006 OTC model rule for portable fuel containers.

[41] 71 FR 51761.
[42] 71 FR 51761.
[43] 66 FR 63311

VOC Content Limits for Consumer Products

Most states in the OTR have adopted regulations based on a 2001 OTC Model Rule for Consumer Products. That OTC Model Rule was, in turn, based on consumer product requirements in California. Connecticut opted not to adopt a regulation for 1-hour ozone NAAQS attainment purposes based on that initial OTC model rule.

The OTC states were prompted to revisit the 2001 OTC model rule for consumer products in 2005 when California amended its consumer products program to create additional VOC reductions by reducing the VOC content limits for certain products and specifying new VOC content limits for additional products. This led to the creation of a 2006 OTC model rule for consumer products.

CTDEP has adopted regulation, R.C.S.A. section 22a-174-40, consistent with the 2006 OTC model rule for consumer products. The new Connecticut regulation will apply to anyone who sells, supplies, offers for sale or manufactures for sale regulated products sold on or after January 1, 2009.

VOC Content Limits for Architectural & Industrial Maintenance (AIM) Coatings

New R.C.S.A. section 22a-174-41 (Section 41) will limit VOC emissions from AIM coatings through VOC content limits developed in 2001 by the OTC as part of a model rule. Section 41 will apply to anyone who sells, supplies, offers for sale or manufactures for sale in the State of Connecticut any AIM coating for use in the State of Connecticut and to any person who applies or solicits the application of any AIM coating within the State of Connecticut on or after the implementation date of May 1, 2008.

Additional VOC Reductions from Solvent Cleaning (Metal Degreasing)

In 2001, solvent cleaning was identified by the OTC as a control measure for which many states in the region could achieve further VOC emission reductions by implementing measures to go beyond applicable federal control technique guideline (CTG) requirements. A model rule was developed that includes hardware and operating requirements and alternative compliance options for vapor cleaning machines used to clean metal parts. These requirements are based on the Federal maximum achievable control technology (MACT) standard for chlorinated solvent vapor degreasers. The OTC Model Rule for Solvent Cleaning establishes a limitation on the vapor pressure of solvents used in cold cleaning and additional operating practices to further limit VOC emissions from metal cleaning.

The Department has recently amended pre-existing requirements for solvent cleaning in R.C.S.A. section 22a-174-20(*l*) to include the vapor pressure limitation for solvents used in cold cleaning plus additional operating requirements recommended by the OTC Model Rule. Compliance with the new vapor pressure limitation will be required as of May 1, 2008.

VOC Reductions from Asphalt Paving

Connecticut is pursuing adoption of an amendment to the current Connecticut regulation for asphalt paving, R.C.S.A. section 22a-174-20(k). The existing rule, based on a 1977 CTG, restricts the use of cutback asphalt during the ozone season to that which emits, under test conditions, less than five percent of the total solvent contained in the asphalt. The existing rule also provides exemptions for specific uses such as penetrating prime coats and long-term storage. The proposed amendment removes exemptions and requires more stringent VOC content limits for cutback and emulsified asphalt. The amended regulation would be consistent with Delaware's emissions limitations for asphalt paving and a 2006 OTC model rule applicable to asphalt paving. The amended requirements are anticipated to apply beginning May 1, 2008.

VOC Reductions from Adhesives and Sealants

CTDEP is pursuing adoption of a new section of the air quality regulations, R.C.S.A. section 22a-174-44 (Section 44), to limit emissions of VOCs from adhesives, sealants and primers. Section 44 will achieve VOC reductions through two basic components: sale and manufacture restrictions that limit the VOC content of specified adhesives, sealants and primers sold in the state; and use restrictions that apply primarily to commercial/industrial operations. By reducing the availability of higher VOC content adhesives and sealants within the state, the sales prohibition is also intended to address adhesive and sealant usage at area sources. In addition to the VOC content limits and use requirements, Section 44 will include requirements for cleanup and preparation solvents and a compliance alternative in the form of add-on air pollution control equipment.

CTDEP held a public hearing on a proposed adhesive and sealant regulation on October 16, 2007. The proposed regulation is based on an OTC model rule, which is, in turn, based on a reasonably available control technology determination prepared by the CARB in 1998.

