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FINAL
BACKGROUND DOCUMENT AND TECHNICAL SUPPORT FOR REVISIONS TO THE STATE IMPLEMENTATION PLAN FOR CARBON MONOXIDE:

REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR LOWELL, SPRINGFIELD, WORCESTER, AND WALTHAM, MASSACHUSETTS CARBON MONOXIDE NONATTAINMENT AREAS

The draft proposed Carbon Monoxide (CO) Redesignation Request and Maintenance Plan for Lowell, Springfield, Worcester, and Waltham together with the Background Document and Technical Support (TSD) were originally submitted to the Environmental Protection Agency (EPA) September 2000. This proposed CO SIP revision was subject to public hearing comments November 15 & 16 2000. Comments were received from one person in addition to EPA. MassDEP addressed the comments that required some updating of the 1996-2012 CO emissions inventories and providing supporting documentation. MassDEP submitted this final TSD and the Redesignation Request to EPA May 25, 2001. EPA then approved the Massachusetts CO Redesignation Request, Maintenance Plan, and Emissions Inventory for the four cities as noted in the Federal Register Volume 67 No 33 dated February 19, 2002.

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FOR USE IN INTRA-AGENCY POLICY DELBERATIONS

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF WASTE PREVENTION
DIVISION OF PLANNING AND EVALUATION

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Regulatory Authority:
M.G.L c.111, Sections 142A through 142M

May, 2001

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May 2001

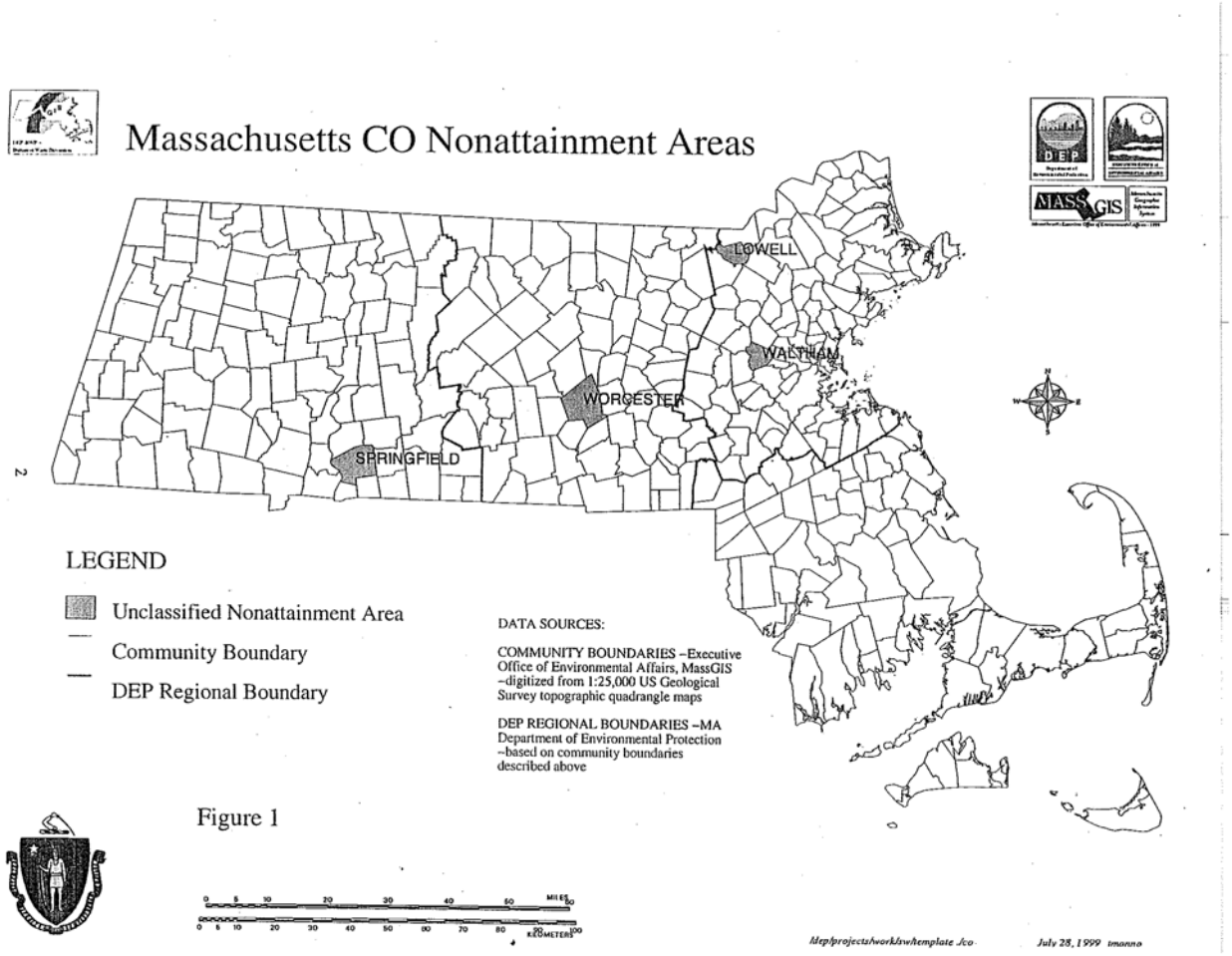
Executive Summary: *DEP is committed to measures that will attain and maintain the health and welfare related National Ambient Air Quality Standards (NAAQS) for criteria pollutants. Since first being designated as non-attainment for carbon monoxide (CO) in the mid-1970s, Massachusetts has implemented aggressive programs to reduce ambient concentrations of CO. Recent analyses have demonstrated that, through the actions of federal, state, and local agencies, CO concentrations have been reduced below the NAAQS throughout the Commonwealth. At this time, Massachusetts is requesting that EPA redesignate the cities of Lowell, Springfield, Waltham, and Worcester from non-attainment to "attainment" for CO. This document provides EPA with the technical support for this request, including a demonstration that the state has attained and will maintain the NAAQS for CO. The attainment demonstration consists of monitored attainment data for three cities and modeled attainment for one city. The document contains an emission inventory for a typical CO winter day by county for the CO non-attainment cities for 1996, projected to 2012. The document also includes a demonstration that the improvement in air quality is related to emission reductions that are permanent and enforceable. The applicable maintenance plan, including a contingency plan, meets the requirements of Section 175A of the Clean Air Act; this document addresses each of these requirements as part of this request for redesignation.*

1.0 INTRODUCTION

This is a proposal to revise the Massachusetts State Implementation Plan (SIP) for Carbon Monoxide (CO). The proposal consists of a request to EPA to redesignate the cities of Lowell, Springfield, Waltham and Worcester (see Figure 1) to attainment for CO. Included is the current status of these areas, a description of the data collected by the Massachusetts Department of Environmental Protection's (DEP's) CO ambient monitoring network, and an evaluation of CO levels at critical intersections through modeling analyses. The weight-of-evidence indicates that the cities of Lowell, Springfield, Waltham and Worcester should be redesignated to attainment of the CO standard. DEP will submit this revision to the US Environmental Protection Agency (EPA) after responding to public comment.