Presently, the air quality regulations only cover the use of adhesives in very limited circumstances; the requirements of this proposal apply to more activities, regulate more materials and are more prescriptive than the limited requirements in Connecticut's current regulations. The new regulation is anticipated to apply as of January 1, 2009.

NO_X Reductions from ICI Boilers

Any facility in Connecticut that has the potential to emit at least fifty tons per year of NO_X is regulated by R.C.S.A. section 22a-174-22 (Section 22). Section 22 also applies to sources in the southwestern part of the State, the "severe" area, that have the potential to emit at least twenty-five tons per year of NO_X. Therefore, all major NO_X RACT sources under the 8-hour ozone NAAQS (i.e. those with potential emissions of at least 100 tpy) are regulated by this section. Section 22 was approved as part of Connecticut's 1-hour ozone attainment demonstration.

Based on 2001 and 2006 OTC model rules, CTDEP proposed for public hearing on October 19, 2006 an amended version of Section 22 that includes more stringent emission and control requirements such that all major NO_X sources will meet or exceed RACT.

4.2.2.3 The Clean Air Interstate Rule (CAIR) Nitrogen Oxides (NO_X) Ozone Season Trading Program

Effective May 1, 2009, a new regulation will replace the market-based emissions cap-and-trade program of R.C.S.A. section 22a-174-22b, Connecticut's Post-2002 NO_X Budget Program, with a similar program to reduce emissions of NO_X and reduce the regional transport of ozone. All the sources that now participate in the trading program of R.C.S.A. section 22a-174-22b will be subject to the CAIR trading program. With the transition to the new program, the ozone season budget will be reduced from 4,466 tons in 2008 to 2,691 tons beginning in 2009. As a result of the decreased ozone season budgets in Connecticut and in states throughout the region, NO_X emissions levels are expected to continue to decline beyond the emissions reductions achieved in the NO_X SIP Call trading program. On April 28, 2006 EPA finalized its CAIR Federal Implementation Plan (FIP).[44] EPA published approval of CTDEP's CAIR regulation on January 24, 2008, indicating that a separate rulemaking will be issued withdrawing the FIP.

4.3 Future Year Emission Projections

EPA's Phase 2 Ozone Implementation Rule[45] for the 8-hour NAAQS requires states such as Connecticut, with moderate nonattainment areas, to achieve a 15 % reduction in ozone precursor emissions between 2002 and 2008. The rule also requires submittal of attainment year (i.e., 2009) inventories incorporating the effects of adopted control measures. Continued emission reductions beyond the statutory attainment date are also needed as contingency measures and to maintain attainment once it is achieved. In response to these requirements, CTDEP has prepared projected future year inventories for 2008, 2009 and 2012. Emissions projections were developed from the 2002 Base Year Inventory (see Section 4.1) by applying appropriate growth factors and post-2002 control levels to each source category.

The following subsections describe the selection of growth factors for each source category, estimated reductions from post-2002 controls, and resulting future year emission projections for 2008, 2009 and 2012.

4.3.1 Growth Factors

Growth factors for most industrial-related stationary point and area source categories were developed using statewide employment projections obtained from the Connecticut Department of Labor (CTDOL)[46]. CTDOL sector-specific employment estimates for 2004 and employment forecasts out to 2014 were used to derive linearly interpolated employment growth estimates for 2008, 2009 and 2012. For reference purposes, CTDOL projects that total employment in

[44] 71 FR 25328.
[45] 70 FR 71612.
[46] "Connecticut's Industries and Occupations: Forecast 2014"; Connecticut Department of Labor; Summer 2006; See http://www.ctdol.state.ct.us/lmi/misc/forecast2014.pdf.

Connecticut will increase by 8.5% between 2002 and 2012. However, total manufacturing employment, more directly related to stationary source emissions, is projected to decrease by 5.3% over the same period. Detailed CTDOL employment projections by industry category, and resultant 2002 through 2012 growth factors, are included in Appendix 4D.

Growth factors for gasoline storage and marketing activities were estimated by extrapolating statewide gasoline consumption data from the 1996 through 2005 period out through 2012. Based on these data, obtained from the Federal Highway Administration's (FHWA) "Highway Statistics Series"[47], gasoline consumption is projected to increase by 1.9% annually between 2002 and 2012. A summary of the FHWA's data is included in Appendix 4D.

Statewide forecasted population growth, obtained from the United States Census Bureau[48], was used to project future year emissions for the following categories: architectural coatings, dry cleaning, consumer/commercial solvent usage, publicly owned treatment works, residential fuel combustion, wood stoves, structural fires and open burning. Statewide population is projected to increase by 3.0% in 2008, 3.4% in 2009 and 4.5% in 2012 from an estimated 2002 population of 3,445,579. The Census Bureau's data are summarized in Appendix 4D.

Statewide forecasts of growth in vehicle miles traveled (VMT), provided by CTDOT, were used to project future year emissions for the following categories: on-road vehicles, traffic markings, cutback asphalt paving and asphalt paving. CTDOT forecasts[49] that summer season average daily traffic (ADT) will increase by 7.5% in 2008, 8.6% in 2009 and 11.8% in 2012 from 2002 VMT levels of 92,845,131. A summary of CTDOT's projected VMT is provided in Appendix 4D.

Default growth factors included in EPA's NONROAD2005 model were used to project future emissions for most non-road source categories. The NONROAD2005 model incorporates national growth projections based on a time series analysis of historical non-road engine populations from 1989 through 1996, segregated by market sector and fuel type[50]. As described above, CTDOL employment projections were used to derive growth factors for aircraft, locomotive and commercial marine engines, which are not considered by the NONROAD2005 model.

Connecticut's NO_X Budget Program and regulation to implement EPA's Clean Air Interstate Rule (CAIR) (both described in Section 4.2) establish a decreasing cap on NO_X emissions from electric generating units (EGU) and other large fuel combustion units. As a result, emissions growth for the EGU sector is limited to VOC emissions. Growth in EGU VOC emissions was approximated by assuming that the annual growth in seasonal heat input (i.e., 1.43%) for NO_X Budget sources between 2002 and 2006 would continue at the same pace through 2012.

[47] FHWA Highway Statistic Series; Tables MF-2; See http://www.fhwa.dot.gov/policy/ohpi/qffuel.htm.
[48] US Census Bureau; See link to "File 1" at http://www.census.gov/population/www/projections/projectionsagesex.html.
[49] Based on CTDOT's Series 28D estimates.
[50] Further information on EPA's development of non-road equipment population growth can be found in the technical report "Nonroad Engine Growth Estimates"; EPA420—P-04-008; April 2004; NR-008c; See: http://www.epa.gov/omswww/models/nonrdmdl/nonrdmdl2004/420p04008.pdf.

Consistent with CTDEP's recently updated Solid Waste Management Plan[51], no growth in emissions is projected for municipal waste combustion or landfills. Connecticut's resource recovery facilities (RRF) are operating at or near capacity, with no current plans to expand RRF or landfill capacity. The new plan lays out a strategy to address potential growth in waste generation through increased source reduction, reuse, recycling, and composting.

Categories assumed to have no growth in emissions relative to 2002 also include forest fires and biogenic emission sources.

4.3.2 Post-2002 Emission Reductions

Numerous federal and state control measures have been or will be adopted and incorporated into this ozone SIP, providing significant post-2002 emission reductions to meet CAA requirements for reasonable further progress and timely attainment of the 8-hour ozone NAAQS. Section 4.2 provides a description of each of the control measures, including regulation adoption and implementation schedules. Table 4.3.2 provides a summary of estimated emission reductions expected in 2008, 2009 and 2012 from each of the measures. The following paragraphs briefly outline how reductions were determined; more detailed calculations are provided in Appendix 4E.