The National Ambient Air Quality Standards (NAAQS) for criteria pollutants are promulgated by EPA, and designed to protect the public health and welfare. The NAAQS for CO is 35.0 parts per million by volume (ppmv) averaged over one-hour, and 9.0 ppmv averaged over an eight-hour period. The CO standards may not be exceeded more than once per year at any monitoring site. On November 6, 1991, as required by the 1990 Clean Air Act Amendments, EPA designated Lowell, Springfield, Waltham and Worcester as non-classifiable CO non-attainment areas with

FIGURE 1


Massachusetts CO Nonattainment Areas
LOWELL
WALTHAM
WORCESTER
SPRINGFIELD
LEGEND
Unclassified Nonattainment Area
Community Boundary
DEP Regional Boundary
DATA SOURCES:
COMMUNITY BOUNDARIES –Executive Office of Environmental Affairs, MassGIS –digitized from 1:25,000 US Geological Survey topographic quadrangle maps
DEP REGIONAL BOUNDARIES –MA Department of Environmental Protection –based on community boundaries described above
Figure 1
MILES
KILOMETERS
July 28, 1999 tmanno

respect to the eight-hour NAAQS for CO. Non-classifiable means that there were no air quality measurements that would justify classifying these non-attainment areas as either serious or moderate non-attainment areas. These areas were already classified as non-attainment prior to the 1990 Clean Air Act Amendments and the Act required that these areas remain classified as non-attainment areas under those Amendments, notwithstanding monitored values.

On October 6, 1995, EPA issued guidance in a memorandum from Joseph Paisie, Group Leader of the Integrated Policy and Strategies Group, to Regional Air Branch Chiefs on the "Limited Maintenance Plan Option for Nonclassifiable CO Non-attainment Areas." Using EPA's Limited Maintenance Plan Option guidance and based on currently available data, DEP believes that the cities of Springfield, Worcester, and Lowell are primary candidates for redesignation to attainment for CO. There have been no monitored violations of the one-hour or the eight-hour CO standards in those cities since 1990.

Waltham was designated as a non-attainment area prior to the 1990 Clean Air Act Amendments because of measured exceedances of the CO NAAQS prior to 1990. Since there are no recent CO monitoring data for Waltham, DEP proposes to submit a weight-of-evidence analysis. This includes modeling performed for a proposed office park located in Waltham. Based on the evidence, DEP believes that that the results support redesignating Waltham to attainment for CO.

2.0 CHARACTERIZATION OF THE PROBLEM

Carbon monoxide is a colorless, odorless gas emitted as a by-product of incomplete combustion of fossil fuels. When inhaled, CO has a high affinity for the body's red blood cells, and displaces the oxygen molecules carried to organs and other tissues. The health threat is most severe for those with cardiovascular disease; however, healthy individuals can be affected at higher concentrations (> 30 ppmv). Symptoms associated with exposure to CO include shortness of breath, chest pain, headaches, confusion and loss of coordination. Exposure to high enough concentrations of CO can result in death due to hypoxia. However, these levels are extremely rare in the ambient air.

In Massachusetts, CO is a localized problem caused by nearby combustion sources such as mobile sources, industrial fuel combustion, commercial fuel combustion, residential fuel combustion, forest fires and structural fires. High levels of CO occur most often during the winter months, and more than 50% of the ambient CO concentration comes from motor vehicle emissions. Ambient CO concentrations are generally highest during the morning and afternoon rush hours because of stable atmospheric conditions. Under stable atmospheric conditions, there is very little mixing of the air, either vertically or horizontally, which is very important in diluting pollutants. The effects of high levels of vehicle emissions and poor atmospheric dispersion can result in high ground level CO concentrations. This is especially noticeable in urban areas near heavily trafficked intersections. Urban intersections can also encounter a phenomenon known as "canyon effect" that occurs when the atmospheric wind flow becomes trapped between tall buildings, allowing the build-up of CO from idling vehicles.

3.0 EPA GUIDANCE AND PLAN REQUIREMENTS

In accordance with Section 107(d)(3)(E) of the Clean Air Act, the EPA Administrator may not redesignate a non-attainment area (or portion thereof) to attainment unless:

1) the Administrator determines that the area has attained the NAAQS;
2) the Administrator determines that the improvement in air quality is due to permanent and enforceable reductions in emissions;
3) the Administrator has fully approved the applicable implementation plan required under section 110(k);
4) the State containing such area has met all requirements applicable to the area under section 110 and Part D; and
5) the Administrator has fully approved a maintenance plan for the area as meeting the requirements of section 175A.

The following sections document that the cities of Lowell, Springfield, Waltham, and Worcester have met all the criteria for redesignation to attainment. The requirements for redesignation are further described in EPA's September 4, 1992 guidance memorandum, from John Calcagni to EPA's Regional Division Directors entitled "Procedures for Processing Requests to Redesignate Areas to Attainment" (EPA, 1992). This redesignation request for Lowell, Springfield and Worcester was prepared following EPA's Limited Maintenance Plan option guidance. The Limited Maintenance Plan is applicable to non-classifiable CO non-attainment areas seeking redesignation, provided that monitored design values are at or below 7.65 ppmv (85% of the exceedance of the eight-hour levels for CO NAAQS). The monitored data for Lowell, Springfield, and Worcester qualify these locations for this option. The redesignation request for Waltham is based primarily on a modeling analysis for a proposed office park in Waltham performed in July 1998, since there are no monitoring sites in this city.

4.0 ATTAINMENT DEMONSTRATION

The attainment demonstration consists of two components. The first component presents an evaluation of ambient monitored data for Lowell, Springfield, and Worcester. The second component provides the results of air quality modeling based on EPA-approved procedures for the city of Waltham.

4.1 Monitored Attainment (Lowell, Springfield, and Worcester)

DEP's Air Assessment Branch operates one CO monitor in Lowell, two CO monitors in Springfield, and two CO monitors in Worcester. All monitors are located adjacent to high traffic volume intersections and have been continuously operated for more than 10 years. The CO data from these stations have been routinely collected and quality assured by DEP's Air Assessment Branch in accordance with 40 CFR 58. The data have been recorded in EPA's Aerometric Information Retrieval System (AIRS), consistent with EPA requirements.

A violation of the eight-hour NAAQS for CO is defined as two or more eight-hour observations greater than 9.0 ppmv in a calendar year. Note that one exceedance is allowed at each site, each year. For example, if, at a site, the first maximum is over 9.0 ppmv, and the second maximum is less than 9.0 ppmv, then there is no violation. As indicated in Table 1, there have been no

measured violations of the 8-hour CO NAAQS of 9.0 ppmv in Lowell, Springfield and Worcester since 1988. The data presented in Table 1 indicates that the two years of attainment data (required for redesignation) were achieved in 1988 and 1989, with continued compliance through the present. The data shown in Table 1 and Table 2 indicate a general downward trend in the highest and second highest 8-hour CO concentrations. This general downward trend is attributable to the emission reductions associated with better federal motor vehicle control technology, motor vehicle fleet turnover, the use of reformulated gasoline and the MA basic Inspection and Maintenance Program operated in Massachusetts since 1983. This downward trend can be seen in Figures 2 to 8.

DEP does not have any recent CO monitoring data for the city of Waltham. However, several years of CO measurements at the Kenmore Square monitor in Boston have demonstrated "monitored attainment". The 8-hour CO values at Kenmore are well below the 7.65 ppmv criteria necessary for a site to qualify for EPA's Limited Maintenance Plan Option. As indicated in Table 1, there has been no measured violation of the 8-hour CO NAAQS of 9.0 ppmv at the Boston Kenmore Square site since 1988. Table 1 also shows that, from 1988 to 1998, all the values are well below the 7.65 ppmv criteria necessary to qualify a site for the Limited Maintenance Plan Option. The highest of the second-high for the two most recent years (1997 and 1998) at the Boston Kenmore Square site is 3.2 ppmv, which is less than half of the 7.65 ppmv criteria.

Since the Boston Kenmore Square intersection is more heavily travelled than any intersection in the city of Waltham, DEP, with EPA's concurrence, assumes that Waltham should have at least the same attainment status as Boston Kenmore Square ("monitored attainment").

Table 1. Second Maximum 8 Hour CO Value (ppm)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Boston[1]	5.3	6.1	6.1	4.2	4.2	4.0	3.7	3.6	3.3	2.9	3.2
Lowell	6.4	5.3	7.3	5.8	5.9	5.1	6.5	7.8	4.5	3.6	3.4
Springfield[2]	3.8	7.6	6.4	6.5	6.9	5.5	7.2	7.4	6.5	5.3	4.6
Springfield[3]	7.0	7.0	7.0	6.1	7.3	6.7	7.8	8.4	7.7	4.9	3.6
Worcester[4]	5.6	7.9	6.0	7.2	8.0	6.1	5.9	4.9	5.3	3.4	3.5
Worcester[5]					4.5	5.0	4.8	3.2	3.9	3.3	3.5

[1]Kenmore Square [2]East Columbus Avenue [3]Liberty Street [4]Central Street [5]Franklin and Galvin Streets

Table 2. First Maximum 8 Hour Value (ppm)

1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998

Boston[1]	5.6	6.6	7.4	4.9	5.0	4.8	3.7	3.8	4.0	4.5	3.4
Lowell	9.4	5.4	9	6.4	6.9	6.1	8.2	9.6	10.5	4.1	3.6
Springfield[2]	4.3	7.6	7	7.4	7.1	7	8.4	8.1	7.1	6.1	5
Springfield[3]	8.6	7.4	7.3	8.1	9.0	6.9	7.9	9.2	9.5	5.3	4.5
Worcester[4]	7.4	8.0	8.0	11.7	9.7	8.3	6.3	4.9	5.6	3.7	4.1
Worcester[5]					4.8	5.6	5.3	3.2	4.2	3.4	3.9

[1]Kenmore Square [2]East Columbus Avenue [3]Liberty Street [4]Central Street [5]Franklin and Galvin Streets

Figure 2. CO 2nd Max 8-Hour Values at Kenmore Sq. Boston

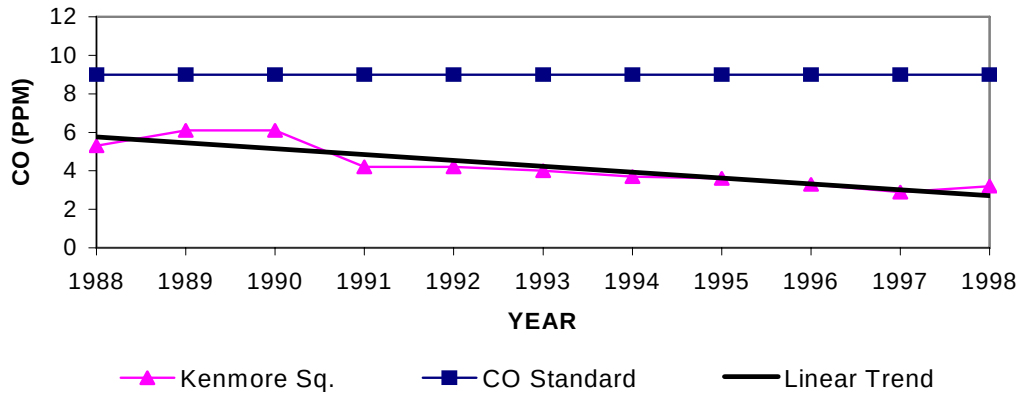


Figure 3. CO 2nd Max 8-Hour Values for Lowell

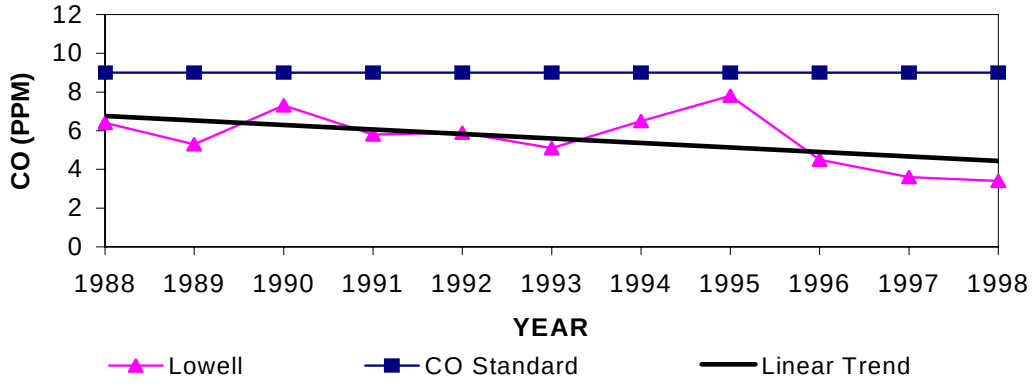


Figure 4. CO 2nd Max 8-Hour Values for Springfield(E. Columbus Ave.)

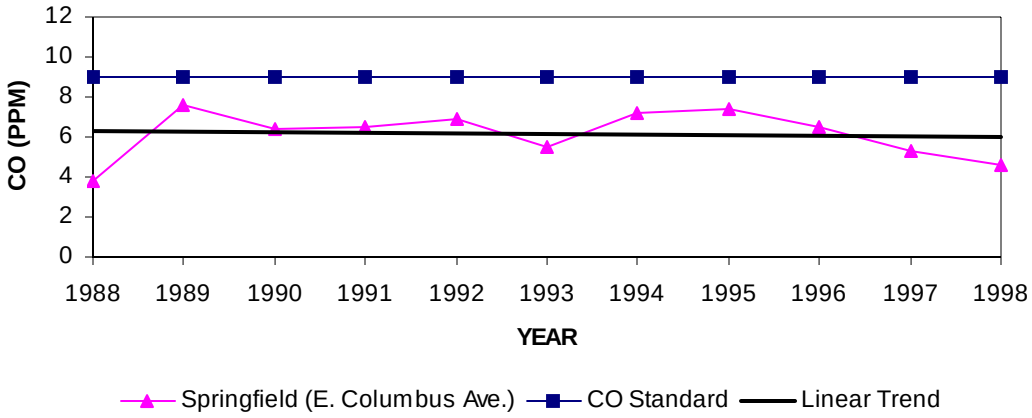


Figure 5. CO 2nd Max 8-Hour Values for Springfield(Liberty Street)