On-Road Mobile Source Control Programs

As described in Section 4.2.1.1, EPA has adopted a number of increasingly more stringent fuel and new engine standards over the last several years for passenger vehicles, motorcycles, buses and heavy-duty trucks. As the fleet of light-duty and heavy-duty vehicles gradually turns over, emissions will continue to decrease significantly. In addition, in 2005, Connecticut upgraded the vehicle emission inspection and maintenance (I/M) program to include testing of the on-board diagnostic (OBDII) systems included in light duty vehicles manufactured since the late 1990's. CTDEP applied the EPA's MOBILE6.2 model to estimate the impacts of these programs in 2008, 2009 and 2012, accounting for growth in vehicle miles traveled and CTDOT's planned improvements to the roadway and transit networks. Projected reductions from 2002 emission levels, after accounting for growth, are summarized in Table 4.3.2. More detailed summaries of on-road mobile source emission estimates for 2008, 2009, and 2012 are included in Appendix 4E. MOBILE6.2 model input files are contained in Appendix 4A.

Federal Non-Road Mobile Source Control Programs

Section 4.2.1.2 also describes federal requirements for increasingly more stringent fuel and new engine standards for a variety of land-based and water-based non-road engines. Many of the federal non-road regulations are being phased in; therefore, in combination with gradual fleet turnover, emission reductions from this sector will continue to occur through 2012 and beyond. The EPA's NONROAD2005 model was used to determine emission reductions expected from the federal program. Estimated reductions compared to 2002 emission levels, accounting for growth, are included in Table 4.3.2. More detailed summaries of non-road mobile source

[51] Connecticut's "Solid Waste Management Plan" was approved by CTDEP Commissioner Gina McCarthy on December 20, 2006; see http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP.

Table 4.3.2: Estimated Statewide Emission Reductions From Post-2002 Ozone Control Strategies
(tons/day)

Control Strategy	2008		2009		2012	
	VOC	NO_X	VOC	NO_X	VOC	NO_X
Federal **On-Road** Control Programs (see: http://www.epa.gov/omswww/url-fr.htm) and Connecticut's **On-Board Diagnostic** Inspection & Maintenance Program (RCSA 22a-174-27)	35.3	77.2	39.7	88.2	53.0	119.0
Federal **Non-Road** Control Programs (see: http://www.epa.gov/nonroad-diesel/regulations.htm)	25.9	7.8	29.4	10.1	35.4	17.0
VOC Content Limits for **Consumer Products** (RCSA 22a-174-40)	0.0	n/a	6.6	n/a	6.7	n/a
Design Improvements for **Portable Fuel Containers** (RCSA 22a-174-43)	1.9	n/a	3.0	n/a	6.0	n/a
VOC Content Limits for Architectural and Industrial Maintenance **(AIM) Coatings** (RCSA 22a-174-41)	6.6	n/a	6.6	n/a	6.7	n/a
Restrictions on **Asphalt in Paving** Operations (RCSA 22a-174-20(k))	0.0	n/a	3.9	n/a	4.1	n/a
Restrictions on the Manufacture and Use of **Adhesives and Sealants** (RCSA 22a-174-44)	0.0	n/a	4.2	n/a	4.7	n/a
Automotive Refinishing Operations[1] (RCSA 22a-174-3b(d))	0.0	n/a	0.0	n/a	0.0	n/a
Pressure-Vacuum **Gas Station Vent Valves** (RCSA 22a-174-30)	0.7	n/a	0.8	n/a	0.8	n/a
Reduced Vapor Pressure Limitation for **Solvent Cleaning** (RCSA 22a-174-20(*l*))	9.6	n/a	9.5	n/a	9.4	n/a
Standards for **Municipal Waste Combustion** (RCSA 22a-174-38)	n/a	1.0	n/a	1.0	n/a	1.0
NO_X Reductions from **ICI Boilers** (RCSA 22a-174-22)	n/a	0.0	n/a	3.1	n/a	3.1
CAIR NO_X Ozone Season Trading Program (RCSA 22a-174-22c)	n/a	n/a	n/a	1.7	n/a	1.7
Total Post-2002 Estimated Statewide Emission Reductions[2]	**80.0**	**86.0**	**103.7**	**104.1**	**126.8**	**141.8**

n/a – not applicable

[1] Although CTDEP's original automobile refinishing regulation was adopted in 2002, many refinishing shops began using high volume-low pressure spray guns (or equivalent) in prior years. As a result, CTDEP has conservatively assumed that no additional VOC reductions occur in the post-2002 period.