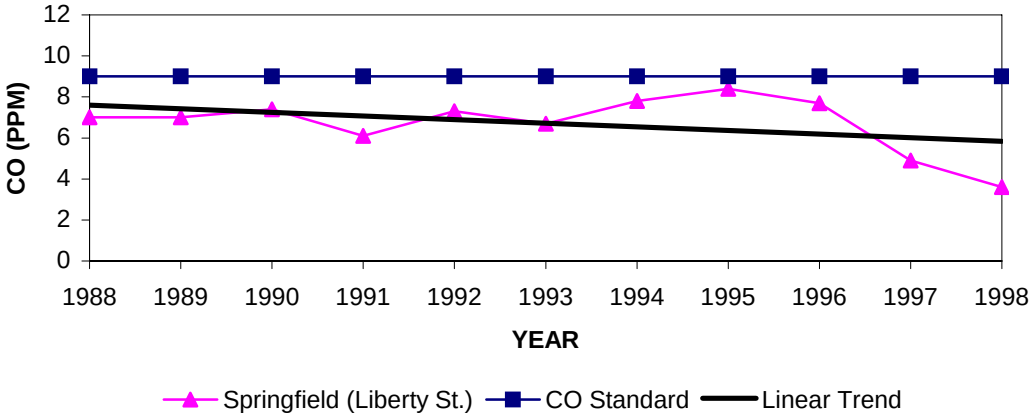


Figure 6. CO 2nd Max 8-Hour Values for Worcester(Central Street)

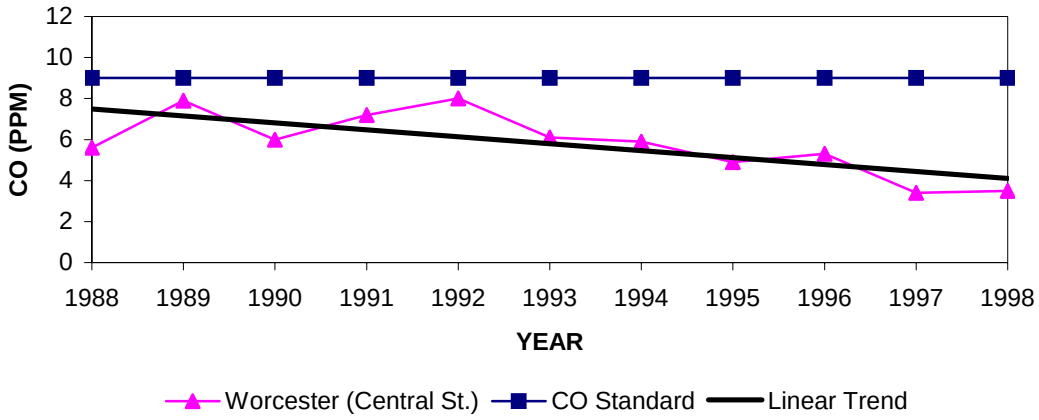
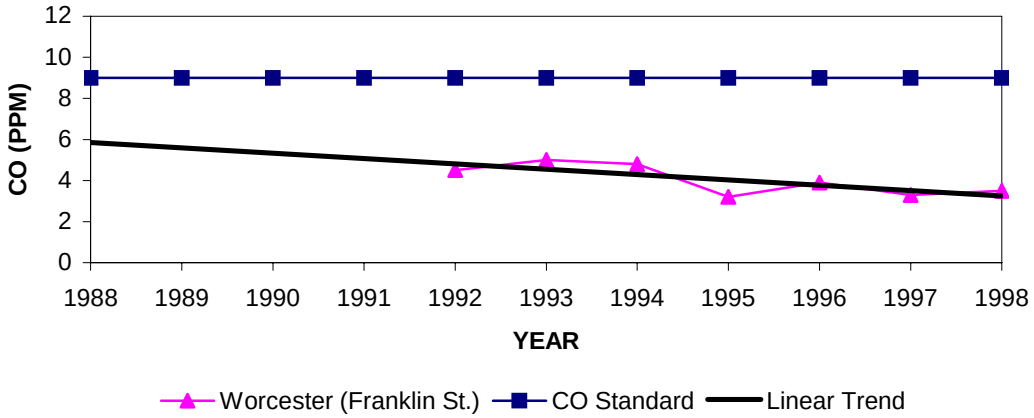


Figure 7. CO 2nd Max 8-Hour Values for Worcester(Franklin Street)



4.2 Modeled Attainment (Waltham)

Since there are no ambient monitors in Waltham, DEP is using modeling analyses to demonstrate that it attains the CO standards. Microscale and mesoscale modeling analyses were performed in 1998 by Vanasse Hagen Brustlin, Inc. for a proposed office park to be located at 50 Jones Road in Waltham. The microscale analysis evaluated the CO concentrations at congested intersections in the study area during the peak CO season (winter). The mesoscale analysis evaluated areawide emissions of VOCs during a typical day in the peak ozone season (summer). EPA's CAL3QHC line source dispersion model was used to predict ambient CO concentrations from motor vehicles near roadway intersections. CAL3QHC uses traffic data, emission estimates, and local meteorology to predict ambient CO concentrations. The traffic data was developed based on traffic volumes, observed traffic flow characteristics, and roadway capacities. This traffic data is in Appendix III, " Proposed Office Park 50 Jones Road Waltham, Massachusetts (EOEA No. 11677)." Three congested intersections were modeled: Route 117

and Jones Road, Route 20 and Tavern Road, and Second Avenue and Winter Street. These intersections were selected in accordance with the EPA's "Guideline for Modeling Carbon Monoxide from Roadway Intersections" (EPA-454/R-92-005) and used peak hour 1998 traffic counts. The CAL3QHC modeling results demonstrated attainment with the one-hour and eight-hour CO NAAQS.

4.3 Summary of Waltham Modeling Analyses

As indicated earlier, more than 50% of wintertime CO emissions in Massachusetts are from mobile sources. Peak ground level concentrations of CO typically occur near high volume, congested intersections where vehicle emissions are greater due to slow travel speeds and idling vehicles. Concentrations measured at these peak impact locations are comprised of a local component from traffic on nearby roadways, and a regional (background) component from distant vehicle emissions and other combustion sources. In light of this, CO modeling analyses typically focus on estimating localized ambient concentrations in the vicinity of intersections with the highest traffic volumes and congestion levels. Representative background concentrations are then added to the local traffic impacts for comparison to the CO NAAQS.

The modeling for the office park at 50 Jones Road analyzed a representative group of three high traffic volume intersections, which were selected by DEP because those intersections would experience increases in project-related traffic. In addition, seven major roadways in Waltham were included in the analysis. The locations of the intersections and roadways are shown in Figure 8. The proposed office park at 50 Jones Road conforms to the Clean Air Act and SIP requirements for transportation projects. The microscale analysis evaluated site-specific impacts from vehicles traveling through congested intersections in the study area. The modeling analysis demonstrated that all existing and future CO concentrations would be below the NAAQS. In addition, as previously discussed, Waltham can be considered to have the same status as "monitored attainment" since the Boston Kenmore Square monitor (which is in attainment) is located in an intersection area that is more heavily-travelled than any intersection in Waltham.

Traffic and dispersion modeling for the microscale and mesoscale analyses were performed for each intersection using EPA's CAL3QHC model (Version 2.0), MOBILE5a-h emission factors, and traffic data representative of evening peak hour traffic conditions during the winter season. The model calculates emissions of CO in grams per vehicle-mile traveled for existing and future conditions. The 50 Jones Road study used Massachusetts-specific mobile source emissions modeling inputs consistent with the Massachusetts SIP. The Appendix to the 50 Jones Road study includes a detailed presentation of the MOBIL5ah input and output data. Output data from MOBIL5ah was used as input data for the application of EPA's CAL3QHC dispersion model. CAL3QHC was used to predict CO concentrations at various locations, for various averaging times at each intersection. Predicted maximum concentrations for each intersection are presented in Appendix III. The maximum predicted one-hour and eight-hour concentrations, 8.1 ppm and 13.1 ppm, were below the CO one-hour CO NAAQS (35 ppm) and the eight-hour CO NAAQS (9 ppm).

5.0 PERMANENT AND ENFORCEABLE AIR QUALITY REDUCTIONS

EPA's guidance for redesignation requests (EPA, 1992a) requires that the State be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable. In order to demonstrate that this requirement has been satisfied, the following discussion of adopted control programs, corresponding emission reductions, and resultant air quality improvements is provided.

The federal government and DEP have implemented numerous programs over the past 30 years designed to reduce CO emissions and ambient CO concentrations in Lowell, Springfield, Waltham, and Worcester, and elsewhere in Massachusetts. Federal strategies include the pre-1990 Federal Motor Vehicle Control Program (FMVCP), federal Tier I emission standards for newly manufactured cars and trucks (phased-in beginning with the 1994 model year), and reformulated gasoline (beginning in January 1995). In 1983, Massachusetts began implementing regulations requiring Basic Inspection and Maintenance (Basic I/M) of on-road vehicles. California Low Emission Vehicles (LEV) were introduced into Massachusetts beginning with the 1995 model year. Traffic flow improvements have also been implemented in heavily congested areas to reduce CO concentrations. Massachusetts is also required to determine if transportation plans and programs in the Lowell, Springfield, Waltham, and Worcester CO non-attainment areas meet state and federal transportation conformity requirements. Because a CO mobile source emission budget has not been established for these areas, transportation plans and programs must not result in emission levels greater than the "no-build**"** conditions, as per Transportation Conformity requirements. The CO attainment demonstration SIP for the Boston Metropolitan area, approved by EPA on January 30, 1996, incorporates emission reductions for these federal and State programs (hereafter referred to as the SIP Strategies). The same SIP Strategies also provide the basis for this redesignation request.

In addition to the SIP Strategies noted above, further emission reductions have been and/or will be realized due to other programs for which emission credit has not been incorporated into either the previous CO attainment demonstration or this redesignation request. These include the new federal tailpipe standards (Tier II), the second phase of the California Low Emission Vehicle Program (LEV II), and the Massachusetts Enhanced Emissions and Safety (Enhanced I/M) Program.

6.0 CAA SECTION 110 AND PART D REQUIREMENTS

EPA's guidance for evaluating redesignation requests (EPA, 1992) requires that the SIP for the subject area must be fully approved under CAA Section 110k of the Clean Air Act and that all requirements of CAA Section 110 and Part D must be met. Section 110 and Part D stipulate the general and specific requirements for implementation plans. Specifically, the requirements for CO non-attainment areas include:

1) developing a base year emission inventory, with periodic update every three years until the area is redesignated to attainment;
2) implementing transportation conformity procedures;

3) adopting and implementing oxygenated gasoline requirements during the CO season (for areas classified as "moderate non-attainment" and above);
4) implementing vehicle miles traveled forecast and tracking procedures (for serious areas);
5) adopting applicable new source review regulations;
6) adopting and implementing an enhanced I/M program for the urbanized portion of the nonattainment areas; and
7) developing and submitting an attainment demonstration (for areas classified as "moderate non-attainment" and above).

Massachusetts submitted a revised implementation plan for the Boston Metropolitan Non-attainment Area to EPA in August 1994, updating a previous revision that had been approved by EPA in 1984. The area was comprised of nine communities: Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere and Somerville. The 1994 SIP revision documented that all general and CO-specific requirements of CAA Section 110 and Part D had been met.

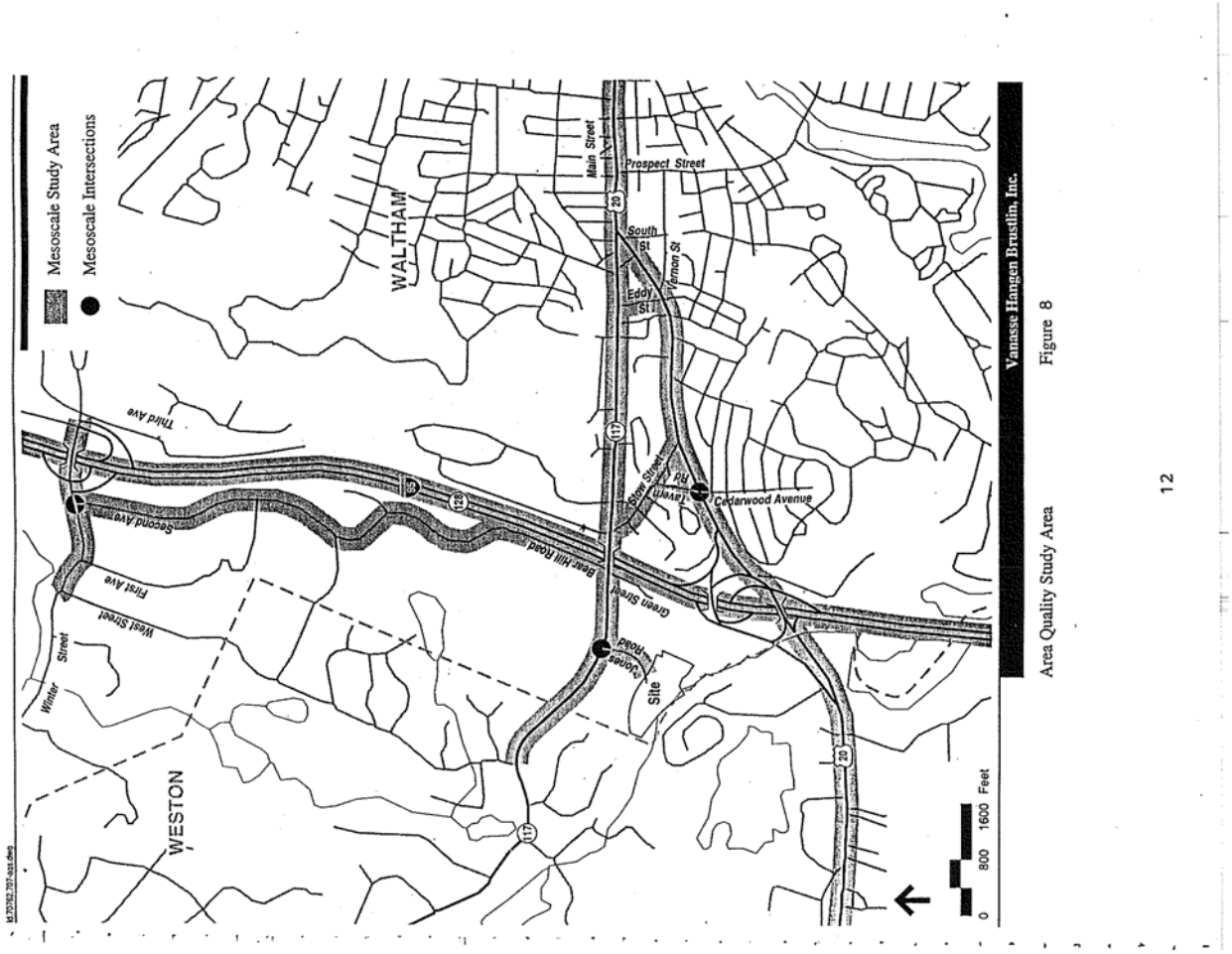
EPA issued full final approval of the 1994 implementation plan and redesignated those areas to attainment on January 30, 1996. This redesignation request is nearly identical to the August 1997 request and submittal.