[2] Reductions are relative to emission levels without the post-2002 controls. For comparison purposes, 2002 statewide anthropogenic emissions are estimated as 391.1 tons/day of VOC and 331.8 tons/day of NO_X.

emission estimates for 2008, 2009, and 2012 are included in Appendix 4E. NONROAD2005 model input files are contained in Appendix 4A.

Consumer Products

Consumer and commercial products are those items sold to retail customers for personal, household or automotive use, along with products marketed by wholesale distributors for use in commercial or institutional settings such as beauty shops, schools and hospitals. VOC emissions from these products are the result of the evaporation of propellant and organic solvents during use. Emission estimates for 2002 include the effects of EPA's federal consumer and commercial products rule, was adopted in 1998 under the authority of CAA section 183(e). The federal rule limits the VOC content of 24 product categories representing about 48% of the consumer and commercial products inventory nationwide.

CTDEP worked with other OTC states to develop model rules for consumer products in 2001 and 2006. OTC's 2001 model rule, which is similar to rules developed by the California Air Resources Board (CARB) in the late 1990's, expands the number of covered consumer and commercial product categories to a total of 80, and requires more stringent limits than the federal rule. The 2001 OTC model rule provides VOC reductions from the total consumer product inventory that are 14.2% greater than the national rule reductions[52]. The 2006 OTC model rule regulates 14 new product categories, based on recent CARB rule updates through July 2005, providing an additional 2% overall reduction in emissions[53] compared to the 2001 OTC model rule (i.e., 15.9% reduction overall, relative to emission levels after the federal rule).

As described in Section 4.2.3, CTDEP has recently adopted a state regulation consistent with the requirements of both OTC model rules. The rule, which is scheduled to be implemented in January 2009, is expected to produce the emission reductions summarized in Table 4.3.2. A more complete summary of emission reduction calculations is included in Appendix 4E.

Portable Fuel Containers

Future year emission reductions, which are expected to result from Connecticut's January 2007 revision to the portable fuel container regulation, were determined using the CARB procedures referred to in Section 4.1.2. As documented in Section 4.3.1, annual growth of 1.9% in gasoline usage was assumed. Based on a 10-year turnover to fully compliant fuel containers, the combination of Connecticut's original 2004 rule and the January 2007 revision is estimated to achieve a 19.5% reduction in VOC emissions by 2008, 30.2% by 2009 and a 58.1% reduction by 2012. In 2018, when all fuel containers are compliant, reductions are expected to reach 85.3% from uncontrolled levels. Corresponding reductions in tons/day are listed in Table 4.3.2. A more detailed documentation of emissions reduction calculations is included in Appendix 4E.

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[52] "Control Measure Development Support Analysis of Ozone Transport Commission Model Rules"; OTC & E.H. Pechan & Associates, Inc.; March 31, 2001; See http://www.otcair.org/document.asp?Fview=Report#.

[53] "Identification of Candidate Control Measures: Final Technical Support Document"; OTC & MACTEC; February 28, 2007; See http://www.otcair.org/document.asp?fview=Report.

AIM Coatings

As described in Section 4.2.3, CTDEP has recently adopted a regulation to implement the requirements of the OTC 2001 model rule[54] for architectural and industrial maintenance (AIM) coatings. The regulation requires manufacturers to reformulate coatings to meet the specified VOC content limits initially developed by CARB, providing a 31% VOC reduction beyond the levels achieved by the national rule implemented by EPA in 1998. Connecticut's regulation, which is scheduled to be implemented in May 2008, is expected to produce the emission reductions summarized in Table 4.3.2. A more complete summary of emission reduction calculations is included in Appendix 4E.

Asphalt Paving Operations

Asphalt paving is used to pave, seal and repair surfaces such as roads, parking lots, driveways, walkways and airport runways. There are three general categories of asphalt paving: cutback, emulsified and emulsified. Hot mix asphalt plants are regulated and permitted by CTDEP at the time they are built or modified. Hot mix asphalt, the most commonly used paving asphalt, produces minimal VOC emissions because its organic components have high molecular weights and low vapor pressures. Cutback asphalt, typically prepared by blending asphalt cement with a diluent that can contain 25 to 45 percent petroleum distillate, produces the highest level of VOC emissions. Emulsified asphalt, typically prepared by blending asphalt cement with water and an emulsifying agent, is a lower emitting alternative to cutback asphalt.