7.0 MAINTENANCE PLAN

Section 175A of the CAA specifies that an area cannot be redesignated to attainment unless the Administrator has approved a maintenance plan. The maintenance plan must include the following elements:

1) an emissions inventory representative of a level of emissions that is sufficient to ensure attainment;
2) a demonstration of attainment through the 10-year maintenance period;
3) a commitment to maintain appropriate air quality monitoring networks;
4) a method to track the progress of the maintenance plan; and
5) a contingency plan to be implemented if a violation of the CO NAAQS occurs during the maintenance period.

The approvable maintenance plan should describe the necessary measures to ensure that the areas will remain in compliance with NAAQS for a 10-year period. If an area is at or below 7.65 ppmv (85% of exceedance levels of the 8-hour CO NAAQS), the State may select the Limited Maintenance Plan Option for the first 10-year maintenance period as per EPA guidance. Lowell, Springfield, and Worcester are candidates for the Limited Maintenance Plan, based on eight consecutive quarters of data (two years of monitored data) measured in and representative of the areas. DEP requests 1990 as the attainment year, since there has been no violation of the standard since then. The maintenance plan (described in the following sections) includes CO emission inventory estimates for the attainment year 1990 and the maintenance year (2012). DEP has chosen 2012 as the maintenance year to allow EPA to use the two-year period allowed under the Clean Air Act to review this redesignation request. The predicted emissions for 2012 FIGURE 8



are below 1990 emission levels, demonstrating compliance with the CO NAAQS. Detailed emission inventory results are presented in Appendix II.

The maintenance plan also requires Massachusetts to track compliance through continued ambient monitoring and to prepare CO emission inventories every three years during the maintenance period. The CO contingency plan for nine Boston-area communities submitted to EPA in August 1994 is discussed in section 7.5. This plan for the remaining four CO nonattainment communities is identical to the Boston contingency plan.

7.1 Base Year and Attainment Year Inventories

DEP has developed a CO inventory per EPA guidance for 1996 and projected to 2012 as shown in Appendix II. The year 1996 has been chosen as the inventory base year because it is the most recent inventory available to DEP, and is a conservative starting point for future projections. The methodologies for estimating the base year 1996 CO winter-day emissions were derived from the 1996 Periodic Emission Inventories (PEI) for VOC, NOx and CO (ozone precursors). The 1996 PEI emissions were estimated for a typical ozone summer day for each county in Massachusetts. For this CO report, the 1996 PEI CO emissions were adjusted for a typical CO winter day. The county emissions were apportioned to the CO Non-attainment cities (Lowell, Springfield, Waltham and Worcester) using population information for each city.

The 1996 base year CO emissions were projected to the year 2012 using EPA recommended Bureau of Economic Affairs (BEA) growth factors. The On-Road Mobile source emissions were projected using daily vehicle miles traveled developed by the Mass Highway Department.

7.2 Inventory Methodology

The general methodology for the 1996 Periodic Emission Inventory (PEI) CO emissions inventory involved multiplying activity factors by appropriate emission factors. DEP followed the EPA inventory guidelines and referenced all sources of information used for generating emissions in the Draft 1996 PEI. Seasonal adjustment factors presented in EPA guidance documents were used to adjust the annual emissions to a typical winter day. The CO emissions inventory is subdivided into four sections:

1. Stationary point - commercial, industrial and electric generation utilities
2. Stationary area - sources too small and numerous to be recorded in the Massachusetts Stationary Source Emission Inventory System (SSEIS) such as residential/commercial fuel and fires
3. Off-road mobile - includes aircraft, rail locomotives, boats, and residential, commercial, industrial and farm equipment.
4. On-road mobile - includes cars, trucks and buses

The stationary point source category (Section 2 of the Draft 1996 PEI) involved a data collection process originating from a DEP mail survey source registration form mailed to CO-emitting facilities statewide. Appendices 1 and 3 of the 1996 PEI present the source registration form and individual point source facilities, respectively. DEP staff recorded the completed forms into the Stationary Source Emissions System (SSEIS) database. SSEIS has a built-in table of EPA emission factors, and includes the effects of any control equipment in the emissions calculations. The quarterly throughput entered into SSEIS determined the winter day emissions. The

stationary point source emissions for each source category are shown in Table 3, and are summarized for each non-attainment city in Table 4.

The stationary area source category (Section 3 of the draft 1996 PEI) represents point sources that are too small and numerous to be recorded in the SSEIS point source inventory (e.g. residential fuel combustion). CO is mainly emitted from combustion processes such as residential, commercial/institutional and small industrial fuel burning. CO is also emitted from forest and structural fires. DEP estimates emissions from these sources by using activity factors that include sales records, fuel/materials used and surrogate employment and population data. Most of the fuel data were derived from the Department of Energy Annual State Energy Data Report for 1996. Tables 1 to 3 in Appendix II present the Area Source emissions by county for 1996 and 2012.

The off-road mobile source category (Section 5 of the draft 1996 PEI) includes emission estimates from a wide range of engines such as aircraft, rail locomotives, commercial and recreational marine vessels and other numerous off-road engines. The basic activity factor for this category is the number and type of engines multiplied by the appropriate emission factors. Aircraft emissions were developed from EPA and Federal Aviation Emission Estimation Database (FAEED) model based on Landing and Take-off Cycles (LTO) of each type of aircraft at each airport in the state. DEP also used the February 1999 draft version of EPA's non-road engine model (NONROAD) that covers the numerous off-road engines such as lawnmowers, construction equipment, farm equipment, recreational boats and other commercial engines for 1996 and 2012.

The on-road mobile source category (Section 4 of the draft 1996 PEI) represents emissions from roadway and highway vehicles such as cars, trucks and buses. The Massachusetts Highway Department (MHD) presented the 1996 and projected 2010 daily vehicle miles traveled (DVMT) by county and roadway functional class. The 2010 MHD daily vehicle miles traveled projections were linearly projected to 2012.