CTDEP is currently in the process of modifying its existing regulation to implement the recommendations of OTC's 2006 model rule.[55]. The draft rule eliminates the use of cutback asphalt during the ozone season and limits the VOC content of emulsified asphalt. Emission reductions expected to result from the revised regulation are summarized in Table 4.3.2, with more complete documentation of emission reduction calculations provided in Appendix 4E.

Adhesives and Sealants

Adhesives and sealants are used in product manufacturing, packaging and construction and in the installation of metal, wood, plastic and other materials. Adhesives are used to bond two surfaces together. Sealants are materials with adhesive properties that are used to fill, seal or weatherproof gaps or joints between two surfaces. VOC emissions from this category result from solvent evaporation during surface preparation, transfer, drying and cleanup activities, largely from building construction, floor covering installations and roof repair operations.

As described in Section 4.2.3, CTDEP is currently pursuing the adoption of a new regulation implementing the requirements of the OTC 2006 model rule for adhesives and sealants;[56] with implementation currently scheduled to begin in 2009. The OTC model rule, based on a rule

[54] "Control Measure Development Support Analysis of Ozone Transport Commission Model Rules"; OTC & E.H. Pechan & Associates, Inc.; March 31, 2001; See http://www.otcair.org/document.asp?Fview=Report#.
[55] "Identification of Candidate Control Measures: Final Technical Support Document"; OTC & MACTEC; February 28, 2007; See http://www.otcair.org/document.asp?fview=Report.
[56] Ibid.

developed by CARB in 1998, is estimated to provide a VOC emission reduction of 64.4% from unregulated industrial/commercial adhesive and sealants. Connecticut's expected emission reductions from the revised regulation are summarized in Table 4.3.2, with more complete documentation of emission reduction calculations provided in Appendix 4E.

Automotive Refinishing

Connecticut adopted a regulation in 2002 requiring improved transfer efficiency of paint sprays used in automotive refinishing operations, with subsequent modifications to the regulation occurring as recently as 2006. Although CTDEP's original automobile refinishing regulation became effective in 2002, many refinishing shops began using high volume-low pressure spray guns (or equivalent) in prior years. As a result, CTDEP has conservatively assumed that no additional VOC reductions occur in the post-2002 period.

Gasoline Station Pressure-Vacuum Vent Valves

Prior to the May 2004 amendment to CTDEP's Stage II gasoline refueling regulation, pressure-vacuum (PV) vent valves were only required at Stage II gasoline stations equipped with vacuum assist dispensing nozzles. The amended regulation required all gasoline stations with Stage II systems to install PV vent valves by May 2005. As a result, over 96% of all gasoline sold in Connecticut is now dispensed at stations equipped with PV vent valves to limit the amount of gasoline vapors escaping from underground storage tanks. Following the procedures used in CTDEP's December 2005 version of the 2002 periodic inventory, and accounting for estimated growth in gasoline sales, the regulation results in nearly one ton per day of VOC emission reductions (see Table 4.3.2). Documentation of emission reduction calculations is included in Appendix 4E.

Solvent Cleaning

As described in Section 4.2.3, CTDEP has recently revised a regulation to implement the major requirements of the OTC 2001 model rule for solvent cleaning operations[57]. The revised regulation, scheduled for implementation in May 2008, includes vapor pressure limitations for cold cleaning solvents and additional operating requirements recommended by the OTC model rule. Emission reductions expected in Connecticut from the revised regulation are summarized in Table 4.3.2, with more complete documentation of emission reduction calculations provided in Appendix 4E.

Municipal Waste Combustion

Connecticut's MWC NO_X regulation[58] (RCSA 22a-174-38) was implemented in two phases, as described in Section 4.2.2. The emission limits for Phase 1 were implemented in 1999 and are reflected in the 2002 Base Year Inventory. Phase 2 of the regulation required further emission

[57] "Control Measure Development Support Analysis of Ozone Transport Commission Model Rules"; OTC & E.H. Pechan & Associates, Inc.; March 31, 2001; See http://www.otcair.org/document.asp?Fview=Report#. (hereinafter referred to as Pechan.)
[58] RCSA 22a-174-38.

reductions, with implementation in 2003. The Phase 2 portion of the regulation results in post-2002 NO_X emission reductions of one ton per day, as listed in Table 4.3.2. A more complete summary of emission reduction calculations is included in Appendix 4E.

Industrial/Commercial/Institutional Boilers

As described in Section 4.2.2, CTDEP is currently pursuing a regulatory revision to incorporate many of the recommendations of OTC's 2001[59] and 2006[60] model rules for industrial, commercial and institutional (ICI) boilers. As of this writing, NO_X emission limits for the final version of that regulation are yet to be determined. In recognition of this uncertainty, CTDEP has conservatively calculated the emission reductions listed in Table 4.3.2 by applying both an 80% rule effectiveness and 80% rule penetration to the reductions achievable with the OTC 2006 model rule. More detailed calculations are included in Appendix 4E.

CAIR Ozone Season NO_X Trading Program

Connecticut's CAIR regulation, scheduled for implementation in 2009, will establish a revised statewide NO_X budget of 2,691 tons per ozone season for electric generating units and large industrial boilers. When compared to 2002 actual emission levels for covered sources (i.e., 2,948 tons during the 2002 ozone season), the new budget is estimated to provide 1.7 tons/day of NO_X reductions starting in 2009.

4.3.3 Emission Projections for 2008, 2009, and 2012

Future year emission projections were developed from the 2002 Base Year Inventory, applying the growth factors described in Section 4.3.1 and the emission reductions described in Section 4.3.2. Resulting emission projections for 2008, 2009 and 2012 are depicted in Tables 4.4.1 and 4.4.2 for each of Connecticut's 8-hour nonattainment areas and Figures 4.4.1 and 4.4.2 for all of Connecticut.

Both VOC and NO_X emissions are projected to decrease dramatically in Connecticut over the 10-year period from 2002 to 2012 due to federal and state control programs. Statewide anthropogenic VOC emissions are projected to decrease 19% by 2008, 25% by 2009 and 30% by 2012, after accounting for growth. Statewide NO_X emission reductions are projected to be even greater, with estimated reductions of 25% by 2008, 31% by 2009 and 42% by 2012.

4.4 Additional Reductions Not Included In Emission Projections

The emission reductions discussed in this section, and depicted in Tables 4.4.1 and 4.4.2 and Figures 4.4.1 and 4.4.2, result from the control strategies relied upon to comply with RFP and modeled attainment requirements. Several other programs are in place, or are being pursued, that would provide additional, significant emission reductions, increasing the probability of achieving attainment in the 2009 timeframe. These strategies, examples of which include

[59] Pechan.
[60] "Identification of Candidate Control Measures: Final Technical Support Document"; OTC & MACTEC; February 28, 2007; See http://www.otcair.org/document.asp?fview=Report.

energy efficiency and demand side management of electricity demand, a high electricity demand day (HEDD) initiative, additional proposed federal non-road standards and telecommuting incentives, are described as part of the weight-of-evidence discussion later in this document (see Section 8.5.5).

Table 4.4.1
Summary of Greater Connecticut's Projected Emission Trends 2002 –2012
(tons / summer day)

	2002		2008		2009		2012	
Greater Connecticut	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
Stationary Point	4.6	19.0	4.6	18.8	4.6	17.9	4.6	18.1
Stationary Area	75.5	6.4	69.5	6.5	61.6	5.6	61.0	5.7
On-Road Mobile	45.1	89.3	28.5	54.3	26.3	49.2	19.8	34.8
Non-Road Mobile	56.2	30.8	46.7	27.4	45.2	26.4	42.3	23.3
Total Anthropogenic	**181.4**	**145.5**	**149.3**	**107.0**	**137.8**	**99.1**	**127.7**	**81.9**
Biogenic	268.6	1.3	268.6	1.3	268.6	1.3	268.6	1.3
Total Emissions	**450.0**	**146.8**	**417.9**	**108.2**	**406.4**	**100.4**	**396.3**	**83.2**