The state Central Transportation Planning Staff (CTPS) provided 1996 MOBILE5ah emission factors for speeds up to 65 mph. DEP staff provided the projected 2012 MOBILE5ah emission factors based on anticipated mobile source controls. MOBILE5ah is EPA's on-road emission factor model which accepts a wide range of state specific inputs such as Enhanced Emissions and Safety (Enhanced I/M) Test parameters, temperature, vehicle mix and vehicle age distribution. DEP multiplied the county and roadway functional class DVMT by the MOBILE5ah emission factors according to average vehicle speeds. Table 5.9 and 5.10 in Appendix II presents the 1996 and projected 2012 On-Road Mobile Source emissions by road class and county. County emissions were then apportioned to CO non-attainment cities by population in Table 4.

TABLE 3. MASSACHUSETTS CO EMISSION IN TONS PER WINTER DAY

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	STATE ESTIMATED	**STATE PROJECTED**

SOURCE CATEGORY	1996	2012
On-Road Mobile		
LIGHT DUTY GASOLINE VEHICLE	1,286.3	818.3
LIGHT DUTY GASOLINE TRUCK 1	469.4	295.6
LIGHT DUTY GASOLINE TRUCK 2	203.1	128.5
HEAVY DUTY GASOLINE VEH	90.3	55.7
LIGHT DUTY DEISEL VEHICLE	4.5	2.9
LIGHT DUTY DIESEL TRUCK	9.0	5.7
HEAVY DUTY DIESEL VEHICLE	187.3	117.1
MOTOR CYCLES	6.8	4.3
TOTAL HIGHWAY MOBILE	**2,256.7**	**1,428.1**
Off-Road Mobile		
NON-ROAD ENGINES	594.9	776.5
RAIL	2.1	2.0
AIRCRAFT	33.9	31.6
COMMERCIAL VESSELS	2.7	2.9
TOTAL OFF-ROAD MOBILE	**633.6**	**813.0**
TOTAL STATIONARY POINT	**40.0**	**44.3**
Stationary Area		
INDUSTRIAL FUEL COMBUSTION	12.5	13.2
COMMERCIAL FUEL COMBUSTION	5.3	6.4
RESIDENTIAL FUEL COMBUSTION	670.1	680.6
FOREST & STRUCTURAL FIRES	8.7	8.7
TOTAL STATIONARY AREA	**696.6**	**708.9**
TOTAL CO EMISSIONS	**3,626.9**	**2,994.3**

TABLE 4 MASSACHUSETTS CO EMISSION TONS PER WINTER DAY (by non-attainment area)

	SPRINGFIELD		WORCESTER		LOWELL		WALTHAM	
	1996	2012	1996	2012	1996	2012	1996	2012
SOURCE CATEGORY	HAMPDEN	HAMPDEN	WORC CNTY	WORC CNTY	MIDSX CNTY	MIDSX CNTY	MIDSX CNTY	MIDSX CNTY
	7%	7%	12%	12%	22%	22%	22%	22%
	SPFLD 34%	SPFLD 34%	WORC 24%	WORC 24%	LOWELL 7%	LOWELL 7%	WALTH 4%	WALTH 4%
On-Road Mobile								
LIGHT DUTY GASOLINE VEHICLES	33	8	36	10	21	5	12	3
LIGHT DUTY GASOLINE TRUCKS 1	12	3	13	4	8	2	4	1
LIGHT DUTY GASOLINE TRUCKS 2	5	1	6	2	3	1	2	0
HEAVY DUTY GASOLINE VEHICLES	2	1	3	1	1	0	1	0
LIGHT DUTY DIESEL VEHICLES	0	0	0	0	0	0	0	0
LIGHT DUTY DIESEL TRUCKS	0	0	0	0	0	0	0	0
HEAVY DUTY DIESEL VEHICLES	5	1	5	1	3	1	2	0
MOTORCYCLES	0	0	0	0	0	0	0	0
TOTAL HIGHWAY MOBILE	**57**	**15**	**64**	**17**	**37**	**10**	**21**	**5**
Off-Road Mobile								
NON-ROAD ENGINES	14	16	16	18	9	10	5	5
RAIL	0	0	0	0	0	0	0	0
AIRCRAFT	1	1	1	1	1	1	0	0
COMMERCIAL VESSELS	0	0	0	0	0	0	0	0
TOTAL OFF-ROAD MOBILE	**15**	**16**	**17**	**19**	**10**	**11**	**6**	**6**
TOTAL STATIONARY POINT	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**
Stationary Area								
INDUSTRIAL FUEL COMBUSTION	0	0	0	0	0	0	0	0
COMMERCIAL FUEL COMBUSTION	0	0	0	0	0	0	0	0
RESIDENTIAL FUEL COMBUSTION	17	17	19	19	11	11	6	6
FOREST & STRUCTURAL FIRES	0	0	0	0	0	0	0	0
TOTAL STATIONARY AREA	18	18	20	20	11	11	6	6
TOTAL CO EMISSIONS	**91**	**50**	**102**	**57**	**59**	**32**	**33**	**18**

7.3 Demonstration of Future Attainment

Monitoring and modeling data discussed in Section 4.0 of this document (Attainment Demonstration) indicate that Lowell, Springfield, Waltham, and Worcester, have been in compliance with the eight-hour CO NAAQS since 1990. Tables 3 and 4 present the statewide CO 1996 and projected 2012 emissions by emission categories. The column headings on Table 4 show the apportioning factors from state to county, and then from county to non-attainment city, based on population. Projected 2012 emissions were developed with the Bureau of Economic Affairs growth factors.

Table 3 demonstrates that statewide CO emissions are projected to decline by 44% over the 16-year period from 1996 to 2012. Table 4 presents the CO 1996 and projected 2012 emissions by categories for the non-attainment cities showing similar projected reductions. Since emissions continue to decline, continued compliance with the NAAQS can be expected through 2012.

7.4 Monitoring Network and Verification of Future Attainment

As required, the DEP will continue to track attainment of the CO standard. EPA guidance requires continued operation of an appropriate air quality monitoring network during the maintenance period to verify the attainment status of the area in accordance with 40 CFR Part 58. Massachusetts plans to continue operation of its CO monitors in Lowell, Springfield, and Worcester. Any future modification to this network will be coordinated with EPA to ensure that the attainment status of the area can be adequately verified. A verified exceedance of the CO standard measured in any of the three cities will trigger the contingency plan described below.

7.5 Contingency Plan

Section 175A of the Clean Air Act requires that the maintenance plan include contingency provisions, as necessary, to promptly correct any exceedances of the NAAQS that occur after redesignation of the area to attainment. DEP has developed a multiple-stage contingency plan to address any verified monitored exceedances of the CO NAAQS in the cities of Lowell, Springfield, Waltham, and Worcester. The contingency plan consists of the following steps and actions to be taken if there is a measured CO concentration in Lowell, Springfield, Waltham, and Worcester above the level of the NAAQS that meets quality assurance criteria and does not qualify for exclusion under EPA's "exceptional events" policy.