Table 4.4.2
Summary of Southwest Connecticut's Projected Emission Trends 2002 –2012
(tons / summer day)

	2002		2008		2009		2012	
Southwest Connecticut	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
Stationary Point	11.3	37.7	11.8	38.3	11.8	35.6	12.1	35.9
Stationary Area	84.1	7.2	76.6	7.4	69.4	6.6	68.6	6.7
On-Road Mobile	48.3	102.7	29.7	60.5	27.4	54.6	20.6	38.2
Non-Road Mobile	66.0	38.7	49.5	34.3	47.6	33.0	44.5	29.2
Total Anthropogenic	**209.7**	**186.3**	**167.6**	**140.5**	**156.2**	**129.8**	**145.8**	**109.9**
Biogenic	125.6	0.7	125.6	0.7	125.6	0.7	125.6	0.7
Total Emissions	**335.3**	**187.0**	**293.2**	**141.2**	**281.8**	**130.4**	**271.4**	**110.6**

Figure 4.4.1: Projected Anthropogenic VOC Emission Trends for Connecticut

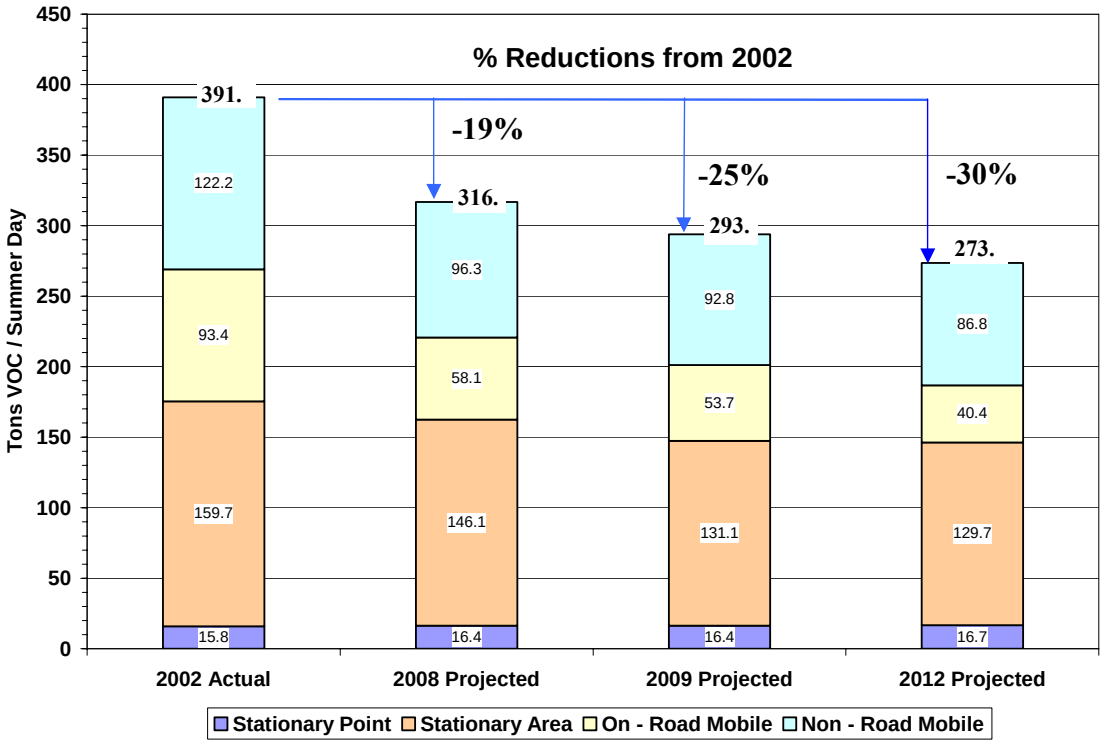

Figure 4.4.2: Projected Anthropogenic NOx Emission Trends for Connecticut