Stage 1) Subsequent to the verification of any measured concentration above the level of the CO NAAQS in Lowell, Springfield, Waltham, and Worcester, the DEP will investigate the traffic conditions and other local conditions in the vicinity of the monitor measuring the exceedance. The DEP will confer with the appropriate officials at the MADOT, regional planning agencies, and municipalities to determine if a local remedy (e.g., traffic signal changes, revised parking restrictions) is appropriate to avoid exceedances of the standard. If such local actions are feasible and determined to be effective, DEP will work with the affected agencies to pursue implementation. If local actions are determined to be infeasible or ineffective, the second or third stage contingency measure would be automatically triggered as described below.

Stage 2) The second stage contingency measure will be triggered if the first stage contingency is determined to be infeasible or ineffective and if the measured exceedance occur prior to the end of the year 2001. This contingency measure involves acknowledgment that implementation of the enhanced I/M program will achieve additional CO reductions that have not yet been realized. Although implementation of Massachusetts' biennial enhanced I/M program began in October 1998, it will not be fully implemented until April 2001, when all vehicles will have been tested at the final CO cutpoints. Therefore increased emission reductions, and corresponding improvements in ambient CO levels, can be anticipated during this period. Note that current compliance with CO NAAQS is not dependent on enhanced I/M, as discussed in Section 4.0 and Section 5.0.

Stage 3) The third stage contigency measure involves acknowledgement that implementation of Massachusetts low emission vehicle (LEV) program will achieve additional CO emission reductions through the maintenance period. This requirement will be triggered if the first stage contingency is determined to be infeasible or ineffective and if the measured exceedance after the year 2001. Implementation of the CA LEV I program began with model year 1994 and implementation of the CA LEV II program will begin with model year 2004. Emission reductions are expected to increase during the maintenance period due to both the increasing stringency of the program and fleet turnover. In addition, the MOBILE5a-h model is being updated to provide additional reductions for implementation of the CA LEV II program. Corresponding improvements in ambient CO levels are expected to result. Note that current compliance with the CO NAAQS is not dependent on the LEV program, as discussed in Section 4.0 and Section 5.0.

Based on the above, we find that the contingency measures provided in Massachusetts' maintenance plan are sufficient and meet the requirements of Section 175A (d) of the CAA.

8.0 SUMMARY

Section 107(d)(3)(E) of the Clean Air Act specifies the criteria that must be satisfied before EPA can approve the redesignation of a non-attainment area (or portions thereof) to attainment. This submittal demonstrates that the cities of Lowell, Springfield, Worcester and Waltham meet each of the necessary criteria, documenting that:

1) monitoring data and modeling analyses indicate that the above mentioned cities continue to attain the eight hour CO NAAQS;
2) emission reductions in the above mentioned cities are permanent and enforceable;
3) Massachusetts has implemented a CO SIP for the four cities that has been fully approved by EPA under Section 110(k) of the Clean Air Act;
4) Massachusetts has met all relevant requirements of Section 110 and Part D of the Clean Air Act, as they apply to the four cities; and
5) a maintenance plan has been prepared that demonstrates continued attainment of the eight hour CO NAAQS in the four cities through the maintenance period (i.e., 2012).

Based on the fulfillment of the CAA section 107(d)(3)(E) criteria, Massachusetts requests that EPA redesignate Lowell, Springfield, Waltham, and Worcester to attainment of the eight-hour CO NAAQS.

9.0 AGRICULTURAL IMPACTS

It is the intent of Massachusetts General Laws, Chapter 30A, Section 18 that state agencies should evaluate the impact of proposed programs on agriculture within the Commonwealth. The proposed SIP revision will not have any significant impacts on agricultural production in Massachusetts.

10.0 IMPACTS ON CITIES AND TOWNS (Proposition 2-1/2)

The proposed SIP will not affect cities and towns under the provisions of Proposition 2-1/2.

11.0 MEPA

This proposed action is "categorically exempt" from the MEPA regulations at 301 CMR 11.00, because the proposed redesignation will result in no change in CO emissions, and no adverse environmental impacts.

12.0 PUBLIC PARTICIPATION

The following is the public hearing notice announcement:

This proposed redesignation request and proposed plan is subject to public review and comment prior to finalization and promulgation. After public review, and DEP evaluation of and response to any comments, the final request and plan will be submitted to EPA as a revision to the Massachusetts SIP for carbon monoxide.

As required by state law, DEP gives notice and provides the public the opportunity to review background and technical information at least 21 days prior to proposing SIP amendments at a public hearing. To assure more adequate notice for processing an amendment to the SIP and to comply with EPA notice requirements, a formal notice is issued 30 days before the public hearings. Public hearing to collect comments on the proposed SIP revision will be conducted under the provisions of M.G.L. chapter 30A on:

Wednesday, November 15, 2000 -- 10:00 a.m.
One Ashburton Place, 21st Floor
McCormack Conference Room 1
Boston, Massachusetts

Thursday, November 16, 2000 -- 10:00 a.m.
Massachusetts Department of Environmental Protection
627 Main Street, 1st Floor
Worcester, Massachusetts

Testimony may be presented orally or in writing at the public hearing. Written comments will be accepted until **5:00 Friday, November 24, 2000**. Please submit comments to:

Charles R. Mentos
Department of Environmental Protection
BWP/Division of Planning and Evaluation
One Winter Street, 8th Floor
Boston, MA 02108
Attention: SIP CO Redesignation

To ensure that your written comments are included in the hearing docket, please make sure that you address your comments to Charles R. Mentos on the 8th Floor. Comments sent to other offices may not be received in time to be included in the official docket.

If there are any questions regarding this document, please contact Charles R. Mentos (617-292-5608) at DEP's Bureau of Waste Prevention, Division of Planning and Evaluation.

13.0 REFERENCES

EPA, 1992a. Procedures for Processing Requests to Redesignate Area to Attainment, EPA memorandum dated September 4, 1992 by John Calcagni. EPA Office of Air Quality Planning and Standards. RTP, NC.

EPA, 1992b. Guideline for Modeling Carbon Monoxide From Roadway Intersections. EPA-454/R-92-005. EPA Office of Air Quality Planning & Standards. RTP, NC.

EPA, 1992c. User's Guide to CAL3QHC: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections. EPA OAQPS. Research Triangle Park, NC.

EPA, 1993a. User's Guide to the MOBILE5a-h Emission Factors Model. EPA Office of Air Quality Planning and Standards. Research Triangle Park, NC.

Massachusetts 1982 State Implementation Plan for Ozone and Carbon Dioxide, Massachusetts Department of Environmental Quality Engineering, DAQC, August 1982.

Revision to the Massachusetts State Implementation Plan for Carbon Dioxide, Request for Redesignation to Attainment and Maintenance Plan, for the Boston Metropolitan Nonattainment Area Including the Communities of, Boston, Cambridge, Revere, Chelsea, Somerville, Medford, Everett, Malden, and Quincy, August 1994.

Massachusetts 1999 Air Quality Report (http://www.state.ma.us/dep/), Massachusetts Department of Environmental Protection.

APPENDIX I: MOBILE5a-h Input Files for 1996 and 2012

(Contact MassDEP for data)

APPENDIX II: MOBILE5a-h 1996 and 2012 Projected CO Emissions

(Contact MassDEP for report)

APPENDIX III: EOEA No. 11677, 50 Jones Road Project

(Contact MassDEP for report)